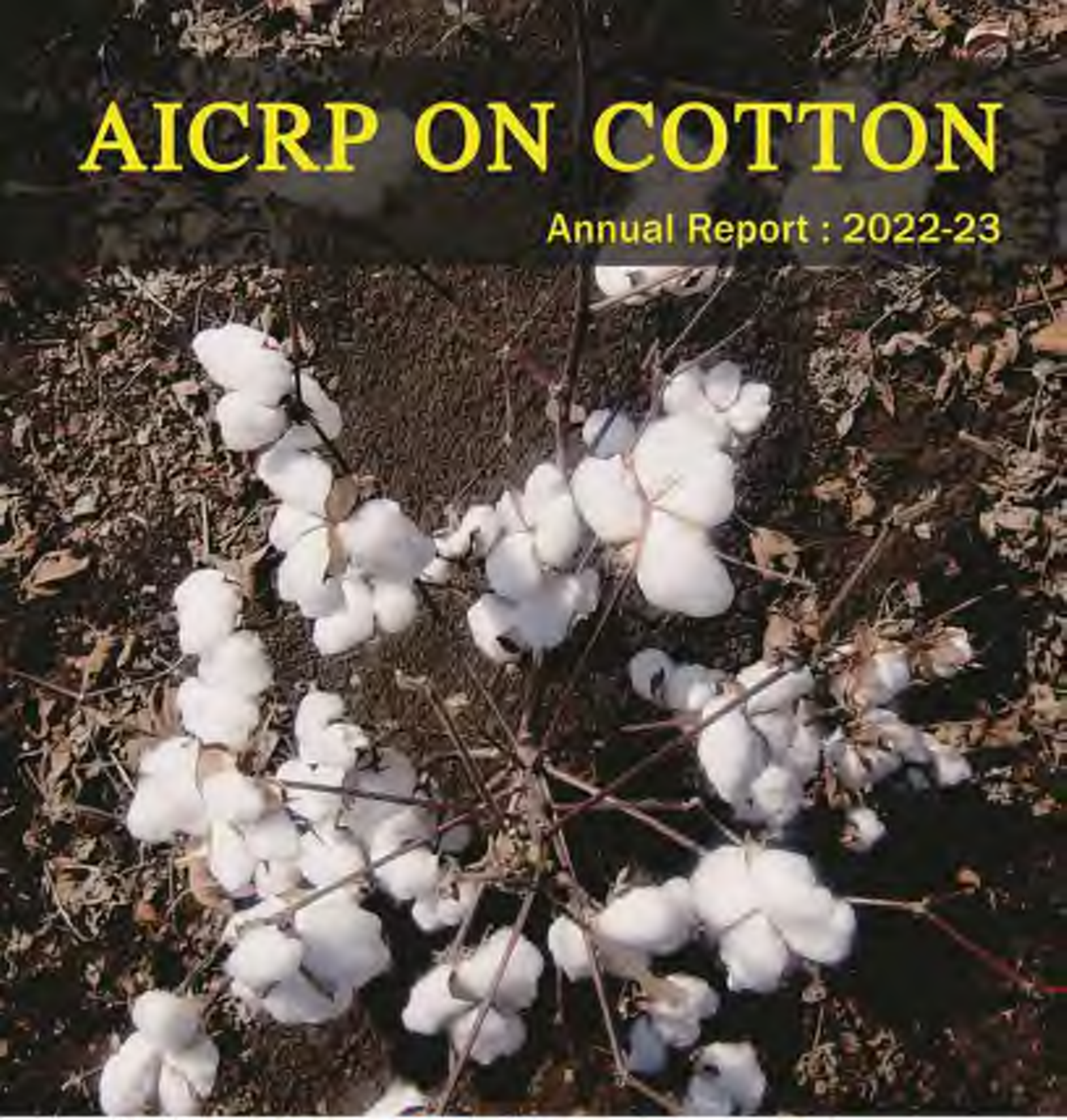
AICRP ON COTTON

Annual Report : 2022-23



ICAR - All India Coordinated Research Project on Cotton
ICAR - Central Institute for Cotton Research
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ICAR – ALL INDIA COORDINATED RESEARCH PROJECT (COTTON)

ANNUAL REPORT

2022-23

PROJECT COORDINATOR (COTTON IMPROVEMENT)
ICAR-CENTRAL INSTITUTE FOR COTTON RESEARCH,
REGIONAL STATION,
LAWLEY ROAD, COIMBATORE – 641 003

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Preface

Cotton is still the "king" of fibers because most of the world's apparel is made of cotton. It is the most widespread profitable non-food crop in the world. Its production provides income for more than 250 million people worldwide and employs almost 7% of all labor in developing countries. Approximately half of all textiles are made of cotton.At global level, during the year 2022-23 China was estimated to produce 59.80 lakh tonnes of cotton, followed by India, 52.00; the USA 31.96; Brazil 29.46 lakh tonnes. Around 71% of the world cotton production comes from these countries from 64% of the world cotton area.

Cotton is one of the most important commercial crops cultivated in India (130.49 lakh hectares) and accounts for around 21% of the total global cotton production. Indian cotton area occupies 40% of global cotton growing area. It plays a major role in sustaining the livelihood of an estimated 6 million cotton farmers and 40-50 million people engaged in related activity such as cotton processing & trade.AllthoughIndia is the leading country in terms of area under cotton, able to produce just 21% of the global cotton production. In the productivity front, India (439 kg/ha) is far behind compared to the leading cotton producing countries like Australia (2002 kg/ha) followed by China (1971); Turkey (1828); Brazil (1771); Mexico (1599) and the USA (1061).To enhance the cotton productivity, research and developmental efforts are being taken up in various fronts such as genetic improvement of genotypes with novel genes, creation of better production environment, alternate approach on crop geometry, supply of quality seeds, subsidised inputs to cotton farmers, involvement of public private partnership, intensive extension activities on popularisation of elite genotypes, Integrated nutrient management, Integrated pest management. Concerted efforts on all above programme may lead India to become the world leader in the coming years.

In line with above, during 2022-23, 18 non-Bt. cotton variety/hybridshave been identified and 14 non-Bt.Variety/hybrids have been notified for public cultivation. 45 Bt cotton varieties/hybrids have been identified and 46 Bt cotton varieties/hybrids have been notified for cultivation.

Leading from the front **Dr. Himanshu Pathak,** Secretary, DARE and Director General, ICAR, New Delhi. I express my deep sense of gratitude to our Hon'ble Director General, ICAR, for his valuable guidance and direction in running the activities of ICAR-AICRP on Cotton.

I place on record my sincere thanks to **Dr. T. R. Sharma,** Hon'ble Deputy Director General (Crop Science) ICAR, New Delhi for constant encouragement and guidance for the progress of ICAR-AICRP. **Dr. R. K. Singh,** Assistant Director General (Commercial Crops), ICAR, New Delhi has been constantly monitoring and guiding in both financial and Research programmes to achieve the targets. **Dr. Y. G. Prasad,** Director, ICAR- CICR, Nagpur and **Dr. S. K. Shukla**, Director, ICAR-CIRCOT, Mumbai, who have been very helpful and remain as sources of strength and knowledge for efficient running of the ICAR-AICRP programme, for which I am greatly indebted to them. The Programme Advisory and Monitoring Committee Headed by **Dr. C. D. Mayee,** and Members **Dr. B. M. Khadi, Dr. T. M. Manjunath and Dr. A. R. Sharma** have given new direction in Formulation of technical programme and taking the activities to next level. I thank them for their tireless services in this direction. It is a great pleasure to acknowledge the full cooperation extended by **Dr. S. Manickam,** Principal Investigator (Plant Breeding), **Dr. K. Sankaranarayanan,** Principal Investigator (Agronomy), **Dr. Rishi Kumar,** Principal Investigator (Entomology) , **Dr. Satish Sain**, Principal Investigator (Pathology), **Dr. A. S. M. Raja**, Principal Investigator (Fibre Technology), **Dr. M. Sabesh** (Senior Scientist computer Applications), **Dr. (Mrs). S. Usha Rani** (Principal Scientist, Extension) and **Dr. K. Rathinavel,** Principal Scientist (Seed Technology), in running various technical activities of this huge project. It gives me immense pleasure to convey my gratitude to **Dr. (Mrs). Sujata Saxena**, Former Director, ICAR-CIRCOT, Mumbai, **Dr. A. H. Prakash**, Former Project Coordinator and Head, and **Dr. P. K. Mandhyan**, Former Principal Investigator, (Fibre Technology) excellent effort in bringing out the complete information in this publication. The Scientists and Staff of ICAR-CICR, Regional Station, Coimbatore deserve a special mention for extending whole hearted support in the general activities of the Project, without whom it would be very difficult to carry out the assignments. I acknowledge the sincere efforts put in by my team **Sh. S. Sathyakumar** (Assistant Chief Technical Officer), **Sh. N. Ramesh**, (Assistant), and **Sh. K. Vedavyas** (Personal Assistant), ICAR-CICR, RS, Coimbatore for assisting me in the regular correspondence. Administrative and financial matters. I also would like to place on record the timely assistance rendered by **Sh. A. A. Goswami** (Chief Administrative Officer), **Sh. Sanjay Kumar** (Finance and Accounts Officer) and their team at ICAR-CICR, Nagpur without whom the timely disbursal of funds to participating centres would have been impossible. It is a testimony to the quality, dedication and professionalism of our ICAR-AICRP scientists that we have seen significant progress on implementing both the new organizational structure and made a significant start on improving knowledge – sharing and increasing multidisciplinary projects.

K.Rathinavel
Head,ICAR- Central Institute for Cotton Research,
Regional Station, Coimbatore.

PROJECT COORDINATOR'S REPORT

Introduction

Since 1967, AICRP on Cotton has focused on formulating innovative methodologies, strategical and technical programs for the varied agro-ecological condition of India for developing improved cotton varieties and economically viable agronomical practices along with eco-friendly and cost-effective plant protection strategies for increasing cotton productivity in the country with the prime focus on remunerative returns to cotton farmers. Cotton, as a commodity have sailed smoothly during the Covid pandemic across the globe. In India, the cotton supply and demand chain unaffected, and sustainability has been maintained. India has propelled well with strong policy framework, which sustained cotton production and supply chain system during the pandemic and post pandemic also.

Indian Cotton Scenario: 2022-23

The cotton production in India during 2022-23 is estimated to produce 337.23 lakh bales of 170 kg from 130.49 lakh hectares with a productivity of 439 kg lint/ha as estimated by the Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, New Delhi. The area under cotton in the current year in the country increased from 123.72 to 130.49 lakh hectare estimated to 5.5 % increase compared to last year. As increase in the area under cotton, the production also increased to the tune of 8.4 % (from 311 to 337 lakh bales). On the productivity front, a marginal increase from 428 to 439 kg per hectare in the current year compared to last year.

In the recent years from 2018-19 to 2022-23, Gujarat, Maharashtra, and Telangana were the major cotton-growing and producing states in the country. In the last five years, Maharashtra produced on an average 79.54 lakh bales from 43.78 lakh hectare; Gujarat produced 76.67 lakh bales from 24.84 lakh hectare; and Telangana produced 53.59 lakh bales from 20.47 lakh hectare. These states, Maharashtra, Gujarat, and Telangana in the last five years cultivated on an average 33.79, 19.16, and 15.80 percent of area under cotton respectively, and produced 24.22, 23.75, and 16.32 percent of the national output. The same scenario was observed when analysed for the past ten years data.

State-wise Cotton Area (in Lakh ha)

State	18-19	19-20	20-21	21-22	22-23*
Punjab	2.68	2.48	2.52	2.51	2.41
Haryana	7.08	7.23	7.40	6.36	6.47
Rajasthan	6.29	7.60	8.07	7.56	7.77
Gujarat	26.60	26.55	22.70	22.84	25.49
Madhya Pradesh	6.14	6.50	5.88	5.60	5.99
Maharashtra	42.18	44.91	45.44	44.10	42.29
Andhra Pradesh	6.20	6.57	6.06	5.54	6.95
Telangana	18.39	21.27	23.58	18.89	20.24
Karnataka	7.18	8.17	8.20	6.74	8.97
Tamil Nadu	1.33	1.70	1.12	1.48	1.56
Odisha	1.57	1.70	1.71	1.93	2.16
Others	0.50	0.09	0.17	0.17	0.18
All India	**126.14**	**134.77**	**132.85**	**123.72**	**130.49**

Source: Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, New Delhi

State-wise Cotton Production (in Lakh bales of 170 kg)

State	18-19	19-20	20-21	21-22	22-23*
Punjab	12.22	12.06	10.23	6.46	4.54
Haryana	20.13	24.84	18.23	13.16	17.20
Rajasthan	20.26	27.88	32.07	24.81	25.51
Gujarat	62.79	86.17	72.18	75.09	87.12
Madhya Pradesh	23.29	16.46	13.38	14.20	15.19
Maharashtra	65.93	66.39	101.05	82.49	81.85
Andhra Pradesh	14.91	25.08	16.00	17.08	18.85
Telangana	38.47	68.33	57.97	48.78	54.41
Karnataka	14.00	23.30	23.20	19.55	21.48
Tamil Nadu	2.69	4.18	2.43	3.02	3.56
Odisha	4.55	5.79	5.51	6.26	7.23
Others	1.18	0.17	0.23	0.28	0.30
All India	**280.42**	**360.65**	**352.48**	**311.18**	**337.23**

Source: Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, New Delhi

State-wise Cotton Productivity (in kg/ha)

State	18-19	19-20	20-21	21-22	22-23*
Punjab	775	827	690	437	320
Haryana	483	584	419	352	452
Rajasthan	548	624	676	558	558
Gujarat	401	552	541	559	581
Madhya Pradesh	645	430	387	431	431
Maharashtra	266	251	378	318	329
Andhra Pradesh	409	649	449	524	461
Telangana	356	546	418	439	457
Karnataka	331	485	481	493	407
Tamil Nadu	344	418	369	347	388
Odisha	493	579	548	551	568
Others	401	321	230	280	278
All India	378	455	451	428	439

Source: Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, New Delhi

Cotton Balance Sheet

Particulars	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22(P)*	2022-23(P)*
SUPPLY								
Opening Stock	66.00	36.44	43.76	42.91	56.52	120.79	71.84	45.25
Crop	332.00	345.00	370.00	333.00	365.00	352.48	311.17	337.23
Import	22.79	30.94	15.80	35.37	15.50	11.03	21.13	10.00
TOTAL SUPPLY	**420.79**	**412.38**	**429.56**	**411.28**	**437.02**	**484.30**	**404.14**	**392.48**
DEMAND								
Mill Consumption	270.20	262.70	280.11	270.78	233.70	297.45	279.57	275.00
S.S.I Consumption	27.08	26.21	26.18	22.43	20.49	22.42	21.07	20.00
Non-Textile Consumption	18.00	21.50	12.77	18.00	15.00	15.00	16.00	16.00
Export	69.07	58.21	67.59	43.55	47.04	77.59	42.25	35.00
TOTAL DEMAND	**384.35**	**368.62**	**386.65**	**354.76**	**316.23**	**412.46**	**358.89**	**346.00**
Closing Stock.	36.44	43.76	42.91	56.52	120.79	71.84	45.25	46.48

Note: In lakh bales of 170 kg. Each
*As estimated by Committee on Cotton Production and Consumption (COCPC) in its meeting held on 20.02.2023; P- provisional

World Cotton Scenario: 2022-23

In world cotton scenario, China was leading producer of cotton in recent decades. India was leader in cotton production in few years in the last decade. However, China have re-established their position of leading producer of cotton and become leading producer of cotton in the world since 2018-19.

According to ICAC data, China estimated to produce 59.80 lakh tonnes of cotton during the year 2022-23, followed by India, 52.00; the USA 31.96; Brazil 29.46 lakh tonnes. Around 71% of the world cotton production comes from these countries from 64% of the world cotton area. India is the leading country in terms of area under cotton, which cultivates cotton in around 130 lakh hectares, which is estimated around 40% of the world cotton area. At global level, though India occupies 40% of the area, but able to produce just 21% of the global cotton production. Whereas in China, has 30 lakh hectares and produces 59.80 lakh tonnes of cotton. On global level, the productivity of cotton was high in Australia (2002 kg/ha) followed by China (1971); Turkey (1828); Brazil (1771); Mexico (1599) and the USA (1061). India productivity estimated at 400 kg/ha (ICAC, 2023). Between the years 2006 and 2018, the cotton productivity in the country on an average above 500 kg/ha, but between 2019-23 the productivity slumped and hovering around on an average 440 kg/ha. As envisaged, to enhance the cotton productive in the country, need to identify the elite cultures for HDPS, which should be robust with better fiber quality for the demand of the textile industries. It is the high time for the cotton fraternity to retrospect lacuna behind low productivity of our cultures.

China is the largest importer of cotton, imports 18 lakh tonnes of cotton which is estimated at 21% of the world cotton imports of all countries. And also, China is the largest consumer of cotton, consumes 72.80 lakh tonnes of cotton, which is estimated at 32% of the global cotton consumption. India is the second largest consumer of raw cotton, consumes 50.06 lakh tonnes of raw cotton which is 21% of the global raw cotton consumption in the year 2022-23. Other Asian countries like Vietnam, Bangladesh and Pakistan imports 13.91, 13.77, and 11.59 % of the global imports, respectively. China again the leading country to keep the raw cotton reserve in the world. As mentioned in the last year report, significant import has been carried out by Turkey in the past four years and imports on an average 11 lakh tonnes of raw cotton, in order to reserve raw cotton stock in the country, on an average 12.50 lakh tonnes of raw cotton in the past four years. Brazil also started keeping the raw cotton reserves around on an average 24 lakh tonnes of raw cotton in the past four years.

World Cotton Status: 2022-23 (projection)

Country	Area	Yield	Production	Beginning Stock	Imports	Consumption	Exports	Ending Stocks
	000 ha	**Kg/ha**	**000** tonnes					
Argentina	400.00	625.00	250.00	788.46	0.00	140.00	161.82	736.64
Australia	490.00	2002.04	981.00	742.44	0.00	1.59	1200.00	521.85
Bangaladesh	45.90	776.77	35.65	557.72	1188.00	1200.00	0.00	581.37
Benin	572.94	491.88	281.82	165.40	0.00	2.00	250.00	195.22
Brazil	1660.00	1771.08	2940.00	2194.82	5.49	696.72	1964.00	2479.59
Burkina Fasa	617.61	313.85	193.83	140.20	0.00	5.44	180.00	148.59
Cameroon	231.83	606.14	140.52	63.06	0.00	1.90	125.00	76.68
Chad	256.73	202.88	52.09	27.78	0.00	1.02	45.00	33.84
China	3034.00	1971.00	5980.00	8602.37	1800.00	7280.00	26.99	9075.39
Cote d Ivoire	410.68	294.63	121.00	15.48	0.02	3.06	100.00	33.44
Egypt	83.16	837.50	69.65	5.15	86.78	100.71	55.72	5.15
India	13000.00	400.00	5200.00	1962.13	204.00	5006.50	425.00	1934.63
Indonesia	3.68	621.06	2.29	109.98	597.55	592.76	1.31	115.73
Mali	745.00	395.33	294.52	38.33	0.00	2.00	244.70	86.15
Mexico	146.15	1599.88	233.82	220.88	227.80	318.09	143.53	220.88
Pakistan	2127.97	399.44	850.00	500.10	1000.00	1900.00	8.97	441.13
Sudan	180.00	736.86	132.63	51.03	0.00	18.03	127.36	38.27
Tajikistan	202.36	540.98	109.47	22.69	0.00	25.00	106.69	0.48
Tanzania	641.00	220.46	141.32	61.22	0.00	45.00	96.32	61.22
Turkey	484.80	1828.80	886.60	1270.93	1200.00	1927.80	128.36	1301.43
Turkmenistan	573.00	522.47	299.37	124.36	0.00	144.24	155.13	124.36
USA	3011.00	1061.50	3196.19	338.10	1.63	464.84	2275.48	795.59
Uzbekistan	1000.00	590.00	590.00	111.42	14.76	600.00	25.66	90.52
Vietnam	1.00	1509.01	1.51	96.95	1199.59	1200.00	0.00	98.05
World	32360.87	749.67	24259.97	19436.98	8624.73	23132.13	8624.60	20564.94

Area in '000 ha; Yield in Kg/ha; Production, Beginning Stock, Imports, Consumption, Exports, Ending Stocks in '000 tonnes.
Source: International Cotton Advisory Committee (ICAC) data portal; 2022-23 in the projection, accessed on 13/03/2023.

Varieties and hybrids identification and release during 2022-23.

During the year 2022-23, 18 non-Bt cotton variety and hybrids have been identified and 14 non-Bt cotton variety and hybrids have been notified for public cultivation. During the year 2022-23, 45 Bt cotton varieties and hybrids from both public and private sectors have been identified for commercial cultivation and 46 Bt cotton varieties and hybrids from both public and private sectors have been notified. Details are provided in the following tables.

List of Non-Bt cotton variety / hybrid identified

S. No.	Name of the culture	Species	Institution
1	CCH 19-4	*G. hirsutum*	CICR, Coimbatore
2	LHDP Cotton 5	*G. hirsutum*	ANGRAU, Lam
3	GISV 312 (G N Cot 44)	*G. hirsutum*	NAU, Surat
4	KR 136	*Desi hybrid*	Shaktivardhak, Hisar
5	CICR-A Cotton 57 (CNA 1091)	*G. arboreum*	CICR, Nagpur
6	CICR-A Cotton 56 (CNA1031)	*G. arboreum*	CICR, Nagpur
7	CICR-H NC-Cotton-53 (16301 DB)	*G. hirsutum*	CICR, Nagpur
8	CICR-H Cotton 58 (CNH 17395)	*G. hirsutum*	CICR, Nagpur
9	CICR-A Cotton 59 (CNA17522)	*G. arboreum*	CICR, Nagpur
10	Nandyal Cotton 25 (NDLH 2035-5)	*G. hirsutum*	ANGRAU, Nandyal
11	CICR-B Cotton 55 (CCB 51-2)	*G. barbadense*	CICR, Coimbatore
12	GJHV 522	*G. hirsutum*	JAU, Junagadh
13	Phule Shubhra (RHB 1623)	H X B hybrid	MPKV, Rahuri
14	JLA 1207	*G. arboreum*	MPKV, Jalgaon
15	RAH 1075	*G. hirsutum*	UAS, Raichur
16	DB 1801	*G. barbadense*	UAS, Dharwad
17	DHCC 1801	*G. hirsutum*	UAS, Dharwad
18	DWDa 1802	*G. arboreum*	UAS, Dharwad

List of Non-Bt cotton variety / hybrid notified

S. No.	Name	Species	Notification	Institution
1	CICR-H Cotton 54 (Nano)	*G. hirsutum*	S. O. 4065 (E)	CICR, Coimbatore
2	LHDP Cotton 5	*G. hirsutum*	S. O. 4065 (E)	ANGRAU, Lam
3	GISV 312 (G N Cot 44)	*G. hirsutum*	S. O. 4065 (E)	NAU, Surat
4	KR 136	Desi Hybrid	S. O. 4065 (E)	Shaktivardhak, Hisar
5	PA 837	*G. arboreum*	S. O. 4065 (E)	VNMKV, Parbhani
6	PBH 115	*G. hirsutum*	S. O. 4065 (E)	PAU, Bathinda
7	SBSG 1-5 (SIMA Platinum)	*G. barbadense*	S. O. 4065 (E)	SIMA-CDRA
8	CICR-A Cotton 57 (CNA 1091)	*G. arboreum*	S. O. 4065 (E)	CICR, Nagpur
9	CICR-A Cotton 56 (CNA1031)	*G. arboreum*	S. O. 4065 (E)	CICR, Nagpur
10	CICR-H NC-Cotton-53 (16301 DB)	*G. hirsutum*	S. O. 4065 (E)	CICR, Nagpur
11	CICR-H Cotton 58 (CNH 17395)	*G. hirsutum*	S. O. 4065 (E)	CICR, Nagpur
12	CICR-A Cotton 59 (CNA17522)	*G. arboreum*	S. O. 4065 (E)	CICR, Nagpur
13	Nandyal Cotton 25 (NDLH 2035-5)	*G. hirsutum*	S. O. 1056 (E)	ANGRAU, Nandyal
14	CICR-B Cotton 55 (CCB 51-2)	*G. barbadense*	S. O. 1056 (E)	CICR, Coimbatore

Note: in the list 1 to 12 notified on 31:08:2022 and 13, 14 notified on 06:06:2023

List of Bt cotton variety / hybrid identified

S. No.	Name of Variety / hybrid	Name of the Sponsors	Species
1	PBH Bt 21 (PAU Bt 5)	PAU, Bathinda	G. hirsutum
2	CICR- H Bt Cotton 60 (Yogank Bt (CICR-183059- 5)	CICR, Nagpur	G. hirsutum
3	CICR- H Bt Cotton 61 (Tejas Bt (Bt- 183059-4)	CICR, Nagpur	G. hirsutum
4	CICR- H Bt Cotton 62 Namami (CICR 19-32 Bt)	CICR, Nagpur	G. hirsutum
5	CICR- H Bt Cotton 63 (Samart Bt (CICR- 183059-2)	CICR, Nagpur	G. hirsutum
6	Indam 1634 BG II	Indo-American seeds PL	H X B Hybrid
7	KCH 9323 BGII	Kaveri Seed	H X H Hybrid
8	KCH 9333 BGII	Kaveri Seed	H X H Hybrid
9	RCH 960 BGII	Rasi Seeds PL	H X H Hybrid
10	ATCH 118 BG II	Agri Top Seeds PL	H X H Hybrid
11	GBCH 1801 BG II	Green Gold Seeds PL	H X H Hybrid
12	KCH 9292 BG II	Kaveri Seed	H X H Hybrid
13	Vrishti MC 5441 BGII	Rallis India Limited	H X H Hybrid
14	Shaiv MC 5444 BGII	Rallis India Limited	H X H Hybrid
15	NBC 2020 BGII	Nath Bio-Genes (I) Ltd	H X H Hybrid
16	RCH 971 BGII	Rasi Seeds PL	H X H Hybrid
17	US 704 BGII	Seed Works Int PL	H X H Hybrid
18	VSCH 369 BGII	Veda Seed Sciences PL	H X H Hybrid
19	ARCH 3001 BG II	Ankur Seeds PL	H X H Hybrid
20	ARCH 3106 BG II	Ankur Seeds PL	H X H Hybrid
21	Rocky (Hy. Cotton Daftari 3434 BG II)	Daftari Agro PL	H X H Hybrid
22	ACH 909-2 BG II	Ajeet Seeds PL	H X H Hybrid
23	Pushpa (Hy. Cotton Daftari 2244 BG II)	Daftari Agro PL	H X H Hybrid
24	GBCH 1801 BG II	Green Gold Seeds PL	H X H Hybrid
25	Damak MC 5459 BGII	Rallis India Limited	H X H Hybrid
26	Neo 1656 BGII	Neo Seeds India PL	H X H Hybrid
27	US 704 BGII	Seed Works Int PL	H X H Hybrid
28	C 9392 BG II	Mahyco	H X H Hybrid
29	ARCH 3001 BG II	Ankur Seeds PL	H X H Hybrid
30	NCS 2778 Bt2	Nuziveedu Seeds	H X H Hybrid
31	ACH 52-2 BG II	Ajeet Seeds PL	H X H Hybrid
32	ARCH 3106 BGII	Ankur Seeds PL	H X H Hybrid
33	KCH 9292 BG II	Kaveri Seed	H X H Hybrid
34	RCH 971 BGII	Rasi Seeds Pvt Ltd	H X H Hybrid
35	US 704 BGII	Seed Works Int PL	H X H Hybrid
36	VSCH 369 BGII	Veda Seed Sciences PL	H X H Hybrid
37	C 376 BG II	Mahyco	H X H Hybrid
38	SP 7679 BG II	Crystal Crop Protection PL	H X H Hybrid

S. No.	Name of Variety / hybrid	Name of the Sponsors	Species
39	US 704 BGII	Seed Works Int PL	H X H Hybrid
40	VSCH 369 BGII	Veda Seed Sciences PL	H X H Hybrid
41	GBCH 1801 BG II	Green Gold Seeds PL	H X H Hybrid
42	Vrishti MC 5441 BGII	Rallis India	H X H Hybrid
43	SP 7686 BGII	Crystal Crop Protection PL	H X H Hybrid
44	CCH 03 BG II (CCH 333 BG II)	Crystal Crop Protection PL	H X H Hybrid
45	VSCH 234 BG II	Veda Seed Sciences PL	H X H Hybrid

List of Bt cotton variety / hybrid notified in 2022-23

S. No.	Name of Variety / hybrid	Species	Name of the Applicant	Notification
1	Panchaganga ZCH 1439 BG II Pradhan	H X H	Panchaganga Seeds PL	S. O. 4065 (E)
2	KCH 9323 BGII	H X H	Kaveri Seed	S. O. 4065 (E)
3	KCH 9333 BGII	H X H	Kaveri Seed	S. O. 4065 (E)
4	RCH 960 BGII	H X H	Rasi Seeds Pvt Ltd	S. O. 4065 (E)
5	ATCH 118 BG II	H X H	Agri Top Seeds PL	S. O. 4065 (E)
6	GBCH 1801 BG II	H X H	Green Gold Seeds PL	S. O. 4065 (E)
7	KCH 9292 BG II	H X H	Kaveri Seed	S. O. 4065 (E)
8	Vrishti MC 5441 BGII	H X H	Rallis India Limited	S. O. 4065 (E)
9	Shaiv MC 5444 BGII	H X H	Rallis India Limited	S. O. 4065 (E)
10	NBC 2020 BGII	H X H	Nath Bio-Genes	S. O. 4065 (E)
11	RCH 971 BGII	H X H	Rasi Seeds PL	S. O. 4065 (E)
12	US 704 BGII	H X H	Seed Works Int PL	S. O. 4065 (E)
13	VSCH 369 BGII	H X H	Veda Seed Sciences PL	S. O. 4065 (E)
14	ARCH 3001 BG II	H X H	Ankur Seeds PL	S. O. 4065 (E)
15	ACH 909-2 BG II	H X H	Ajeet Seeds PL	S. O. 4065 (E)
16	GBCH 1801 BG II	H X H	Green Gold Seeds PL	S. O. 4065 (E)
17	Damak MC 5459 BGII	H X H	Rallis India Limited	S. O. 4065 (E)
18	Neo 1656 BGII	H X H	Neo Seeds India PL	S. O. 4065 (E)
19	US 704 BGII	H X H	Seed Works Int PL	S. O. 4065 (E)
20	ARCH 3001 BG II	H X H	Ankur Seeds PL	S. O. 4065 (E)
21	NCS 2778 Bt2	H X H	Nuziveedu Seeds	S. O. 4065 (E)
22	CICR- H Bt Cotton 60 (Yogank Bt (CICR-183059- 5))	G. hirsutum	CICR, Nagpur	S. O. 4065 (E)
23	CICR- H Bt Cotton 61 (Tejas Bt (Bt- 183059-4))	G. hirsutum	CICR, Nagpur	S. O. 4065 (E)
24	CICR- H Bt Cotton 62 (Namami (CICR 19-32 Bt))	G. hirsutum	CICR, Nagpur	S. O. 4065 (E)
25	ACH 52-2 BG II	H X H	Ajeet Seeds PL	S. O. 4065 (E)
26	ARCH 3106 BGII	H X H	Ankur Seeds PL	S. O. 4065 (E)
27	KCH 9292 BG II	H X H	Kaveri Seed	S. O. 4065 (E)
28	RCH 971 BGII	H X H	Rasi Seeds PL	S. O. 4065 (E)
29	US 704 BGII	H X H	Seed Works Int PL	S. O. 4065 (E)
30	VSCH 369 BGII	H X H	Veda Seed Sciences PL	S. O. 4065 (E)

S. No.	Name of Variety / hybrid	Species	Name of the Applicant	Notification
31	Indam 1634 BG II	H X B	Indo-American Hybrid	S. O. 4065 (E)
32	US 704 BGII	H X H	Seed Works Int PL	S. O. 4065 (E)
33	VSCH 369 BGII	H X H	Veda Seed Sciences PL	S. O. 4065 (E)
34	Vrishti MC 5441 BGII	H X H	Rallis India	S. O. 4065 (E)
35	CICR- H Bt Cotton 63 (Samart Bt (CICR- 183059-2))	G. hirsutum	CICR, Nagpur	S. O. 4065 (E)
36	VSCH 234 BG II	H X H	Veda Seed Sciences PL	S. O. 4065 (E)
37	Mahbeej 124 BG II	H X H	MSSC, Akola	S. O. 4065 (E)
38	SP 7674 BG II	H X H	Bayer Bioscience PL	S. O. 1056 (E)
39	PBH Bt 21 (PAU Bt 5)	G. hirsutum	PAU, Bathinda	S. O. 1056 (E)
40	ARCH 3106 BG II	H X H	Ankur Seeds PL	S. O. 1056 (E)
41	Rocky (Daftari 3434 BG II)	H X H	Daftari Agro PL	S. O. 1056 (E)
42	Pushpa (Daftari 2244 BG II)	H X H	Daftari Agro PL	S. O. 1056 (E)
43	SP 7679 BG II	H X H	Crystal Crop Protec PL	S. O. 1056 (E)
44	GBCH 1801 BG II	H X H	Green Gold Seeds PL	S. O. 1056 (E)
45	SP 7686 BGII	H X H	Crystal Crop Protec PL	S. O. 1056 (E)
46	CCH 03 BG II (CCH 333 BG II)	H X H	Crystal Crop Protec PL	S. O. 1056 (E)

Note: in the list between 1 and 37 notified on 31:08:2022 and between 38 and 46 notified on 06:03:2023

Implementation of PVP legislation and DUS testing of cotton under ICAR and SAU system

At ICAR-Central Institute for Cotton Research, Regional Station, Coimbatore, as a nodal center for DUS testing, Distinctiveness Uniformity and Stability testing of cotton genotypes has been done under this project, a centrally sponsored and funded by PPV &FRA. In addition to ICAR-Central Institute for Cotton Research, Regional Station, Coimbatore, ICAR-Central Institute for Cotton Research, Nagpur; National Seeds project Unit, UAS, Dharwad; Department of Cotton CCSHAU, Hisar; Regional Research Station Bhatinda, PAU and the Department of Cotton, MPKV, Rahuri are the co-nodal centers involved in conducting DUS trials.

During the year 2022-23, the data base on extant cotton varieties and cotton varieties notified under section 5 of the Seeds Act, 1966 has been updated. Field trials for the characterization and establishment of Distinctiveness, Uniformity and Stability was conducted with 10 hybrids in the First-year trial and 25 candidate hybrids along with its corresponding hybrids produced at PPV&FRA center at Shivamoga were accommodated in the second-year trial. Another trial with 12 hybrids and three varieties were grown in the second-year trial. The Bt. Hybrids of 15 numbers recommended for cultivation in central and south zone were grown to serve as references verities for hybrids grown in all the trials. Field sowing was taken up on 17.9.2022 in randomized block design with 3 replications. Germination count at 12 DAS in corresponding plot was recorded in all the entries. Morphological characters such as Hypocotyl: Pigmentation, Leaf: Colour, Leaf: Hairiness, Leaf: Appearance, Leaf: Gossypol glands, Leaf: Nectaries, Leaf: Petiole pigmentation, Leaf: Shape, Plant: Stem hairiness, Plant: Stem pigmentation, Bract: Type, Flower: Time of flowering, Flower: Petal colour, Flower: Petal spot, Flower: Stigma, Flower: Anther Filament colouration , Flower: Pollen colour, Flower: Male Sterility, Boll: Bearing habit, Boll: Colour, Boll: Shape, Boll: Surface, Boll: Prominence of tip were recorded in 10 plants of all varieties. The data received from participating centers would be compiled and submitted to PPV&FRA for issue of registration certificate.

Field trial at RRS Bathinda and CCSHAU involved 15 candidate hybrids with 15 hybrids from Shivamoga for hybridity test and 3 hybrids for DUS test. Field trial at CICR, Nagpur and MPKV Rahuri involved 22 candidate hybrids with 22 hybrids from Shivamoga for hybridity test. Monitoring of DUS trials at the participating centers have also been done through online meetings on 18.10.2022 at RRS Bathinda, CCSHAU, at CICR, Nagpur and MPKV Rahuri, at CICR Coimbatore and on UAS Dharwad on 27.1.2023and 28.1.2023, respectively

Registration of cotton varieties for plant variety protection

1. CICR-H Cotton 54 (Nano) (*Gossypium hirsutum* L.) - White linted
2. CICR-HC Cotton 58 (CNH 17395) (*Gossypium hirsutum* L.) - Brown linted
3. CICR-AC Cotton 59 (CNA17522) (*Gossypium arboreum* L.) - Brown linted

Front Line Demonstrations (FLD) under National Food Security Mission (NFSM) (Commercial Crops)

Front Line Demonstrations (FLD) in Cotton is a Transfer of Technology (TOT) program to demonstrate the productivity potential of newly released cultivars and recommended agro-techniques. Bridgeable yield gaps are assessed from these demonstrations and also the incremental benefit: cost ratio. This FLD program has been in implementation since1996 in cotton through the networking centers of Indian Council of Agricultural Research - All India Coordinated Research Project (ICAR-AICRP) on Cotton. Since then, ICAR-AICRP on cotton has been conducting FLDs on cotton through its network centers and by the ICAR- Central Institute for Cotton Research, Nagpur and its regional stations at Coimbatore and Sirsa. Until 2013, these demonstrations were conducted on Production Technology, Integrated Pest Management and on Farm implements under Technology Mission on Cotton, Mini Mission II. Since 2014-15, FLDs have been conducted under National Food Security Mission (NFSM) – Commercial Crops (CC). During the year 2022-23 under NFSM - Commercial Crops, a total of 560 FLDs on Integrated Crop Management (ICM), 210 Front Line Demonstrations on Desi / ELS cotton / ELS cotton seed production and 200 Front Line Demonstrations on intercropping with cotton were allotted to ICAR-AICRP on Cotton with a budget outlay of Rs80.00 lakhs. Out of the allotted FLDs, a total of 538 Front Line Demonstrations on Integrated Crop Management in cotton, 163 Front Line Demonstrations on Desi / ELS cotton / ELS cotton seed production and 165 Front Line Demonstrations on intercropping in cotton were conducted by twenty participating centers of ICAR – AICRP on Cotton.

While conducting the FLDs, main emphasis was given to the demonstrations for enhancing the production of cotton in low productivity areas / problematic areas. A baseline survey was conducted by the participating centers to document the resource endowments of the farmers and the level of cotton productivity. For selecting the beneficiaries and identifying the priority areas, village level Institutions were actively utilized. A list of beneficiaries and their plot numbers were notified in the local Block Development / Panchayat Office. Farmers were selected in consultation with local Agricultural Officers and Panchayat Samiti. These officials formed part of the FLD team. Bench mark survey was conducted before taking up the demonstration which included information on the crops and cropping system of the area, inter cropping, the average yields of cotton and the local practices adopted in terms of irrigation, use of fertilizer, plant protection, etc., Information on the cost of cultivation was also collected for the area as a whole. An impact analysis after the harvest was carried out in the light of reduction in insecticide use, reduction in cost of cultivation, awareness of modern technology etc., Further in accordance with the decision of Government of India (GOI) regarding implementation of Special Component Plan (SCP) for Scheduled Caste and Tribal Sub Plan (TSP) for Scheduled Tribes and

Gender Budgeting, the beneficiaries were selected for the year's front line demonstration programme. The center wise details of FLDs conducted during 2022-23 with the budget outlay and number of beneficiaries are given below**.**

Physical and Financial Achievements of Cotton Front Line Demonstrations under NFSM-Commercial Crops by the centers of ICAR- AICRP on cotton during 2022-23

S. No	Centers	FLDs on ICM (Rs.8000/ha)		FLDs on Desi / ELS Cotton / ELS Cotton Seed Production (Rs.9000 / ha)		FLDs on Intercropping in Cotton (Rs.8000/ha)		Total in Lakh (Rs.)	
		PT	PA	PT	PA	PT	PA	FT	FA
1	PAU, Faridkot	35	35	10	10	-	-	3.70	3.70
2	CCSHAU, Hisar	30	30	-	-	-	-	2.40	2.40
3	SKRAU, Sriganganagar	30	30	10	10	-	-	3.30	3.30
4	ICAR – CICR, Sirsa	20	20	-	-	-	-	1.60	1.60
5	NAU, Surat	40	20	10	10	-	-	4.10	2.50
6	JAU, Junagadh	25	25	-	-	20	10	3.60	2.80
7	PDKV, Akola	40	60	20	-	-	-	5.00	4.80
8	MAU, Nanded	40	44.6	20	11.6	20	20	6.60	6.28
9	MPKV, Rahuri	30	30	10	10	10	10	4.10	4.10
10	ICAR-CICR, Nagpur	20	23	10	11	20	20	4.10	4.43
11	RVSKVV, Khandwa	20	20	-	-	20	20	3.20	3.20
12	OUAT, Bhawani Patna	30	30	-	-	20	20	4.00	4.00
13	ANGRAU, Guntur	40	40	-	-	20	20	4.80	4.80
14	RARS, Nandyal	25	25	-	-	-	-	2.00	2.00
15	PJTSAU, Adilabad	25	25	-	-	25	20	4.00	3.60
16	UAS, Dharwad	30	-	20	-	20	-	5.80	-
17	UAS, Raichur	30	30	30	30	-	-	5.10	5.10
18	UAS, Chamrajnagar	30	30	30	30	-	-	5.10	5.10
19	TNAU, Coimbatore	20	20	20	20	25	25	5.40	5.40
20	ICAR- CICR, Coimbatore	-	-	20	20	-	-	1.80	1.80
	PC Cell							0.30	0.30
	Total	**560**	**537.6**	**210**	**162.6**	**200**	**165**	**80**	**71.21**

AICRP on Cotton Monitoring team during 2022-23

Monitoring teams were constituted for evaluation of both ICAR-AICRP on Cotton trials and ICAR Bt trials conducted by respective ICAR-AICRP on Cotton centres and Private R & D firms during 2022-23. The Team members are as follows: -

North Zone Centers (Punjab, Haryana & Rajasthan - Sriganganagar)

Chairman/Pathologist	Dr. S. K. Sain, Principal Scientist, ICAR-Central Institute for Cotton Research, Regional Station, Sirsa
Breeder	Dr. K. S. Baig, Cotton specialist, Vasantrao Naik Marathwada Krishi Vidyapeeth, Cotton Research Station, Nanded
Agronomist	Dr. K. B. Sankat, Assistant Research Scientist, MCRS, Navsari Agricultural University, Surat – 395 007, Gujarat
Entomologist	Dr. China Babu Naik, Senior Scientist, ICAR-Central Institute for Cotton Research, Nagpur
RelatedDiscipline	Dr. Ramkrushna Gandhiji Idapuganti, Senior Scientist, ICAR-Central Institute for Cotton Research, Nagpur
Representative from Private Sector R&D	Dr. Mahendar Singh, M/s. Kaveri Seeds

Central Zone Centers (Gujarat, Banswara of Rajasthan, Madhya Pradesh)

Chairman/Breeder	Dr. S. Manickam, Principal Scientist, ICAR-Central Institute for Cotton Research, Regional Station, Coimbatore
RelatedDiscipline	Dr. K. Rathinavel, Principal Scientist, ICAR-Central Institute for Cotton Research, Regional Station, Coimbatore
Entomologist	Dr. K. Rameash, Principal Scientist, ICAR-Central Institute for Cotton Research, Regional Station, Coimbatore
Agronomist	Dr. K. Thirukumaran, Professor(Agronomy), TNAU, Coimbatore
Pathologist	Dr. A. Sampath Kumar, Senior Scientist, ICAR-Central Institute for Cotton Research, Regional Station, Coimbatore
Representative from Private Sector R&D	Sh. Shrirang Wanjarwadekar, M/s. Mahyco Pvt. Ltd.

South Zone Centers (Telangana)

Chairman/Breeder	Dr. S. Manickam, Principal Scientist, Central Institute for Cotton Research, Regional Station, Coimbatore
Entomologist	Dr. K. Rameash, Principal Scientist, Central Institute for Cotton Research, Regional Station, Coimbatore
Related Discipline	Dr. M. Sabesh, Senior Scientist, ICAR-Central Institute for Cotton Research, Regional Station, Coimbatore
Representative from Private Sector R&D	Dr. N. Kannan, M/s. Rasi Seeds (P) Ltd.

South Zone Centres (Andhra Pradesh, Karnataka and Tamil Nadu)

Chairman/Entomologist	Dr. Rishi Kumar, Principal Scientist, ICAR-Central Institute for Cotton Research, Regional Station, Sirsa
Breeder	Dr. Paramjit Singh, Director cum Principal Cotton Breeder, PAU, Regional Research Station, Bathinda
Pathologist	Dr. Shailesh Pandurang Gawande, Senior Scientist, ICAR-Central Institute for Cotton Research, Nagpur
Agronomist	Dr. Amar Preet Singh, Scientist, ICAR- Central Institute for Cotton Research, Regional Station, Sirsa
Related Discipline	Dr. Shah Vivek, Senior Scientist, ICAR-Central Institute for Cotton Research, Nagpur
Representative from Private Sector R&D	Sh.Sunil Varhade, M/s. Ankur Seeds(P)Ltd.

ICAR-AICRP on Cotton Grant – in – aid General: TSP Funds

During the year an amount of **Rs. 10,00,000/-** (Rupees Ten Lakhs Only) was allotted and released in respect of ICAR-AICRP on Cotton Grant- in – aid General TSP funds for the financial year 2022-23. Out of total an amount of **Rs.4,50,000/-** (Rupees Four Lakhs and Fifty Thousand Only) was remitted to University of Agricultural Science, Bangalore, Chamrajnagar Centre;**Rs.1,00,000/-** (Rupees One Lakh Only) was remitted to Odisha University of Agriculture and Technology, Bhubaneswar, Bhawani Patna Centre;**Rs.2,68,000/-** (Rupees Two Lakhs and Sixty Eight Thousand Only) was remitted to Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Nanded Centre; and **Rs.1,82,000/-** was remitted to University of Agricultural Science, Raichur, Raichur Centre.

ICAR-AICRP on Cotton Grant – in – aid General: SCSP Funds

During the year an amount of **Rs. 30,00,000/-** (Rupees Thirty Lakhs Only) was allotted and released in respect of ICAR-AICRP on Cotton Grant- in-aid General SCSP funds for the financial year 2022-23. Out of total an amount of **Rs.14,45,000/-** (Rupees Fourteen Lakhs and Forty Five Thousand only) was remitted to University of Agricultural Science, Bangalore, Chamrajnagar Centre;**Rs.3,00,000/-** (Rupees Three Lakhs Only) was remitted to Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Nanded Centre **Rs.4,00,000/-** (Rupees Four Lakhs Only) was remitted to University of Agricultural Science, Raichur, Raichur Centre;**Rs.2,05,000/-** remitted to Tamil Nadu Agricultural University, Coimbatore, Coimbatore Centre, **Rs.4,50,000/-**; and **Rs.2,00,000/-** was remitted to Professor Jayashankar Telangana State Agricultural University, Adilabad and Warangal Centers respectively.

ICAR-AICRP on Cotton financial statement for the year 2022-23 (Rs. In lakhs)

SNO	Centre Name	Total Salary Head	Total Other than Salary Head	Total Release for the year 2022-2023
1	GUNTUR	110.23	7.50	117.73
2	NANDYAL	44.00	4.50	48.50
3	JUNAGADH	68.22	6.00	74.22
4	SURAT	81.00	7.50	88.50
5	HISAR	80.75	7.50	88.25
6	CHAMRAJNAGAR	51.21	4.50	55.71
7	DHARWAR	134.35	9.00	143.35
8	RAICHUR	61.52	4.50	66.02
10	KHANDWA	48.50	4.50	53.00
11	AKOLA	68.22	6.00	74.22
12	NANDED	56.50	6.00	62.50
14	RAHURI	56.52	4.50	61.02
15	BHAWANIPATNA	50.00	4.50	54.50
16	BHATINDA	67.91	6.00	73.91
17	FARIDKOT	108.53	6.00	114.53
18	BANSWARA	33.25	3.00	36.25
19	SRIGANGANAGAR	45.72	4.50	50.22
20	COIMBATORE	68.22	8.00	76.22
21	SRIVILLIPUTUR	56.52	4.50	61.02
22	KANPUR	15.00	0.00	15.00
23	**Sub Total**	**1306.17**	**108.50**	**1414.67**
24	PC Cell		19.50	19.50
25	**Grand Total**		**128.00**	**1434.17**

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RESEARCH HIGHLISTS

CROP IMPROVEMENT

- In Initial evaluation trials of North Zone, *G.* arboreum culture FDK 341 (2836 kg/ha) and desi hybrid KR 160 (3553 kg/ha) were topping in seed cotton yield in the respective trials and have been promoted to coordinated trials.
- In Coordinated variety trial of *G. hirsutum* in North Zone, the zonal check variety F2228 was the best with 2332 kg/ha seed cotton yield. Among *desi* cotton, FDK 312 with a mean seed cotton yield of 2669 kg/ha was promising among varieties and KR 150 with a mean yield of 3120 kg/ha was promising hybrid.
- In Initial evaluation trials of Central Zone, the *G.* arboreum culture CNA 1085 with a mean seed cotton yield of 1340 kg/ha was the best. However, in *G. herbaceum* trial, none of the test cultures were superior to the check varieties.
- In Central Zone trials, among the coloured genotype CCH 20449 was the best recording a mean seed cotton yield of 2242 kg/ha and have been promoted to coordinated trials.
- Similarly, among *G.* arboreum cultures, white linted AKA 2016-11 recorded the highest mean seed cotton yield of 1245 kg/ha and CNA 20402 was the best with 1129 kg/ha among brown linted genotypes.
- In South Zone trials, among coloured *hirsutum* genotypes, Vaidehi 1, the check was the best for yield, whereas in coordinated variety trial of white linted genotypes, RAH 1081 was the best with a mean seed cotton yield of 1993 kg/ha under irrigated conditions.
- Among ELS barbadense cultures, CCB 22-2 with a mean seed cotton yield of 584 kg/ha was the best under irrigated conditions, whereas in rainfed conditions, among arboreum cultures, DWDa 2252 was the topper recording a mean seed cotton yield of 824 kg/ha.
- In the pre-breeding activities, new crosses between cultivated species and wild species were attempted in different participating centres and different degree of success was reported.
- Introgressed segregating lines with different target characters were shared among the participating centres and their performance is reported.
- Similarly, the shared introgression lines were utilized as donor parents for target characters and crossed with agronomically superior varieties in participating centres.

CROP PRODUCTION

- Optimization of agronomic requirements is the pre requisite for releasing of promising genotypes. Hence, Spacing and Nitrogen requirement of PBD 88 (*G. hirsutum*) in North Zone, GJHV 566, CNH 18529 and TVH007 (*G. hirsutum*), NDLA 3116-3, AKA 2013-8, and PA 873 (*G. arboreum*) and DDCC1901 (*G. arboreum* colour) varieties in central Zone and CPD 1902, CCH 19-2, DHCC 1901, CCH 19-1, NDLH 2056-4 and CCH 19-2 (*G. hirsutum*), DB 1901 (*G. barbadense*), NDLA 3104-4 and DDCC 1902 (*G arboreum*) were standardized in south zone.
- At Chamrajnagar, ELS Bt cotton hybrid (DCH 32 Bt) at 75% of recommended population (33,100/ha) and application of 125% of recommended nitrogen (187.5 kg NPK/ha) was found to be optimum
- Organic nutrient management package comprising of seed treatment, soil application of recommended bio fertilizers, foliar application of Pink Pigmented Facultative Methylotrops (PPFM) at flowering, soil application of Neem cake @ 250 kg/ha and raising and incorporation of Sunnhemp/ fodder cowpea between rows registered significantly higher seed cotton yield at Surat (1129 kg ha^{-1}), Srivilliputhur (1268 Kg/ha) and Coimbatore (1268 kg/ha). In the same package, substituting raising and incorporation of Sunnhemp / fodder cowpea with intercropping of green gram/black gram/ ground nut/soybean registered significantly higher seed cotton yield at Nandyal (1926 kg/ha) and Junagadh (1552 kg/ha).
- Conservation agriculture trial of first year results of North zone revealed that 100% wheat residue incorporation by rotavator followed by sowing of cotton in kharif and 100% cotton residue incorporation after picking + sowing of wheat crop through Super seeder in one go in rabi observed significantly higher seed cotton yield at Faridkot (2645 kg/ha) and Bathinda (3178 kg/ha) in cotton – wheat rotation in North zone. Permanent bed system + Zero tillage + 100 % residue management registered higher seed cotton equivalent yield of 3893 and 3132 kg/ha at Rahuri and Junagadh respectively by following cotton- wheat and cotton-sorghum respectively in fifth year. which These were 25.8 and 4.8 higher respectively as compared to conventional methods
- In Chamrajnagar and Srivilliputhur, conventional tillage with no residue management was at par with permanent bed system with zero tillage and 100 % residue management in cotton – sorghum and cotton- maize cropping system respectively
- Cost of cultivation per quintal on the basis of Cost C3 was arrived as Rs. 7,045 for irrigated Bt Hybrid at Faridkot, Rs. 4958 for irrigated Bt Hybrid at Hisar and Rs. 4959 ha^{-1} for irrigated *G arboreum* at Bathinda. It was Rs. 5781 for rainfed Bt hybrid at Akola, Rs. 5689 for rainfed non Bt hybrid at Bhawanipatna, Rs. 6459 for rainfed Bt hybrid at Nanded, Rs. 5637 for irrigated Bt hybrid at Surat and Rs. 4447 $ha^{-1}$for irrigated Bt hybrid at Khandwa.
- Cost of cultivation per quintal on the basis of Cost C3 was arrived as Rs. 4,181 for rainfed Bt hybrid at Nandyal, Rs. 8,811Bt hybrid- rainfed at LAM , Rs. 6,691 for rainfed Bt hybrid (HxB) at Chamrajnagar , Rs. 4,930 for irrigated Bt hybrid at Raichur and Rs. 4,567 ha^{-1} for irrigated Bt hybrid in Coimbatore
- In Bt variety trial, CICR 23 Bt with 90x30 cm with 150% RDN under rainfed condition at Dharwad registered higher seed cotton (1659kg/ha) yield than ruling Bt hybrid (1501kg/ha)
- In multitier cropping system's trial of Central zone, intercrops were planted between paired row of Bt cotton. Intercropping of two rows of green gram at Akola , two rows of Soybean at Junagadh, Rahuri, and Khandwa, two rows of Indian bean at Surat and red gram (1/6) at Nanded were found economically promising. The relative economic efficiency was 29.6, 17.11, 16.6, 26.7, 35.96 and 6.74 per cent higher than sole Bt hybrid respectively.

- In South Zone, it was found that Multitier cropping systems with two rows of green gram at Dharwad, two rows of cluster bean at Srivilliputhur, two rows of black gram at Chamrajnagar , two rows of soybean at Raichur and one rows of red gram and one row of foxtail millet at Guntur were found economically promising. The relative economic efficiency was 32.1, 89.0, 38.7, 2.9, 1.04 and 33.8 per cent higher than sole Bt hybrid respectively.
- In Khandwa, land configuration of Ridges & Furrow followed by Salicylic acid @100ppm single spray after depletion of 75 % soil moisture was promising This gave 62.3 % higher seed cotton yield compared to control. Adoption of Ridges & Furrow with Glycine Betaine @100ppm spray gave 68.4% higher seed cotton yield as compared to control
- Drought management strategy of Broad Bed Furrow with Glycine Betaine @100ppm spray after depletion of 75 % soil moisture is promising at Perambalur, Dharwad and Nanded which was arrived with higher seed cotton yield of 46.6, 13.0 an d 9.3 per cent as compared to control respectively. However adoption of Broad Bed Furrow with Salicylic acid @100ppm spray gave 30.5 per cent higher seed cotton yield as compared to control at Akola observed moisture stress at squaring to flowering stage
- Sowing on Ridges and & Furrow followed by Salicylic acid @0.5mM spray after water logging found 73.1 and 61.6 per cent higher seed cotton yield as compared to control respectively at Junagadh and Surat
- In canopy management trial, Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray registered 25.6 % seed cotton yield Dharwad. Mepiquat chloride@45ppm at square initiation and 15 days after first spray + Detopping on 20th node recorded 18.9 per cent higher seed cotton yield at Hisar
- Ten days after defoliant application made at 65 % of boll opening found that KCL@10%+Dimethopin@1200ppm registered higher per cent of defoliation at Dharwad (93.0%) , sodium chlorate (0.9 %) gave higher defoliation at Junagadh (89.9%) and Thidiazuron @500 ppm gave higher defoliation at Surat (96.2%)
- Morpho frame studies found that application of ethrel @45 ppm at 40DAS followed by mepiquatchloride@100ppm at 90 DAS registered higher seed cotton yield at Sirsa (3132 kg/ha) , LAM (3028 kg/ha) and Dharwad (2185 kg/ha) .In Surat application of ethrel @45 ppm alone at 40DAS (2302 kg/ha) observed higher performance. Application of mepiquatchloride@100ppm at 90 DAS registered higher seed cotton yield at Hisar (2206 kg/ha). These yields were 50.0,20.2,19.2,14.9 and 30.3 per cent respectively higher than control with Hisar, Sirsa, Surat, Dharwad , and LAM respectively
- Ethrel@8.5µM with Detopping on 20th internode at Dharwad observed higher number of flowers and seed cotton yield in late sown arboreum
- The genotypes viz., H 1530, H 1539, H 1480 and H 1564 at Hisar, GJHV-566, G.Cot-16, and GJHV-522, at Surat, and CPD-1902, DDHC 1901, NDLA 3104, and DB1901were found to be drought tolerant.
- The genotypes H 1530 and H 1529 were identified as salt tolerant at Hisar
- Oil and protein content in seeds was maximum in CPD1901, CCHC-19-1, CCHC-19-2 and DDHC-1902 at Dharwad.
- Higher phenolic content in leaves was recorded by Mepiquat chloride spray @100 ppm at 90 DAS. Highest gossypol content in seeds was recorded Ethrel spray @ 45 ppm at 40 DAS at Hisar. Protein, tannin, reducing sugar and phenol content in leaves at 90 DAS were higher due to the application of Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS at Surat

CROP PROTECTION
ENTOMOLOGY

- **Promising sucking pest tolerant entries** of Hirsutum identified in advance screening trials 2022-23
  - **North Zone-Jassid** : 2 entries (PBH-79 N-Bt & ACRV-44 Bt) **, Whitefly : 3** entries (F-2732, ACRV-44 Bt, HS-310) .
  - **Central Zone-Jassid**: 2 entries (AKH-2013-3& GISV 323**), Whitefly:** 2 entries (GJHV 522& RAH 1076)**.**
  - **South Zone-Jassid:** 2 entries (RAH 1076& RHC 1409)**, Whitefly:** 3 entries (RHC 1409, RAH-1076, AKH 2013-1).
- Seasonal dynamics of key pests in relation to climatic conditions recorded at North, Central and South Zone centers on N-Bt and Bt genotypes under unprotected conditions indicated that in case of **Sucking pests (Non-Bt and Bt)**
  - Leafhopper peak activity was between 28th -34that different locations in North Zone, 35th - 45th in Central zone and 39th - 47th SMW in South Zone across N-Bt and Bt-genotypes selected for study.
  - Similarly, thrips peak activity was between 28th -32nd at different locations in North Zone , 34th - 39th in Central Zone and 34th – 44th SMW in South Zone across N-Bt and Bt-genotypes .
  - In case of whitefly peak activity was observed between 28th - 34that different locations in North Zone, 41st – 52nd in Central Zone and 38th -51st SMW in South Zone, across N-Bt and Bt-genotypes selected for study.
  - In aphid population, peak activity was observed between 35th -52nd in Central and 34th - 48th SMW in South Zone, across N-Bt and Bt-genotypes selected for study.
- **Bollworm dynamics** in **N-Bt-Cotton**
  - North zone: 0 to 5.33 larval population / 5 plants of Spotted Bollworm; 0.77 to 40.82% green boll damage .Highest larval density of SBW was recorded at Sriganganagar location during 39th SMW. Highest green boll damage (%) was recorded at Sirsa during 44th SMW.
  - Central zone: 0-2.0 larval population of each American Bollworm, Tobacco caterpillar and Spotted Bollworm /5 plants. Green boll damage ranged between 0-90.0 percent. Peak activity of American Bollworm was during 41st SMW, Tobacco caterpillar during 40th SMW and Spotted Bollworm during 43rd SMW. The green boll damage ranged between 0-90 percent and maximum at Khandwa during 50th SMW.
  - In South zone, 0.0-5.60 larval population of ABW /5 plants, 0.0-5.0 tobacco caterpillar, 0.0-2.4 spotted bollworm and green boll damage 0.0-81.25 percent. Highest green boll damage (%) due to ABW/SBW/TC was recorded at Raichur during 34th SMW.
- **Bollworm dynamics** in **Bt-Cotton.**
  - North zone: Highest PBW larval recovery recorded at Sriganganagar during 40th SMW. The green boll damage (%) due to PBW was ranged from 0.50-11.25 and maximum damage at Sirsa during 39th SMW.
  - In Central zone, highest larval recovery recorded at Rahuri during 52nd SMW. The green boll damage (%) due to PBW ranged from 0.0-40.0 and maximum damage at Akola during 02nd SMW.
  - In South zone, highest larval recovery and green boll damage due to PBW (10.9-50.83%) recorded at Raichur.

- **Farmers' Field Survey** on key and emerging pests to issue weekly advisory
  - **North zone**: 1779 locations surveyed. Whitefly incidence crossed ETL at 708 locations; Jassid above ETL at 266 locations; Thrips above ETL at 49 locations& PBW at 393 locations. Whitefly and PBW were the key yield limiting pests during the season.
  - **Central Zone**: 2751 locations were surveyed. Leafhopper at 300 locations; whitefly at 38, thrips at 138, aphid at 282 and PBW at 131 locations crossed ETL. The hotspot reported for leafhopper in Banswara, for whitefly in Nanded, for thrips and aphid in Rahuri, Junagarh for PBW.
  - **In South Zone**, 3328 locations surveyed, leafhopper at 465, whitefly at 12, thrips at 216, aphid at 240 locations and PBW crossed ETL at 355 locations. The data indicated that hotspot of leafhopper, whitefly, thrips and aphid was in Raichur.
- In an experiment on **Integrated Pest Management in Cotton,** at majority of the locations of all three zones population of the sucking pest i.e. jassids, whiteflies, thrips, aphids and PBW in case of bollworms were comparatively more in Farmers Practice (FP) in comparison to IPM practices except Akola & Rahuri. Population of natural enemies recorded was more in IPM as compared to FP. Average numbers of sprays applied under IPM were 4.17-5.20 and 6.17-7.67 in FP. Similarly, 16.79-26.03 per cent higher yield was obtained in IPM over FP.
- **Refuge in bag** (non Bt seed mixed with Bt seed in the same bag) for management of resistance development in bollworm against cry protein: various proportion of Non-Bt and Bt seed mixed in the form of 'Refuge in bag' were compared with standard refuge (20% non Bt structured refuge at periphery) along with 100% Bt and 100% N-Bt treatments.
  - Green boll damage in N-Bt plants of various treatments (5% and 10% Non-Bt seed mixed with Bt-seed) due to *Helicoverpa/Earias*, PBW (through destructive boll sampling) & open boll damage was recorded to be at par with standard refuge treatment (20% non Bt structured refuge at periphery) at majority of the locations but in few locations damage varied among the treatments.
  - Within the RIB treatments (Bt and N-Bt seed mix), maximum yield was obtained in treatment T-5 (5% N-Bt + 95% Bt) and minimum yield was obtained in T-4 (RIB-Random-5-10% Minimal Non-Bt seeds Commercial Pack) but highest yield was obtained in the treatment sown with 100% Bt plants and lowest was in plots sown with 100% N-Bt.
- Among prominent insecticides evaluated against bollworm complex of cotton,
  - Maximum reduction (%) over control in green boll damage due *Helicoverpa*/*Earias* was observed in Chlorantraniliprole 18.5 SC, Flubendamide 39.35SC, Spinetoram 11.7 SC, Spinosad 45 SC and Emamectin benzoate 5 SG at all locations of three zones.
  - Whereas for green boll damage due to PBW, maximum reduction (%) over control was observed in Bifentherin 10EC, Fenpropathrin 10 EC, Flubendamide 39.35SC, Indoxacarb 14.5 SC, Spinetoram 11.7 SC and Spinosad 45 SC in North zone ; Chlorantraniliprole 18.5 SC, Indoxacarb 14.5 SC, Spinosad 45 SC and Emamectin benzoate 5 SG in Central zone , Pyridalyl 10 EC as well as Spinosad 45 SC in South zone.
  - Minimum open boll and locule damage was observed in Fenpropathrin 10 EC, Indoxacarb 14.5 SC and Pyridalyl 10 EC in North, Central and South zone, respectively.
  - Highest yield was recorded in Spinetoram 11.7SC followed by Spinosad 45 SC treated plots.
- Effective novel microbial volatile formulations for trapping of sucking pest insects across all zones
  - **Whitefly**: **CICRMV-W** formulation followed by **CICRMVBI-W**&**CICRMVBI-J**
  - **Jassid**: **CICRMV-J** followed by **CICRMVBI-J & CICRMVBI-W** formulations
  - **Thrips:** **CICRMV-T** followed by **CICRMVBI-T&CICRMVBI-W** formulations
  - **Aphid**: **CICRMV-A** formulation

CROP PROTECTION
PLANT PATHOLOGY

- **Farmers' field survey conducted in 802 villages** (5-10 fields in each) **of 35 districts in 10 states** under all cotton growing zones of India and the major diseases observed during 2022-23 are:
  - **North Zone**: Cotton leaf curl virus disease (CLCuD), root rot during the mid-and late-season
  - **Central & South Zone**: Bacterial leaf blight (BLB), and grey mildew (GM) during mid-and late-season
  - **South Zone***: Alternaria* leaf blight (ALB), GM, boll rot, and rust during mid-and late-season
- **Emerging/remerging diseases observed as moderate to severe are:**
  - **CLCuD in North Zone** appeared 2-3 weeks early (21-23 SMW) in Punjab (41.8%), Haryana (25.1%) and Rajasthan (21.7%) and severity was 10-22% higher than in the previous year.
  - **Grey mildew in Central and South Zone:** 3.5 to 40.5% in Nanded, Akola, Buldana, Khandwa, Junagarh and 5-21.5% in Dharwad, Haveri, Guntur).
  - **Tobacco streak virus in South Zone:** traces to 30.0% in Warangal, Kurnool, Guntur and 0.5 to 17.5% in Coimbatore, Dindugal in Tamil Nadu.
  - ***Corynespora* leaf spot in Central and South Zone:** upto14.5% in Junagarh, Rajkot, Jamnagar and up to 29.5% in Guntur, Krishna, Prakasam districts of AP.
  - ***Alternaria* leaf blight and boll rot in South Zone:** 5 – 28% and 5- 16% in Dharwad, Haveri, Belagavi in Karnataka.
- **Disease progress in relation to weather parameters** studied at on-station trials and the regression equations developed previously were compared/validated with the current season data and equations.
- **Disease screening trials:** 15 National (4) and Zonal trials (11) conducted under field conditions and promising disease-tolerant entries identified.
  - **North Zone:** none of the entries was found resistant to CLCuD and root rot
  - **Central Zone:** Grey mildew-2 entry (GAM 288, JLA 1641) Alternaria-2 entry (PA 919, GBav 181) in IET-Ga NT, Bacterial leaf blight-5 entry (CCH 20452, CNH 19325, CNH 19480, 16301 DB, CNH 20449), Grey mildew 3 entry (CNH 19480, 16301 DB, CNH 20449) in PVT Gh-CC ZT, Grey mildew 2 entry (GAM 283, GAM 266) CVT-Ga,
  - **South Zone:** Corynespora leaf spot- 1 entry (DHCC 2002), PVT CC ZT, Corynespora leaf spot 1 entry (RAH 1083) CVT Gh ZT, GM-5 entry (CCB 26, CCB22-2, CCB22-1, SIMA B-8, CCB 6) CVT Gb ZT
- **Confirmation of disease resistance trials** under field and artificial screening. After three years 19 entries were identified.
  - **CLCuD:** 3 entries (RS-2909, F-2687,RAH-1076), **BLB:** 2 entries (GSHH-15032, GSHH-15035) **CoLS:** 2 entries (DHCC-1801, DHCC-1902), **rust**: 3 (RAH-1083, CNH-19480, Suraj),**grey mildew:** 2 entries (SCS-1206, DB-14)and **ALB** – 2 entries (GJHV-584, CCB-29)
  - **Multiple disease-resistant**: **BLB & ALB** – 2 entries (GJHV 557, GISV-323), **ALB& GM**-2 entries (SVA-1118, DB-14), **rust & CoLS-** 1 entry (CNH 20-31)

- **Multilocation field trials for disease management** were conducted and the promising treatments were noted.
  - Among biopesticides, mineral paraffin oil and their combinations evaluated against **seed & soil-borne diseases,** maximum seed germination, reduction in plant mortality and higher yield over control was observed with CICR *T. asperellum (*Rf-B/Th-11) as seed @5g/kg + soil treatment @2.5 kg/ha at sowing and foliar spray at 60 and 90 DAS @ 2 ml/L + mineral paraffin oil @0.75%.
  - Application of CICR *Bacillus aryabhattai + Bacillus tequeilencis* as seed treatment @10g/kg + soil application @ 2.5 kg/ha (30 & 60 DAS); and seed treatment Carboxin 37.5+ Thiram37.5%WS @ 0.2% and foliar application of Pyraclostrobin @ 0.1% recorded maximum reduction in **ALB, BLB and GM at Surat, Akola**
  - Application of CICR Pf-CICR as seed treatment @10g/kg + soil application @ 2.5 kg/ha (30 & 60 DAS) with FYM/compost was superior over other treatments for the management of **ALB, BLB at Surat**.
- **Among the new IPM and new biomodules** developed using first 2 spray of neem oil (300ppm), 1-2 spray of insecticides and 1-2 spray of CICR bioinsecticides **(CICR Bb4511-***Beauveria bassiana*, **CICR Ma1299** -*Metarhizium anisopliae* and **CICR Cj102**- *Cordyceps javanica*), reduction in **whitefly nymphal, adult mortality and CLCuD** was recorded over control. Mortality of nymphs and adults in new IPM modules ranged 34.9 to 47%, and 38.8 to 53.6% and in n**ew Biomodules it was** 34.3 to 41.3%, and 39 to 45.5%.
- Among the 11 **CIB&RC recommended chemicals evaluated for the management of foliar diseases and boll rot**, the top effective treatments (1-2 spray) over control were
  - **Sooty mold (whitefly & aphid):** 3 sprays of Propiconazole 25 EC @ 1 ml/L, copper oxychloride (COC) 50 WP @ 2.5 g/L, and Flonicamid 50 WP @0.6g/L Faridkot, Hisar & Tamil Nadu.
  - **Fungal foliar spots**- Kresoxim methyl @1 ml/L, Azoxystrobin + Difenoconazole @1 ml/L
  - **ALB &CoLS**- Fluxapyroxad + Pyraclostrobin@0.8ml/L, Azoxystrobin + Difenoconazole@1 ml/L
  - **GM & Rust**- Fluxapyroxad + Pyraclostrobin@0.8 ml/L, Metiram + Pyraclostrobin@.2g/L,
  - **BLB &Boll rot**- Fluxapyroxad + Pyraclostrobin@0.8 ml /L and Copper oxychloride, @2.5g/L
- **Crop loss estimation studies were conducted at on-station trials**
  - The average seed cotton yield reduction in mixed grades was ranged from 29.4 to 31.2%, in US-51, RCH 773, NCS 9013I, and ACH177-2 hybrids. Reduction of SCY corresponding to CLCuD severity grades was 0=Nil, 1= 6.6, 2=19.5, 3=35, 4=50.9, 5=58.1, and 6= 69.2%.
- **Publications/ recommendations in POPs:** 10 research papers & 7 AICRP technology/ recommendations were published in POPs of SAUs including, POPs of ANGRAU, TNAU, PAU, HAU, UAS Dharwad, NAU & Kamdhenu University, Junagarh

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CROP IMPROVEMENT

North Zone Trials

Br. 22a – Initial Evaluation Trial of *G. arboreum* (Irrigated)

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Sirsa (CICR)	Mean NZ	Rank
1	201	HD 545	2228	2888	2200	3086	2831	**2647**	6
2	202	FDK 341	2934	2397	2406	3827	2630	**2839**	1
3	203	RG 895	2908	2800	2406	3128	1634	**2575**	7
4	204	CISAA 33-9	2416	3101	2037	2387	2309	**2450**	11
5	205	**LC**	1838	2629	2068	3210	2733	**2496**	9
6	206	PBD 155	1738	2414	3267	1564	1202	**2037**	13
7	207	HD 563	2045	2924	2335	2469	3679	**2690**	5
8	208	FDK 331	1490	2878	2991	3128	3342	**2766**	2
9	209	**ZC (FDK 124)**	2244	2262	2546	3374	3035	**2692**	4
10	210	RG 892	2898	3257	2480	2551	2519	**2741**	3
11	211	FDK 345	1988	3089	2828	2510	2024	**2488**	10
12	212	PBD 154	1978	2496	3383	1605	1424	**2177**	12
13	213	CISAA 6-165	2324	2886	2047	2922	2421	**2520**	8
		CD @ 5 %	364	527	350	644	302		
		CV %	10	11	8.2	13.8	7		
		Local Checks	**RG 542**	**LD 949**	**LD 949**	**HD 432**	**CISA 310**		

Br. 22a – Initial Evaluation Trial of *G. arboreum* (Irrigated)

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Sirsa (CICR)	Mean NZ
1	201	HD 545	836	1079	785	1272	934	**981**
2	202	FDK 341	968	899	745	1408	850	**974**
3	203	RG 895	1096	1093	845	1155	534	**945**
4	204	CISAA 33-9	855	1174	698	837	793	**871**
5	205	**LC**	673	1004	671	1331	911	**918**
6	206	PBD 155	657	870	1170	515	409	**724**
7	207	HD 563	736	1069	800	848	1177	**926**
8	208	FDK 331	495	1080	1011	1165	1047	**960**
9	209	**ZC (FDK 124)**	765	833	783	1087	941	**882**
10	210	RG 892	1078	1231	875	941	856	**996**
11	211	FDK 345	692	1137	942	872	621	**853**
12	212	PBD 154	722	938	1186	600	489	**787**
13	213	CISAA 6-165	858	1074	695	1045	807	**896**

Ginning outturn (%)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Sirsa (CICR)	Mean NZ
1	201	HD 545	37.5	37.4	35.6	41.2	33.0	**36.9**
2	202	FDK 341	33.0	37.5	31.1	36.8	32.3	**34.1**
3	203	RG 895	37.7	39.0	35.1	36.9	32.7	**36.3**
4	204	CISAA 33-9	35.4	37.8	34.3	35.1	34.3	**35.4**
5	205	**LC**	36.6	38.1	32.4	41.5	33.3	**36.4**
6	206	PBD 155	37.8	36.0	35.8	32.9	34.1	**35.3**
7	207	HD 563	36.0	36.5	34.3	34.3	32.0	**34.6**
8	208	FDK 331	33.2	37.5	33.8	37.2	31.3	**34.6**
9	209	**ZC (FDK 124)**	34.1	36.9	30.8	32.2	31.0	**33.0**
10	210	RG 892	37.2	37.8	35.2	36.9	34.0	**36.2**
11	211	FDK 345	34.8	36.7	33.3	34.7	30.7	**34.0**
12	212	PBD 154	36.5	37.5	35.0	37.4	34.3	**36.1**
13	213	CISAA 6-165	36.9	37.2	34.0	35.8	33.3	**35.4**

Br. 22a – Initial Evaluation Trial of *G. arboreum* (Irrigated)

Bolls/plant

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Sirsa (CICR)	Mean NZ
1	201	HD 545	34.0	31.7	69.8	44.6	43.2	**44.7**
2	202	FDK 341	30.0	40.1	54.7	48.1	43.9	**43.4**
3	203	RG 895	25.0	35.2	65.4	40.7	38.7	**41.0**
4	204	CISAA 33-9	33.0	50.3	57.4	42.5	47.8	**46.2**
5	205	**LC**	31.0	41.7	52.9	40.3	47.3	**42.6**
6	206	PBD 155	26.0	32.4	74.1	40.9	37.9	**42.3**
7	207	HD 563	19.0	33.6	69.7	39.8	42.8	**41.0**
8	208	FDK 331	22.0	40.6	66.3	37.3	46.6	**42.6**
9	209	**ZC (FDK 124)**	33.0	37.9	78.9	47.1	47.7	**48.9**
10	210	RG 892	28.0	44.7	66.7	33.4	39.7	**42.5**
11	211	FDK 345	27.0	41.8	70.7	41.1	44.3	**45.0**
12	212	PBD 154	21.0	35.1	70.6	39.3	30.5	**39.3**
13	213	CISAA 6-165	28.0	45.3	67.1	44.2	47.1	**46.3**

Boll weight (g)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Sirsa (CICR)	Mean NZ
1	201	HD 545	1.9	2.7	2.1	2.7	2.1	**2.3**
2	202	FDK 341	2.3	2.4	2.3	2.8	2.3	**2.4**
3	203	RG 895	2.2	2.5	2.3	2.5	2.2	**2.3**
4	204	CISAA 33-9	2.5	2.6	2.3	2.7	2.3	**2.5**
5	205	**LC**	2.0	2.3	2.1	2.9	2.3	**2.3**
6	206	PBD 155	2.2	2.2	2.5	2.9	2.3	**2.4**
7	207	HD 563	2.3	2.3	2.4	2.7	2.4	**2.4**
8	208	FDK 331	2.2	2.7	2.3	2.8	2.3	**2.5**
9	209	**ZC (FDK 124)**	2.1	2.2	2.0	2.7	2.1	**2.2**
10	210	RG 892	2.3	2.7	2.1	2.6	2.2	**2.4**
11	211	FDK 345	2.2	2.1	2.5	2.6	2.1	**2.3**
12	212	PBD 154	2.7	2.7	2.6	2.9	2.3	**2.6**
13	213	CISAA 6-165	2.3	2.7	2.2	2.9	2.2	**2.5**

Br 25a/b – Preliminary Hybrid Trial of Desi Hybrid

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ	Rank
1	221	CISAA 21-2	3265	3241	3169	2247	2963	**2977**	5
2	222	KR 161	2843	3417	3786	2617	3808	**3294**	2
3	223	**ZC (KR 64-NZ)**	2707	3622	3704	2022	-	**3014**	4
4	224	AAH 47	1916	2579	2551	1519	3848	**2483**	8
5	225	KR 160	3212	3359	4239	3856	3099	**3553**	1
6	226	CISAA 21-1	2334	2672	3169	1794	3045	**2603**	7
7	227	**LC**	2134	3196	-	2069	3497	**2724**	6
8	228	KR 162	2848	2679	3374	3358	3996	**3251**	3
9	229	AAH 46	1960	2586	1811	-	2391	**2187**	9
		CD @ 5 %	482	258	531	280	486		
		CV %	11	4.9	10.6	6	9.4		
		Local Checks	**RAJ DH. 9**	**FMDH 9**	**AAH 1**	**CICR-2**	**AAH 1**		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	221	CISAA 21-2	1241	1202	1219	779	1103	**1109**
2	222	KR 161	1103	1340	1451	951	1440	**1257**
3	223	**ZC (KR 64-NZ)**	1042	1293	1412	694	-	**1110**
4	224	AAH 47	724	948	958	496	1480	**921**
5	225	KR 160	1230	1198	1582	1375	1196	**1316**
6	226	CISAA 21-1	777	894	1079	545	1096	**878**
7	227	**LC**	726	1093	-	731	1327	**969**
8	228	KR 162	1091	963	1285	1209	1528	**1215**
9	229	AAH 46	755	941	711	-	901	**827**

Br 25a/b – Preliminary Hybrid Trial of Desi Hybrid

Ginning outturn (%)

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	221	CISAA 21-2	38.0	37.1	38.5	34.7	37.2	**37.1**
2	222	KR 161	38.8	39.2	38.3	36.3	37.8	**38.1**
3	223	**ZC (KR 64-NZ)**	38.5	35.7	38.1	34.3	-	**36.7**
4	224	AAH 47	37.8	36.8	37.5	32.7	38.5	**36.7**
5	225	KR 160	38.3	35.7	37.3	35.7	38.6	**37.1**
6	226	CISAA 21-1	33.3	33.5	34.1	30.4	36.0	**33.5**
7	227	**LC**	34.0	34.2	-	35.3	37.9	**35.4**
8	228	KR 162	38.3	35.9	38.1	36.0	38.2	**37.3**
9	229	AAH 46	38.5	36.4	39.3	-	37.7	**38.0**

Bolls/plant

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	221	CISAA 21-2	63.0	82.6	42.2	45.0	44.7	**55.5**
2	222	KR 161	53.0	71.7	46.0	47.5	58.0	**55.2**
3	223	**ZC (KR 64-NZ)**	56.0	75.6	41.2	46.7	-	**54.9**
4	224	AAH 47	47.0	72.2	51.4	36.4	60.1	**53.4**
5	225	KR 160	62.0	61.3	45.3	48.8	48.3	**53.1**
6	226	CISAA 21-1	46.0	73.4	45.9	46.3	43.5	**51.0**
7	227	**LC**	47.0	80.2	-	47.9	58.7	**58.5**
8	228	KR 162	51.0	62.8	37.9	48.0	61.6	**52.3**
9	229	AAH 46	42.0	66.0	55.9	-	41.8	**51.4**

Br 25a/b – Preliminary Hybrid Trial of Desi Hybrid

Boll weight (g)

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	221	CISAA 21-2	2.5	2.6	3.0	2.4	2.8	**2.7**
2	222	KR 161	2.4	2.2	3.1	2.2	2.6	**2.5**
3	223	**ZC (KR 64-NZ)**	2.6	2.4	3.1	2.1	-	**2.6**
4	224	AAH 47	2.3	2.1	3.1	2.2	2.9	**2.5**
5	225	KR 160	2.3	2.2	2.9	2.3	2.5	**2.4**
6	226	CISAA 21-1	3.0	2.1	2.9	2.3	2.4	**2.5**
7	227	**LC**	2.5	2.3	-	2.4	2.8	**2.5**
8	228	KR 162	2.9	2.6	3.1	2.3	2.9	**2.8**
9	229	AAH 46	2.6	2.1	3.1	-	2.6	**2.6**

Br 04a – Coordinated Varietal Trial - G. hirsutum (North Zone)

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Sirsa (CICR)	Mean NZ	Rank
1	2001	**QC (CSH 3129)**	1708	2178	2213	2269	1968	**2067**	4
2	2002	F 2732	1792	2726	2589	1628	2022	**2151**	3
3	2003	**ZC (F 2228)**	2465	2203	2045	2531	2415	**2332**	1
4	2004	F 2743	2031	2615	2312	1867	2103	**2186**	2
5	2005	**LC**	708	2100	1703	1296	1798	**1521**	5
		CD @ 5 %	231	281	326	312	240		
		CV %	9	7	9.8	10.5	7		
		Local Checks	**RS 875**	**F 2383**	**F 2383**	**H 1098-i**	**H 1098-i**		

Br 04a – Coordinated Varietal Trial - G. hirsutum (North Zone)

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Sirsa (CICR)	Mean NZ
1	2001	**QC (CSH 3129)**	560	752	762	714	636	**685**
2	2002	F 2732	650	953	878	555	640	**735**
3	2003	**ZC (F 2228)**	849	767	702	853	805	**795**
4	2004	F 2743	696	927	816	609	715	**753**
5	2005	**LC**	264	739	600	406	587	**519**

Ginning outturn (%)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Sirsa (CICR)	Mean NZ
1	2001	**QC (CSH 3129)**	32.8	34.5	34.4	31.4	32.3	**33.1**
2	2002	F 2732	36.3	34.9	34.4	34.1	31.7	**34.3**
3	2003	**ZC (F 2228)**	34.4	34.8	32.3	33.7	33.3	**33.7**
4	2004	F 2743	34.3	35.4	35.5	32.6	34.0	**34.4**
5	2005	**LC**	37.3	35.1	33.5	31.4	32.7	**34.0**

Bolls/plant

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Sirsa (CICR)	Mean NZ
1	2001	**QC (CSH 3129)**	19.0	40.7	41.3	35.3	56.8	**38.6**
2	2002	F 2732	23.0	54.2	57.3	32.5	58.9	**45.2**
3	2003	**ZC (F 2228)**	26.0	42.0	43.4	31.8	53.7	**39.4**
4	2004	F 2743	27.0	50.3	50.7	32.3	51.7	**42.4**
5	2005	**LC**	18.0	39.0	49.6	30.0	57.8	**38.9**

Boll weight (g)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Sirsa (CICR)	Mean NZ
1	2001	**QC (CSH 3129)**	3.1	2.7	3.4	3.2	3.0	**3.1**
2	2002	F 2732	2.8	3.2	4.0	3.3	3.1	**3.3**
3	2003	**ZC (F 2228)**	2.9	3.0	3.6	3.3	3.4	**3.2**
4	2004	F 2743	2.3	3.2	4.0	3.9	3.4	**3.4**
5	2005	**LC**	2.2	2.9	4.0	3.5	3.3	**3.2**

Br 24a – Coordinated Variety Trial - *G. arboreum* - (North Zone)

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Sirsa (CICR)	Hisar	Mean NZ	Rank
1	2011	FDK 315	2043	2008	3132	1905	2263	**2270**	6
2	2012	**FDK 124 (ZC)**	1975	1949	2631	2436	3354	**2469**	5
3	2013	RG 888	2443	1530	2375	1241	1687	**1855**	10
4	2014	CISA 33-7	1920	1884	2491	1510	1667	**1894**	9
5	2015	FDK 312	2217	3152	3005	2010	2963	**2669**	1
6	2016	FDK 325	2479	2437	2995	2027	2551	**2498**	4
7	2017	**Local Check**	1606	1759	1944	2741	3004	**2211**	7
8	2018	PBD 156	1864	2251	3349	1350	1008	**1964**	8
9	2019	RG 868	2472	3049	2030	2309	3169	**2606**	2
10	2020	FDK 324	1844	2966	3051	2136	3025	**2604**	3
		CD @ 5 %	327	387	290	261	405		
		CV %	9	9	6.3	8	9.5		
		Local Checks	**RG 8**	**LD 949**	**LD 949**	**CISA 614**	**HD-432**		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Sriganga-nagar	Faridkot	Bathinda	Sirsa (CICR)	Hisar	Mean NZ
1	2011	FDK 315	756	798	1207	616	738	**823**
2	2012	**FDK 124 (ZC)**	705	730	930	763	1261	**878**
3	2013	RG 888	873	546	839	375	515	**630**
4	2014	CISA 33-7	720	722	909	524	564	**688**
5	2015	FDK 312	836	1150	1069	677	1051	**957**
6	2016	FDK 325	860	906	1057	635	937	**879**
7	2017	**Local Check**	541	682	710	914	1071	**784**
8	2018	PBD 156	694	844	1238	427	333	**707**
9	2019	RG 868	898	1169	737	785	1187	**955**
10	2020	FDK 324	645	1180	1027	719	1147	**944**

Br 24a – Coordinated Variety Trial - *G. arboreum* - (North Zone)

Ginning outturn (%)

S. No.	Code No.	Entries	Sriganga nagar	Faridkot	Bathinda	Sirsa (CICR)	Hisar	Mean NZ
1	2011	FDK 315	37.0	39.7	38.5	32.3	32.6	**36.0**
2	2012	**FDK 124 (ZC)**	35.7	37.4	35.3	31.3	37.6	**35.5**
3	2013	RG 888	35.7	35.6	35.3	30.2	30.5	**33.5**
4	2014	CISA 33-7	37.5	38.3	36.5	34.7	33.9	**36.2**
5	2015	FDK 312	37.7	36.5	35.6	33.7	35.5	**35.8**
6	2016	FDK 325	34.7	37.2	35.3	31.3	36.7	**35.0**
7	2017	**Local Check**	33.7	38.8	36.4	33.3	35.7	**35.6**
8	2018	PBD 156	37.2	37.5	36.9	31.7	33.1	**35.3**
9	2019	RG 868	36.3	38.3	36.3	34.0	37.5	**36.5**
10	2020	FDK 324	35.0	39.8	33.6	33.7	37.9	**36.0**

Bolls/plant

S. No.	Code No.	Entries	Sriganga nagar	Faridkot	Bathinda	Sirsa (CICR)	Hisar	Mean NZ
1	2011	FDK 315	28.0	54.3	74.3	45.5	44.1	**49.2**
2	2012	**FDK 124 (ZC)**	25.0	51.4	69.9	45.5	47.6	**47.9**
3	2013	RG 888	30.0	35.7	75.4	34.1	46.3	**44.3**
4	2014	CISA 33-7	27.0	55.3	70.9	35.4	46.6	**47.0**
5	2015	FDK 312	29.0	57.3	81.8	39.1	47.6	**51.0**
6	2016	FDK 325	33.0	63.9	71.1	46.5	45.2	**51.9**
7	2017	**Local Check**	20.0	44.6	55.8	49.0	39.0	**41.7**
8	2018	PBD 156	24.0	50.9	74.2	39.9	48.9	**47.6**
9	2019	RG 868	29.0	63.2	62.2	47.3	41.7	**48.7**
10	2020	FDK 324	25.0	52.9	76.8	46.0	46.3	**49.4**

Br 24a – Coordinated Variety Trial - *G. arboreum* - (North Zone)

Boll weight (g)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Sirsa (CICR)	Hisar	Mean NZ
1	2011	FDK 315	2.0	2.5	2.5	2.0	2.5	**2.3**
2	2012	**FDK 124 (ZC)**	2.6	2.7	2.4	2.2	2.6	**2.5**
3	2013	RG 888	2.3	2.7	2.2	2.1	2.6	**2.4**
4	2014	CISA 33-7	2.5	2.3	2.5	2.1	2.9	**2.5**
5	2015	FDK 312	2.1	2.4	2.2	2.1	2.7	**2.3**
6	2016	FDK 325	2.3	2.5	2.3	2.1	2.7	**2.4**
7	2017	**Local Check**	2.9	2.5	2.5	2.4	3.1	**2.7**
8	2018	PBD 156	2.8	2.8	2.6	2.4	2.7	**2.7**
9	2019	RG 868	2.5	2.5	2.2	2.4	2.8	**2.5**
10	2020	FDK 324	3.1	2.4	2.7	2.3	2.7	**2.6**

Br 25a/b – Coordinated Hybrid Trial of Desi Hybrid (North Zone)

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Faridkot	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ	Rank
1	2021	KR 153	2714	2819	2767	3457	3004	3860	**3104**	2
2	2022	KR 149	2764	2395	3346	3251	3409	2785	**2992**	4
3	2023	**ZC (KR 64)**	2217	2784	2784	3251	2619	2815	**2745**	6
4	2024	CISAA 20-1	2806	2755	2788	3045	2307	3437	**2856**	5
5	2025	**Local Check**	1746	2319	2858	-	1840	2963	**2345**	8
6	2026	KR 150	2533	2821	2912	4033	2442	3977	**3120**	1
7	2027	KR 152	2300	2706	2562	4239	2786	3844	**3073**	3
8	2028	CISAA 19-4	2126	2191	3204	2922	1545	4010	**2666**	7
		CD @ 5 %	374	287	479	643	287	530		
		CV %	9	6.3	9	12.1	7.0	9.0		
		Local Checks	**RAJ DH. 9**	**FMDH 9**	**FMDH 9**	**AAH 1**	**CISAA 2**	**CISAA 2**		

Br 25a/b – Coordinated Hybrid Trial of Desi Hybrid (North Zone)

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Faridkot	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	2021	KR 153	1033	880	1066	1427	1021	1465	**1149**
2	2022	KR 149	1040	776	1280	1168	1148	991	**1067**
3	2023	**ZC (KR 64)**	848	872	1081	1413	978	1094	**1048**
4	2024	CISAA 20-1	1066	904	1077	1184	823	1299	**1059**
5	2025	**Local Check**	604	726	1050	-	668	1145	**839**
6	2026	KR 150	978	887	1139	1530	830	1474	**1140**
7	2027	KR 152	861	863	980	1616	975	1445	**1123**
8	2028	CISAA 19-4	781	644	1175	1108	515	1512	**956**

Ginning outturn (%)

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Faridkot	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	2021	KR 153	38.1	34.4	38.5	41.3	34.0	38.0	**37.4**
2	2022	KR 149	37.6	37.2	38.2	35.9	33.7	35.6	**36.4**
3	2023	**ZC (KR 64)**	38.2	35.3	38.9	43.5	37.3	38.9	**38.7**
4	2024	CISAA 20-1	38.0	37.3	38.6	38.9	35.7	37.8	**37.7**
5	2025	**Local Check**	34.6	36.1	36.7	-	36.3	38.7	**36.5**
6	2026	KR 150	38.6	35.3	39.1	37.9	34.0	37.1	**37.0**
7	2027	KR 152	37.4	36.0	38.2	38.1	35.0	37.6	**37.1**
8	2028	CISAA 19-4	36.7	32.9	36.7	37.9	33.3	37.7	**35.9**

Br 25a/b – Coordinated Hybrid Trial of Desi Hybrid (North Zone)

Bolls/plant

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Faridkot	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	2021	KR 153	49.0	73.8	39.3	44.5	48.7	63.5	**53.1**
2	2022	KR 149	46.0	74.8	47.1	41.9	44.8	41.3	**49.3**
3	2023	**ZC (KR 64)**	37.0	81.3	40.4	44.1	43.2	46.3	**48.7**
4	2024	CISAA 20-1	50.0	82.4	38.4	42.5	44.2	61.7	**53.2**
5	2025	**Local Check**	38.0	72.1	53.8	-	42.6	48.3	**51.0**
6	2026	KR 150	52.0	88.0	49.6	46.0	43.2	65.3	**57.4**
7	2027	KR 152	39.0	83.0	43.4	47.3	36.9	62.6	**52.0**
8	2028	CISAA 19-4	43.0	64.8	53.8	41.9	36.5	64.7	**50.8**

Boll weight (g)

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Faridkot	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	2021	KR 153	2.1	2.3	2.5	2.9	2.2	2.8	**2.5**
2	2022	KR 149	2.4	2.3	2.2	3.1	2.4	2.5	**2.5**
3	2023	**ZC (KR 64)**	2.5	2.4	2.9	2.8	2.3	2.4	**2.6**
4	2024	CISAA 20-1	2.4	2.3	2.9	2.7	2.1	2.8	**2.5**
5	2025	**Local Check**	2.0	2.3	3.0	-	2.2	2.3	**2.4**
6	2026	KR 150	2.2	2.2	2.8	3.0	2.0	2.9	**2.5**
7	2027	KR 152	2.6	2.1	2.7	2.8	2.1	2.8	**2.5**
8	2028	CISAA 19-4	2.2	2.4	2.8	2.8	2.2	2.9	**2.6**

Central Zone Trials

Br. 22b – Initial Evaluation Trial of *G. arboreum*

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Khandwa	Amreli	Bharuch	Viramgam	Akola	Parbhani	Jalgaon	Nagpur (CICR)	Mean CZ	Rank
1	231	CNA 1085	878	1862	1447	1496	1151	1396	904	1588	**1340**	1
2	232	GAM 296	830	1887	2291	1478	1152	919	727	1185	**1309**	3
3	233	PA 919	670	1381	816	1518	1154	1417	913	947	**1102**	12
4	234	GBav 181	637	1566	2066	1258	1134	940	534	1063	**1150**	8
5	235	JLA 1707	753	1791	1193	1453	1155	1464	917	1772	**1312**	2
6	236	**ZC (AKA 7)**	551	1168	1365	1068	1035	1023	808	518	**942**	17
7	237	PA 929	568	1449	1528	1116	1168	1119	689	1157	**1099**	13
8	238	CNA 1084	682	1627	1376	1353	1278	1357	741	1148	**1195**	7
9	239	GVav 1332	505	1066	1238	1358	1387	893	-	427	**982**	16
10	240	**LC**	534	1433	2091	1597	1202	1447	848	825	**1247**	5
11	241	CNA20178	532	1253	1380	1457	1248	1344	601	922	**1092**	14
12	242	AKA 2016-3	836	1688	1144	1343	1510	1469	1041	1423	**1307**	4
13	243	CNA 1086	701	1274	1438	1287	1297	1095	730	1267	**1136**	10
14	244	GAM 288	573	1743	1711	1638	1247	725	622	578	**1105**	11
15	245	**QC (PA 255)**	628	1382	1377	1258	1178	1344	594	801	**1070**	15
16	246	JLA 1641	625	1447	1275	1330	1433	1430	1115	1201	**1232**	6
17	247	GBav 137	515	1511	1789	1306	1229	1058	689	1021	**1140**	9
		CD @ 5 %	141	287	349	279	128	303	140	321		
		CV %	18	11.5	12.9	12	11	15	11	18		
		Local Checks	**JK 5**	**G. Cot. 19**	**GN Cot 29**	**G. Cot. 19**	**AKA. 8**	**PA 740**	**JLA 505**	**AKA. 8**		

Br. 22b – Initial Evaluation Trial of *G. arboreum*

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Khandwa	Amreli	Bharuch	Viramgam	Akola	Parbhani	Jalgaon	Nagpur (CICR)	Mean CZ
1	231	CNA 1085	267	630	452	427	243	496	285	502	**413**
2	232	GAM 296	268	701	783	476	230	326	253	414	**431**
3	233	PA 919	210	494	256	532	233	495	327	315	**358**
4	234	GBav 181	180	554	670	427	229	316	174	336	**361**
5	235	JLA 1707	230	650	406	517	235	525	324	606	**437**
6	236	**ZC (AKA 7)**	193	476	517	406	203	354	312	197	**332**
7	237	PA 929	174	522	517	346	243	404	222	347	**347**
8	238	CNA 1084	197	594	454	441	270	492	243	383	**384**
9	239	GVav 1332	140	338	368	514	275	304	-	125	**295**
10	240	**LC**	171	497	701	506	259	527	302	291	**407**
11	241	CNA20178	168	452	477	463	267	490	215	317	**356**
12	242	AKA 2016-3	279	618	408	459	321	527	376	525	**439**
13	243	CNA 1086	217	457	497	403	284	431	250	409	**369**
14	244	GAM 288	176	626	598	446	271	268	224	222	**354**
15	245	**QC (PA 255)**	197	494	474	420	251	487	209	268	**350**
16	246	JLA 1641	196	534	463	469	297	552	397	408	**415**
17	247	GBav 137	167	560	643	421	267	377	242	325	**375**

Br. 22b – Initial Evaluation Trial of *G. arboreum*

Ginning outturn (%)

S. No.	Code No.	Entries	Khandwa	Amreli	Bharuch	Viramgam	Akola	Parbhani	Jalgaon	Nagpur (CICR)	Mean CZ
1	231	CNA 1085	30.4	33.8	31.3	28.7	37.4	39.1	31.4	31.6	**33.0**
2	232	GAM 296	32.3	37.2	34.2	32.3	35.4	39.7	34.8	34.9	**35.1**
3	233	PA 919	31.4	35.8	31.3	34.9	35.8	35.5	35.8	33.3	**34.2**
4	234	GBav 181	28.3	35.5	32.4	33.8	35.7	40.0	32.6	31.6	**33.7**
5	235	JLA 1707	30.5	36.3	34.0	35.6	36.1	41.4	35.4	34.2	**35.4**
6	236	**ZC (AKA 7)**	35.1	40.8	37.9	38.1	34.8	37.0	38.6	38.0	**37.5**
7	237	PA 929	30.7	36.0	33.8	31.0	36.8	37.0	32.2	30.0	**33.4**
8	238	CNA 1084	28.9	36.5	33.0	32.9	37.5	37.9	32.9	33.4	**34.1**
9	239	GVav 1332	27.6	31.8	29.7	37.9	35.2	36.1	-	29.2	**32.5**
10	240	**LC**	32.0	34.7	33.5	31.5	38.3	38.1	35.6	35.3	**34.9**
11	241	CNA20178	31.6	36.1	34.6	31.6	38.0	39.1	35.7	34.4	**35.1**
12	242	AKA 2016-3	33.4	36.6	35.7	34.2	37.6	37.6	36.2	36.9	**36.0**
13	243	CNA 1086	30.9	35.8	34.6	31.4	38.8	40.4	34.2	32.3	**34.8**
14	244	GAM 288	30.8	36.0	34.9	26.7	38.6	40.0	36.0	38.4	**35.2**
15	245	**QC (PA 255)**	31.3	35.7	34.4	33.3	37.8	37.0	35.1	33.4	**34.8**
16	246	JLA 1641	31.3	36.9	36.3	35.2	36.8	36.7	35.6	34.0	**35.4**
17	247	GBav 137	32.3	37.1	36.0	32.3	38.4	36.1	35.1	31.8	**34.9**

Br. 22b – Initial Evaluation Trial of *G. arboreum*

Bolls/plant

S. No.	Code No.	Entries	Khandwa	Amreli	Bharuch	Viramgam	Akola	Parbhani	Jalgaon	Nagpur (CICR)	Mean CZ
1	231	CNA 1085	34.6	25.0	43.0	40.0	9.2	15.1	14.8	24.4	**25.8**
2	232	GAM 296	33.6	23.6	57.0	41.0	6.3	10.5	10.2	18.6	**25.1**
3	233	PA 919	28.9	20.8	24.0	41.0	5.8	11.0	14.8	19.6	**20.7**
4	234	GBav 181	27.9	23.3	52.3	44.0	7.0	14.1	8.8	13.3	**23.8**
5	235	JLA 1707	30.8	19.3	35.7	40.0	7.5	10.7	10.6	22.7	**22.2**
6	236	**ZC (AKA 7)**	22.8	16.7	38.3	28.0	6.2	11.4	9.8	9.0	**17.8**
7	237	PA 929	26.3	20.7	37.7	36.0	6.5	9.8	10.2	15.1	**20.3**
8	238	CNA 1084	27.3	24.0	41.6	40.0	6.5	13.5	11.2	22.9	**23.4**
9	239	GVav 1332	23.1	24.3	32.3	33.0	6.3	9.5	-	9.2	**19.7**
10	240	**LC**	25.2	24.5	51.7	50.0	7.3	13.4	12.4	12.6	**24.6**
11	241	CNA20178	25.3	23.7	38.3	43.0	7.2	10.4	10.0	14.1	**21.5**
12	242	AKA 2016-3	33.0	19.1	28.0	38.0	12.0	13.8	15.2	20.9	**22.5**
13	243	CNA 1086	28.1	18.1	36.3	42.0	7.4	11.9	10.8	17.1	**21.5**
14	244	GAM 288	25.5	24.1	50.7	45.0	6.6	10.5	10.4	12.9	**23.2**
15	245	**QC (PA 255)**	27.5	25.9	37.3	37.0	8.1	12.2	9.8	15.3	**21.6**
16	246	JLA 1641	27.5	24.2	31.7	38.0	11.0	12.6	16.4	15.5	**22.1**
17	247	GBav 137	27.7	23.6	40.7	34.0	7.7	13.0	10.6	13.5	**21.4**

Br. 22b – Initial Evaluation Trial of *G. arboreum*

Boll weight (g)

S. No.	Code No.	Entries	Khandwa	Amreli	Bharuch	Viramgam	Akola	Parbhani	Jalgaon	Nagpur (CICR)	Mean CZ
1	231	CNA 1085	2.3	2.2	2.1	2.0	1.9	2.7	2.3	2.3	**2.2**
2	232	GAM 296	2.5	2.1	2.3	2.3	1.9	2.6	2.3	2.5	**2.3**
3	233	PA 919	2.5	2.1	2.3	2.2	1.7	2.6	2.3	2.2	**2.2**
4	234	GBav 181	2.8	2.2	2.4	2.3	1.9	2.7	1.9	2.4	**2.3**
5	235	JLA 1707	2.7	2.2	2.1	2.1	1.9	2.6	2.6	2.4	**2.3**
6	236	**ZC (AKA 7)**	2.5	2.2	2.1	2.1	2.0	2.5	2.2	2.3	**2.2**
7	237	PA 929	2.5	2.2	2.5	2.0	1.8	2.5	2.4	2.5	**2.3**
8	238	CNA 1084	2.5	2.0	2.0	2.0	1.9	2.6	2.1	2.4	**2.2**
9	239	GVav 1332	2.1	1.9	2.4	2.2	1.7	2.5	-	1.6	**2.1**
10	240	**LC**	2.1	2.0	2.3	1.8	2.3	2.6	2.2	2.3	**2.2**
11	241	CNA20178	2.1	1.9	2.2	1.9	1.7	2.4	2.0	2.0	**2.0**
12	242	AKA 2016-3	2.4	2.1	2.5	2.1	2.5	2.7	2.2	2.6	**2.4**
13	243	CNA 1086	2.5	2.2	2.4	2.1	1.9	2.4	2.1	2.3	**2.2**
14	244	GAM 288	2.2	2.0	2.0	1.8	1.6	2.5	1.9	1.9	**2.0**
15	245	**QC (PA 255)**	2.7	2.0	2.2	2.1	2.0	2.4	2.2	2.2	**2.2**
16	246	JLA 1641	2.3	2.0	2.5	2.2	2.2	2.5	2.5	2.4	**2.3**
17	247	GBav 137	2.4	2.0	2.6	2.2	2.1	2.6	2.1	2.3	**2.3**

Br 32b – Initial Evaluation Trial of *G. herbaceum*

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Surat	Bharuch	Bharuch (CSSRI)	Kukada	Viram gam	Dhan duka	Mean CZ	Rank
1	251	CNh 66	1093	1138	1186	1225	936	736	**1052**	7
2	252	GBhv 340	887	2047	751	603	1189	859	**1056**	6
3	253	CNh-33	1106	1570	792	656	1155	891	**1028**	9
4	254	GBhv 334	795	2093	800	795	1409	952	**1141**	2
5	255	**ZC (G Cot 23)**	1106	1978	730	665	1144	887	**1085**	4
6	256	GBhv 356	766	2087	996	878	1224	887	**1140**	3
7	257	GShv 843/17	1183	1690	738	1032	872	907	**1070**	5
8	258	**LC**	1098	1802	-	990	1516	995	**1280**	1
9	259	GShv 812/17		1766	-	705	1268	1299	**1050**	8
		CD @ 5 %	213	381	148	106	291	192		
		CV %	12.1	11	10	7	14	12		
		Local Checks	**GN. Cot.25**	**GN.Cot.25**	**GN.Cot.25**	**GN.Cot.25**	**GADC 3**	**GADC 3**		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Surat	Bharuch	Bharuch (CSSRI)	Kukada	Viramgam	Dhanduka	Mean CZ
1	251	CNh 66	339	411	430	562	308	242	**382**
2	252	GBhv 340	323	729	274	229	383	281	**370**
3	253	CNh-33	379	591	314	234	397	321	**373**
4	254	GBhv 334	237	734	303	323	488	335	**403**
5	255	**ZC (G Cot 23)**	385	737	278	261	370	294	**388**
6	256	GBhv 356	277	691	337	369	393	297	**394**
7	257	GShv 843/17	358	569	271	456	282	304	**373**
8	258	**LC**	366	653	-	426	599	389	**487**
9	259	GShv 812/17		658	-	284	396	425	**441**

Br 32b – Initial Evaluation Trial of *G. herbaceum*

Ginning outturn (%)

S. No.	Code No.	Entries	Surat	Bharuch	Bharuch (CSSRI)	Kukada	Viramgam	Dhanduka	Mean CZ
1	251	CNh 66	31.0	36.1	36.3	39.8	32.9	32.8	**34.8**
2	252	GBhv 340	36.4	35.6	36.4	33.0	32.3	32.8	**34.4**
3	253	CNh-33	34.3	37.6	39.7	31.0	34.4	36.1	**35.5**
4	254	GBhv 334	29.9	35.0	37.8	35.2	34.6	35.2	**34.6**
5	255	**ZC (G Cot 23)**	34.8	37.3	38	34.0	32.3	33.2	**34.9**
6	256	GBhv 356	36.1	33.1	33.8	36.5	32.2	33.6	**34.2**
7	257	GShv 843/17	30.1	33.7	36.7	38.1	32.4	33.5	**34.1**
8	258	**LC**	33.3	36.2	-	37.4	39.5	39.1	**37.1**
9	259	GShv 812/17		37.2	-	35.0	31.3	32.7	**34.1**

Bolls/plant

S. No.	Code No.	Entries	Surat	Bharuch	Bharuch (CSSRI)	Kukada	Viramgam	Dhanduka	Mean CZ
1	251	CNh 66	25.7	26.7	42.0	56.0	41.0	13.3	**34.1**
2	252	GBhv 340	25.0	52.0	34.3	31.7	46.0	18.1	**34.5**
3	253	CNh-33	30.7	47.3	36.0	35.0	55.0	18.0	**37.0**
4	254	GBhv 334	21.7	54.0	34.0	40.6	51.0	20.1	**36.9**
5	255	**ZC (G Cot 23)**	29.3	50.7	35.0	32.7	49.0	19.1	**36.0**
6	256	GBhv 356	21.3	47.0	37.7	43.9	48.0	19.5	**36.2**
7	257	GShv 843/17	29.3	45.7	32.7	50.5	47.0	19.2	**37.4**
8	258	**LC**	26.3	49.7	-	47.9	55.0	20.7	**39.9**
9	259	GShv 812/17		40.0	-	38.1	42.0	22.6	**35.7**

Boll weight (g)

S. No.	Code No.	Entries	Surat	Bharuch	Bharuch (CSSRI)	Kukada	Viramgam	Dhanduka	Mean CZ
1	251	CNh 66	2.4	2.7	2.6	2.5	2.0	2.2	**2.4**
2	252	GBhv 340	2.2	2.4	2.5	1.9	2.0	1.8	**2.1**
3	253	CNh-33	2.1	2.0	2.4	2.1	1.6	1.9	**2.0**
4	254	GBhv 334	2.2	2.3	2.2	2.1	2.0	1.9	**2.1**
5	255	**ZC (G Cot 23)**	2.3	2.4	2.7	2.0	1.8	1.7	**2.2**
6	256	GBhv 356	2.5	2.6	2.1	2.1	2.0	1.6	**2.2**
7	257	GShv 843/17	2.2	2.2	2.5	2.4	1.7	1.8	**2.1**
8	258	**LC**	2.5	2.2	-	2.2	2.2	1.8	**2.2**
9	259	GShv 812/17		2.7	-	2.1	2.3	2.1	**2.3**

Br 03a – Preliminary Varietal Trial –Coloured *G. hirsutum* (Central Zone)

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Khandwa (I)	Surat (R)	Nagpur (R)	Mean CZ	Rank
1	2101	CCH 20452	1405	2617	1853	**1958**	2
2	2102	**Phule Yamuna (ZC)**	1004	3156	1225	**1795**	6
3	2103	DHCC 2151	1073	1946	811	**1277**	9
4	2104	CNH 19325	1348	2444	1933	**1908**	4
5	2105	CNH 19480	1132	2758	1861	**1917**	3
6	2106	16301 DB	1370	2438	1643	**1817**	5
7	2107	CNH 17395	1188	2234	1855	**1759**	7
8	2108	CNH 20449	1280	3057	2389	**2242**	1
9	2109	**Local Check**	960	2058	1582	**1533**	8
		CD @ 5 %	218	424	281		
		CV %	11	9.7	10		
		Local Checks	**JK 4**	**GN Cot 22**	**AKH 8828**		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Khandwa (I)	Surat (R)	Nagpur (R)	Mean CZ
1	2101	CCH 20452	504	819	624	**649**
2	2102	**Phule Yamuna (ZC)**	349	968	407	**575**
3	2103	DHCC 2151	322	531	248	**367**
4	2104	CNH 19325	465	690	651	**602**
5	2105	CNH 19480	406	783	637	**609**
6	2106	16301 DB	496	741	582	**606**
7	2107	CNH 17395	418	690	642	**583**
8	2108	CNH 20449	484	988	884	**785**
9	2109	**Local Check**	291	647	577	**505**

Br 03a – Preliminary Varietal Trial –Coloured *G. hirsutum* (Central Zone)

Ginning outturn (%)

S. No.	Code No.	Entries	Khandwa (I)	Surat (R)	Nagpur (R)	Mean CZ
1	2101	CCH 20452	35.9	31.4	33.7	**33.7**
2	2102	**Phule Yamuna (ZC)**	34.8	30.7	33.2	**32.9**
3	2103	DHCC 2151	30.0	27.2	30.6	**29.3**
4	2104	CNH 19325	34.5	28.2	33.7	**32.1**
5	2105	CNH 19480	35.9	28.4	34.2	**32.8**
6	2106	16301 DB	36.2	30.5	35.4	**34.0**
7	2107	CNH 17395	35.2	30.9	34.6	**33.6**
8	2108	CNH 20449	37.8	32.4	37.0	**35.7**
9	2109	**Local Check**	30.3	31.3	36.5	**32.7**

Bolls/plant

S. No.	Code No.	Entries	Khandwa (I)	Surat (R)	Nagpur (R)	Mean CZ
1	2101	CCH 20452	27.5	40.3	29.0	**32.3**
2	2102	**Phule Yamuna (ZC)**	30.6	53.3	28.6	**37.5**
3	2103	DHCC 2151	26.2	32.0	23.8	**27.3**
4	2104	CNH 19325	32.3	36.3	26.5	**31.7**
5	2105	CNH 19480	33.3	42.3	21.1	**32.2**
6	2106	16301 DB	32.7	39.0	31.4	**34.4**
7	2107	CNH 17395	27.7	37.3	26.1	**30.4**
8	2108	CNH 20449	33.8	51.0	30.4	**38.4**
9	2109	**Local Check**	25.3	33.7	21.9	**27.0**

Boll weight (g)

S. No.	Code No.	Entries	Khandwa (I)	Surat (R)	Nagpur (R)	Mean CZ
1	2101	CCH 20452	3.9	3.5	3.6	**3.7**
2	2102	**Phule Yamuna (ZC)**	3.3	3.1	3.0	**3.1**
3	2103	DHCC 2151	3.3	3.4	3.2	**3.3**
4	2104	CNH 19325	3.4	3.4	3.5	**3.4**
5	2105	CNH 19480	3.2	3.2	3.0	**3.1**
6	2106	16301 DB	3.6	3.3	3.4	**3.4**
7	2107	CNH 17395	3.5	3.4	3.2	**3.4**
8	2108	CNH 20449	3.6	3.1	3.6	**3.4**
9	2109	**Local Check**	3.4	3.6	3.1	**3.4**

Br 24b – Coordinated Variety Trial - *G. arboreum* - (Central Zone)

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Amreli	Khandwa	Nagpur	Akola	Jalgaon	Parbhani	Mean CZ	Rank
1	2111	JLA-1430	1296	782	1494	1200	741	1334	**1141**	3
2	2112	GAM 269	1407	552	1203	1188	657	674	**947**	9
3	2113	**ZC (AKA 7)**	1159	536	844	1242	1094	952	**971**	7
4	2114	GAM 283	1617	643	1209	1249	732	861	**1052**	5
5	2115	CNA 1072	1295	832	1065	1211	582	1068	**1009**	6
6	2116	**QC (PA 255)**	1336	758	1003	1041	551	713	**900**	10
7	2117	AKA 2016-11	1313	948	1282	1202	1221	1503	**1245**	1
8	2118	GAM 266	1373	881	1078	1090	597	808	**971**	7
9	2119	**LC**	1530	800	1178	1001	1008	1216	**1122**	4
10	2120	JLA 1204	1589	929	1642	990	801	1079	**1172**	2
		CD @ 5 %	267	155	267	208	166	120		
		CV %	11	11	13	10	12	7		
		Local Checks	**G Cot 19**	**JK 5**	**AKA 8**	**AKA 8**	**JLA 505**	**PA 740**		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Amreli	Khandwa	Nagpur	Akola	Jalgaon	Parbhani	Mean CZ
1	2111	JLA-1430	486	256	545	514	271	509	**430**
2	2112	GAM 269	532	179	449	495	244	257	**359**
3	2113	**ZC (AKA 7)**	460	196	334	496	397	388	**379**
4	2114	GAM 283	594	199	433	509	255	324	**386**
5	2115	CNA 1072	468	265	374	527	200	398	**372**
6	2116	**QC (PA 255)**	474	252	356	455	193	262	**332**
7	2117	AKA 2016-11	496	319	481	496	455	611	**476**
8	2118	GAM 266	510	302	407	468	213	315	**369**
9	2119	**LC**	526	280	438	415	362	428	**408**
10	2120	JLA 1204	584	311	608	407	276	383	**428**

Br 24b – Coordinated Variety Trial - *G. arboreum* - (Central Zone)

Ginning outturn (%)

S. No.	Code No.	Entries	Amreli	Khandwa	Nagpur	Akola	Jalgaon	Parbhani	Mean CZ
1	2111	JLA-1430	37.5	32.8	36.5	38.0	36.5	39.3	**36.8**
2	2112	GAM 269	37.8	32.4	37.3	36.9	37.2	39.3	**36.8**
3	2113	**ZC (AKA 7)**	39.7	36.6	39.6	35.5	36.3	41.7	**38.2**
4	2114	GAM 283	36.7	30.9	35.8	36.1	34.9	38.6	**35.5**
5	2115	CNA 1072	36.2	31.8	35.1	38.6	34.3	38.2	**35.7**
6	2116	**QC (PA 255)**	35.5	33.3	35.5	38.7	35.0	37.8	**36.0**
7	2117	AKA 2016-11	37.8	33.7	37.5	36.7	37.3	41.9	**37.5**
8	2118	GAM 266	37.2	34.3	37.8	38.1	35.7	40.2	**37.2**
9	2119	**LC**	34.4	34.9	37.2	36.8	35.9	36.3	**35.9**
10	2120	JLA 1204	36.8	33.5	37.0	36.6	34.5	36.5	**35.8**

Bolls/plant

S. No.	Code No.	Entries	Amreli	Khandwa	Nagpur	Akola	Jalgaon	Parbhani	Mean CZ
1	2111	JLA-1430	20.8	25.7	23.2	9.5	12.6	16.3	**18.0**
2	2112	GAM 269	20.1	18.8	21.9	9.1	12.0	8.0	**15.0**
3	2113	**ZC (AKA 7)**	20.3	17.7	16.5	9.4	19.4	10.3	**15.6**
4	2114	GAM 283	19.7	23.4	19.5	11.6	11.6	8.7	**15.8**
5	2115	CNA 1072	20.4	28.9	23.9	11.2	10.4	14.3	**18.2**
6	2116	**QC (PA 255)**	29.3	24.2	20.9	10.1	9.5	8.0	**17.0**
7	2117	AKA 2016-11	23.5	37.2	24.2	10.5	19.6	17.7	**22.1**
8	2118	GAM 266	22.0	27.9	19.9	10.4	10.6	14.7	**17.6**
9	2119	**LC**	24.5	28.7	22.3	9.5	13.8	10.7	**18.3**
10	2120	JLA 1204	23.5	33.9	31.3	10.2	11.6	16.7	**21.2**

Br 24b – Coordinated Variety Trial - *G. arboreum* - (Central Zone)

Boll weight (g)

S. No.	Code No.	Entries	Amreli	Khandwa	Nagpur	Akola	Jalgaon	Parbhani	Mean CZ
1	2111	JLA-1430	2.1	2.6	2.7	2.4	2.5	2.7	**2.5**
2	2112	GAM 269	2.1	2.7	2.3	1.9	2.1	2.4	**2.2**
3	2113	**ZC (AKA 7)**	2.1	2.5	2.6	2.3	2.6	2.5	**2.4**
4	2114	GAM 283	2.0	2.4	2.6	2.3	2.1	2.4	**2.3**
5	2115	CNA 1072	2.0	2.6	2.7	2.2	2.2	2.5	**2.4**
6	2116	**QC (PA 255)**	2.1	2.4	2.6	2.0	2.3	2.4	**2.3**
7	2117	AKA 2016-11	2.2	2.5	2.5	2.1	2.3	2.7	**2.4**
8	2118	GAM 266	2.1	2.7	2.7	2.3	2.3	2.4	**2.4**
9	2119	**LC**	2.0	2.4	2.7	2.3	2.2	2.5	**2.4**
10	2120	JLA 1204	2.2	2.7	2.7	2.3	2.1	2.5	**2.4**

Br 24b – Coordinated Variety Trial of Coloured G. arboreum (Central Zone)

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Surat	Nagpur	Nanded	Parbhani	Jalgaon	Khandwa	Mean CZ	Rank
1	2121	CNA 1092	1451	1367	837	891	1285	834	**1111**	3
2	2122	**Local Check**	1765	1382	1216	892	914	603	**1129**	1
3	2123	CNA 20402	1389	1506	982	773	777	894	**1129**	1
4	2124	CNA 19475	1559	1767	1083	615	981	964	**1054**	5
5	2125	**AKA 7 (ZC)**	1264	1097	1065	907	884	700	**986**	6
6	2126	DDCC 2001	1921	1532	762	505	704	1061	**1081**	4
		CD @ 5 %	360	380	293	150	190	18		
		CV %	15	18	19	13	11	12		
		Local Checks	**G Cot 19**	**AKA 8**	**PA 255**	**PA 740**	**JLA 505**	**JK 5**		

Br 24b – Coordinated Variety Trial of Coloured G. arboreum (Central Zone)

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Surat	Nagpur	Nanded	Parbhani	Jalgaon	Khandwa	Mean CZ
1	2121	CNA 1092	433	455	277	302	431	275	**362**
2	2122	**Local Check**	510	522	415	320	347	249	**394**
3	2123	CNA 20402	411	503	335	263	261	298	**394**
4	2124	CNA 19475	472	606	380	209	345	327	**345**
5	2125	**AKA 7 (ZC)**	435	434	435	380	339	257	**380**
6	2126	DDCC 2001	533	487	246	162	227	351	**334**

Ginning outturn (%)

S. No.	Code No.	Entries	Surat	Nagpur	Nanded	Parbhani	Jalgaon	Khandwa	Mean CZ
1	2121	CNA 1092	29.8	33.3	33.2	34.8	33.6	33.0	**33.0**
2	2122	**Local Check**	28.8	37.8	34.1	36.8	37.9	41.3	**36.1**
3	2123	CNA 20402	29.5	33.4	34.1	35.2	33.6	33.3	**33.2**
4	2124	CNA 19475	30.0	34.3	35.1	34.7	35.1	33.9	**33.9**
5	2125	**AKA 7 (ZC)**	34.4	39.6	40.8	43.1	38.3	36.7	**38.8**
6	2126	DDCC 2001	27.8	31.8	32.5	33.0	32.2	33.1	**31.7**

Bolls/plant

S. No.	Code No.	Entries	Surat	Nagpur	Nanded	Parbhani	Jalgaon	Khandwa	Mean CZ
1	2121	CNA 1092	35.5	28.9	11.5	12.5	18.2	27.7	**22.4**
2	2122	**Local Check**	47.3	25.9	12.6	18.0	13.4	30.6	**24.6**
3	2123	CNA 20402	29.3	26.0	10.2	16.3	10.4	28.3	**20.1**
4	2124	CNA 19475	42.3	36.7	9.6	15.0	13.0	30.0	**24.4**
5	2125	**AKA 7 (ZC)**	29.8	22.2	10.9	18.3	12.8	32.3	**21.1**
6	2126	DDCC 2001	48.0	38.9	13.5	15.8	10.6	34.2	**26.8**

Boll weight (g)

S. No.	Code No.	Entries	Surat	Nagpur	Nanded	Parbhani	Jalgaon	Khandwa	Mean CZ
1	2121	CNA 1092	2.4	2.6	2.2	2.5	2.0	2.7	**2.4**
2	2122	**Local Check**	2.2	2.9	2.6	2.6	2.4	2.4	**2.5**
3	2123	CNA 20402	2.9	3.2	3.0	2.5	2.0	2.7	**2.7**
4	2124	CNA 19475	2.2	2.9	2.2	2.6	2.2	2.7	**2.5**
5	2125	**AKA 7 (ZC)**	2.6	2.7	2.7	2.6	2.3	2.5	**2.6**
6	2126	DDCC 2001	2.3	2.8	2.3	2.5	2.2	2.8	**2.5**

SOUTH ZONE TRIALS

Br 03 – Preliminary Varietal Trial - Coloured *G. hirsutum* (South Zone)

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Raichur (I)	Srivilliputhur (I)	Lam (I)	Dharwad (R)	Nandyal (R)	Mean SZ	Rank
1	2201	DHCC 2002	1141	1264	2401	801	594	**1240**	3
2	2202	Suraj (Zonal Check)	1589	1222	2388	524	746	**1294**	2
3	2203	DHCC 2151	671	1319	1777	785	833	**1077**	5
4	2204	**Local Check**	1541	1125	1951	458	1019	**1219**	4
5	2205	Vaidehi 1 (ZC CC)	1310	1194	2615	623	1430	**1434**	1
		CD @ 5 %	168	-	100	175	133		
		CV %	17	10	14	18	9		
		Local Checks	**BGDS 1063**	**SVPR 6**	**Sivanandi**	**ARBH-813**	**Sivanandi**		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Raichur (I)	Srivilliputhur (I)	Lam (I)	Dharwad (R)	Nandyal (R)	Mean SZ
1	2201	DHCC 2002	322	398	798	246	188	**390**
2	2202	Suraj (Zonal Check)	591	356	884	175	259	**453**
3	2203	DHCC 2151	196	405	584	249	258	**338**
4	2204	**Local Check**	535	360	718	163	329	**421**
5	2205	Vaidehi 1 (ZC CC)	459	378	894	199	492	**484**

Ginning outturn (%)

S. No.	Code No.	Entries	Raichur (I)	Srivilliputhur (I)	Lam (I)	Dharwad (R)	Nandyal (R)	Mean SZ
1	2201	DHCC 2002	28.2	33.0	33.2	30.7	31.7	**31.4**
2	2202	Suraj (Zonal Check)	37.2	36.8	37.0	33.3	34.7	**35.8**
3	2203	DHCC 2151	29.2	33.7	32.9	31.7	30.9	**31.7**
4	2204	**Local Check**	34.7	33.1	36.9	35.7	32.3	**34.5**
5	2205	Vaidehi 1 (ZC CC)	35.0	40.7	34.2	32.0	34.4	**35.3**

Br 03 – Preliminary Varietal Trial - Coloured *G. hirsutum* (South Zone)

Bolls/plant

S. No.	Code No.	Entries	Raichur (I)	Srivilliputhur (I)	Lam (I)	Dharwad (R)	Nandyal (R)	Mean SZ
1	2201	DHCC 2002	12.6	8.8	58.4	17.0	8.8	**21.1**
2	2202	Suraj (Zonal Check)	13.9	9.0	44.9	15.6	9.9	**18.7**
3	2203	DHCC 2151	10.9	8.2	50.3	16.8	13.0	**19.8**
4	2204	**Local Check**	14.3	9.3	46.5	17.1	13.3	**20.1**
5	2205	Vaidehi 1 (ZC CC)	13.3	8.0	56.3	17.6	16.0	**22.2**

Boll weight (g)

S. No.	Code No.	Entries	Raichur (I)	Srivilliputhur (I)	Lam (I)	Dharwad (R)	Nandyal (R)	Mean SZ
1	2201	DHCC 2002	3.3	3.3	4.8	3.3	1.9	**3.3**
2	2202	Suraj (Zonal Check)	3.8	4.3	4.8	4.0	2.8	**3.9**
3	2203	DHCC 2151	2.9	2.8	3.7	3.3	2.0	**2.9**
4	2204	**Local Check**	3.8	3.5	4.4	3.6	2.9	**3.6**
5	2205	Vaidehi 1 (ZC CC)	2.9	3.5	4.9	3.5	2.3	**3.4**

Br 04a – Coordinated Varietal Trial - *G. hirsutum* (South Zone)

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Arabhavi	Raichur	Lam	Srivilliputhur	Mean SZ	Rank
1	2211	RAH 1083	1071	2458	2662	1299	**1873**	2
2	2212	ZC (Suraj)	1102	2429	2036	1181	**1687**	6
3	2213	RAH 1081	1223	2701	2556	1493	**1993**	1
4	2214	TSH 387	599	2353	2315	1785	**1763**	4
5	2215	**LC**	1051	2253	2285	1507	**1774**	3
6	2216	RAH 1082	675	2590	2377	1319	**1740**	5
		CD @ 5 %	230	183	NS	-		
		CV %	18	10	12	17		
		Local Checks	**ARBH 813**	**BGDS 1063**	**NDLH 1938**	**SVPR 6**		

Br 04a – Coordinated Varietal Trial - *G. hirsutum* (South Zone)

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Arabhavi	Raichur	Lam	Srivilliputhur	Mean SZ
1	2211	RAH 1083	376	875	970	563	**696**
2	2212	ZC (Suraj)	393	938	736	519	**646**
3	2213	RAH 1081	457	1097	922	650	**781**
4	2214	TSH 387	212	828	816	715	**643**
5	2215	**LC**	383	804	761	572	**630**
6	2216	RAH 1082	232	958	854	698	**686**

Ginning outturn (%)

S. No.	Code No.	Entries	Arabhavi	Raichur	Lam	Srivilliputhur	Mean SZ
1	2211	RAH 1083	35.1	35.6	36.5	36.1	**35.8**
2	2212	ZC (Suraj)	35.7	38.6	36.0	37.6	**37.0**
3	2213	RAH 1081	37.3	40.6	36.1	39.2	**38.3**
4	2214	TSH 387	35.5	35.2	35.1	38.2	**36.0**
5	2215	**LC**	36.5	35.7	33.5	34.6	**35.1**
6	2216	RAH 1082	34.3	37.0	35.8	35.8	**35.7**

Bolls/plant

S. No.	Code No.	Entries	Arabhavi	Raichur	Lam	Srivilliputhur	Mean SZ
1	2211	RAH 1083	9.5	23.3	63.9	12.8	**27.4**
2	2212	ZC (Suraj)	9.4	20.9	41.5	13.1	**21.2**
3	2213	RAH 1081	9.3	24.3	55.2	14.4	**25.8**
4	2214	TSH 387	8.7	23.8	53.5	12.7	**24.7**
5	2215	**LC**	9.3	21.4	50.3	12.9	**23.5**
6	2216	RAH 1082	8.6	22.7	59.5	12.3	**25.8**

Boll weight (g)

S. No.	Code No.	Entries	Arabhavi	Raichur	Lam	Srivilliputhur	Mean SZ
1	2211	RAH 1083	4.8	5.0	4.8	3.9	**4.6**
2	2212	ZC (Suraj)	4.9	5.1	4.1	4.3	**4.6**
3	2213	RAH 1081	4.2	4.5	4.8	3.7	**4.3**
4	2214	TSH 387	5.1	5.6	4.5	4.2	**4.9**
5	2215	**LC**	4.9	4.6	4.1	4.0	**4.4**
6	2216	RAH 1082	4.0	4.3	4.7	3.7	**4.2**

Br 14a – Coordinated Varietal Trial - *G. barbadense*

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Rahuri	Dharwad	Coimbatore	Mean SZ	Rank
1	2221	CCB 26	654	335	656	**496**	4
2	2222	CCB22-2	576	353	814	**584**	1
3	2223	**ZC (Rhcb-011-CZ; Suvin-SZ)**	410	358	596	**477**	6
4	2224	CCB22-1	491	324	836	**580**	2
5	2225	SIMA B-8	771	309	755	**532**	3
6	2226	CCB 6	515	352	638	**495**	5
		CD @ 5 %	126	67	95		
		CV %	14	19	9		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Dharwad	Coimbatore	Mean SZ
1	2221	CCB 26	106	214	**160**
2	2222	CCB22-2	121	266	**194**
3	2223	**ZC (Rhcb-011-CZ; Suvin-SZ)**	116	186	**151**
4	2224	CCB22-1	108	268	**188**
5	2225	SIMA B-8	105	264	**185**
6	2226	CCB 6	115	197	**156**

Ginning outturn (%)

S. No.	Code No.	Entries	Dharwad	Coimbatore	Mean SZ
1	2221	CCB 26	31.7	32.7	**32.2**
2	2222	CCB22-2	34.3	32.7	**33.5**
3	2223	**ZC (Rhcb-011-CZ; Suvin-SZ)**	32.3	31.1	**31.7**
4	2224	CCB22-1	33.3	32.1	**32.7**
5	2225	SIMA B-8	34.0	35.0	**34.5**
6	2226	CCB 6	32.7	30.9	**31.8**

Bolls/plant

S. No.	Code No.	Entries	Rahuri	Dharwad	Coimbatore	Mean SZ
1	2221	CCB 26	20.5	21.6	19.0	**20.3**
2	2222	CCB22-2	17.2	19.5	23.0	**21.3**
3	2223	**ZC (Rhcb-011-CZ; Suvin-SZ)**	19.0	20.9	18.0	**19.5**
4	2224	CCB22-1	22.7	19.5	19.0	**19.3**
5	2225	SIMA B-8	25.0	18.2	21.0	**19.6**
6	2226	CCB 6	21.7	19.8	17.0	**18.4**

Br 14a – Coordinated Varietal Trial - *G. barbadense*

Boll weight (g)

S. No.	Code No.	Entries	Rahuri	Dharwad	Coimbatore	Mean SZ
1	2221	CCB 26	2.7	3.6	2.6	**3.1**
2	2222	CCB22-2	3.0	3.3	2.5	**2.9**
3	2223	**ZC (Rhcb-011-CZ; Suvin-SZ)**	2.9	3.6	2.7	**3.2**
4	2224	CCB22-1	3.5	3.5	3.0	**3.3**
5	2225	SIMA B-8	2.6	3.2	2.6	**2.9**
6	2226	CCB 6	3.0	3.1	2.7	**2.9**

Br 24b – Coordinated Variety Trial - *G. arboreum* - (South Zone)

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Dharwad	Nandyal	Kovilpatti	Mean SZ	Rank
1	2231	CNA 2034	407	1211	520	**713**	8
2	2232	DWDa 2051	463	1180	627	**757**	5
3	2233	PAIG 411	434	744	502	**560**	16
4	2234	MDL 2674	416	962	558	**645**	11
5	2235	NDLA 3152-1	311	1142	475	**643**	12
6	2236	PA 887	479	1090	490	**686**	10
7	2237	CNA 1085	448	1248	620	**772**	4
8	2238	DWDa 2252	438	1383	650	**824**	1
9	2239	**LC**	542	1396	385	**774**	3
10	2240	CNA 1086	522	1121	570	**738**	6
11	2241	NDLA 3146-2	326	913	467	**569**	15
12	2242	**ZC (DLSa 17)**	614	919	590	**708**	9
13	2243	PA 888	426	1070	425	**640**	13
14	2244	PA 898	341	1146	379	**622**	14
15	2245	DWDa 2251	523	1282	598	**801**	2
16	2246	CNA 1084	510	1063	614	**729**	7
		CD @ 5 %	80	254	71		
		CV %	19	14	8		
		Local Checks	**AKA 235**	**Yaganti**	**K 12**		

Br 24b – Coordinated Variety Trial - *G. arboreum* - (South Zone)

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Dharwad	Nandyal	Kovilpatti	Mean SZ
1	2231	CNA 2034	147	425	166	**246**
2	2232	DWDa 2051	164	427	233	**275**
3	2233	PAIG 411	145	255	166	**189**
4	2234	MDL 2674	166	351	233	**250**
5	2235	NDLA 3152-1	103	384	157	**215**
6	2236	PA 887	164	376	180	**240**
7	2237	CNA 1085	146	383	199	**243**
8	2238	DWDa 2252	159	490	239	**296**
9	2239	**LC**	186	479	133	**266**
10	2240	CNA 1086	184	358	200	**247**
11	2241	NDLA 3146-2	111	313	175	**200**
12	2242	**ZC (DLSa 17)**	207	308	222	**246**
13	2243	PA 888	153	356	146	**218**
14	2244	PA 898	110	383	147	**213**
15	2245	DWDa 2251	194	468	231	**298**
16	2246	CNA 1084	173	359	219	**250**

Ginning outturn (%)

S. No.	Code No.	Entries	Dharwad	Nandyal	Kovilpatti	Mean SZ
1	2231	CNA 2034	36.0	35.1	31.8	**34.3**
2	2232	DWDa 2051	35.3	36.2	37.1	**36.2**
3	2233	PAIG 411	33.3	34.2	33.1	**33.5**
4	2234	MDL 2674	40.0	36.5	41.7	**39.4**
5	2235	NDLA 3152-1	33.1	33.6	33.1	**33.3**
6	2236	PA 887	34.3	34.5	36.8	**35.2**
7	2237	CNA 1085	32.7	30.7	32.1	**31.8**
8	2238	DWDa 2252	36.3	35.4	36.8	**36.2**
9	2239	**LC**	34.3	34.3	34.5	**34.4**
10	2240	CNA 1086	35.3	31.9	35.1	**34.1**
11	2241	NDLA 3146-2	34.0	34.3	37.4	**35.2**
12	2242	**ZC (DLSa 17)**	33.7	33.5	37.6	**34.9**
13	2243	PA 888	36.0	33.3	34.4	**34.6**
14	2244	PA 898	32.3	33.4	38.9	**34.9**
15	2245	DWDa 2251	37.0	36.5	38.6	**37.4**
16	2246	CNA 1084	34.0	33.8	35.6	**34.5**

Br 24b – Coordinated Variety Trial - *G. arboreum* - (South Zone)

Bolls/plant

S. No.	Code No.	Entries	Dharwad	Nandyal	Kovilpatti	Mean SZ
1	2231	CNA 2034	11.5	23.5	12.7	**15.9**
2	2232	DWDa 2051	11.8	21.0	10.5	**14.4**
3	2233	PAIG 411	13.2	23.0	11.4	**15.9**
4	2234	MDL 2674	9.1	25.0	12.0	**15.4**
5	2235	NDLA 3152-1	12.1	20.0	12.0	**14.7**
6	2236	PA 887	11.7	24.0	11.1	**15.6**
7	2237	CNA 1085	14.4	31.2	10.9	**18.8**
8	2238	DWDa 2252	11.4	27.1	12.7	**17.1**
9	2239	**LC**	13.9	34.0	12.8	**20.2**
10	2240	CNA 1086	12.9	20.0	12.7	**15.2**
11	2241	NDLA 3146-2	9.5	23.0	12.1	**14.9**
12	2242	**ZC (DLSa 17)**	15.9	19.0	10.3	**15.1**
13	2243	PA 888	13.0	24.0	10.0	**15.7**
14	2244	PA 898	10.3	19.0	9.5	**12.9**
15	2245	DWDa 2251	12.8	29.7	9.4	**17.3**
16	2246	CNA 1084	9.2	25.5	11.1	**15.3**

Boll weight (g)

S. No.	Code No.	Entries	Dharwad	Nandyal	Kovilpatti	Mean SZ
1	2231	CNA 2034	2.3	2.3	2.1	**2.2**
2	2232	DWDa 2051	3.0	2.4	2.4	**2.6**
3	2233	PAIG 411	2.5	2.0	2.5	**2.3**
4	2234	MDL 2674	2.9	2.5	2.5	**2.6**
5	2235	NDLA 3152-1	2.5	2.2	2.7	**2.5**
6	2236	PA 887	2.6	1.9	1.9	**2.1**
7	2237	CNA 1085	2.5	1.7	2.2	**2.1**
8	2238	DWDa 2252	2.8	2.5	2.3	**2.5**
9	2239	**LC**	2.5	2.4	2.4	**2.4**
10	2240	CNA 1086	2.5	2.4	2.0	**2.3**
11	2241	NDLA 3146-2	2.4	2.1	2.5	**2.3**
12	2242	**ZC (DLSa 17)**	2.4	2.2	2.0	**2.2**
13	2243	PA 888	2.8	2.5	1.8	**2.4**
14	2244	PA 898	2.3	2.3	2.3	**2.3**
15	2245	DWDa 2251	2.8	2.3	2.1	**2.4**
16	2246	CNA 1084	2.4	2.4	2.6	**2.5**

Br 24 (CC) Coordinated Varietal Trial of Naturally Coloured *G. arboreum*

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Kovilpatti*	Dharwad (R)	Nandyal (R)	Mean SZ	Rank
1	2251	DDCC 2151		512	1046	**779**	3
2	2252	**DDCC 1 (CC)**		537	1175	**856**	1
3	2253	DDCC 2001		546	1050	**798**	2
4	2254	Local Check		500	1010	**755**	4
		CD @ 5 %		28	212		
		CV %		6	14		
		Local Checks	**K 12**	**AK-235**	**Yaganti**		

***Vitiated**

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Dharwad (R)	Nandyal (R)	Mean SZ
1	2251	DDCC 2151	169	372	**271**
2	2252	**DDCC 1 (CC)**	179	395	**287**
3	2253	DDCC 2001	178	363	**271**
4	2254	Local Check	172	358	**265**

Ginning outturn (%)

S. No.	Code No.	Entries	Dharwad (R)	Nandyal (R)	Mean SZ
1	2251	DDCC 2151	33.0	35.6	**34.3**
2	2252	**DDCC 1 (CC)**	33.3	33.6	**33.5**
3	2253	DDCC 2001	32.7	34.6	**33.7**
4	2254	Local Check	34.3	35.4	**34.9**

Bolls/plant

S. No.	Code No.	Entries	Dharwad (R)	Nandyal (R)	Mean SZ
1	2251	DDCC 2151	15.1	21.8	**18.5**
2	2252	**DDCC 1 (CC)**	16.1	29.6	**22.9**
3	2253	DDCC 2001	13.6	25.5	**19.6**
4	2254	Local Check	11.5	19.4	**15.5**

Boll weight (g)

S. No.	Code No.	Entries	Dharwad (R)	Nandyal (R)	Mean SZ
1	2251	DDCC 2151	2.0	2.0	**2.0**
2	2252	**DDCC 1 (CC)**	1.9	2.2	**2.1**
3	2253	DDCC 2001	1.9	2.4	**2.2**
4	2254	Local Check	2.2	2.5	**2.4**

Report on Pre-Breeding Activities

PAU, Faridkot

Third backcross generation (BC_3F_1) derived from *G. hirsutum*/*G. armourianum*/*G. hirsutum* cross was planted during *kharif* 2022. The population was screened for CLCuD and plants resistant to the disease were identified. Crosses of these CLCuD resistant plants were attempted with upland cotton varieties and advance lines such as PAU Bt 3, FBt 1908 and FBt 1904. Few BC_4F_1 seeds were developed from these crosses which will be sown to advance the generation and crossed with *G. hirsutum* parents in *kharif* 2023.

NAU, Surat

Activity:1 - Crosses between available wild species and cultivated diploid and tetraploid cotton species.

Female	**Male**	**Number of Cross attempted**	**No of bolls set**	**Number of seeds harvested**
{(G-6 X *G.anomalum*) X *G.tomentosum*} X G.Cot.10	G.Cot.10	450	Crosses were not successful.	-
(Karnugani-1 X *G.stocksii*) X G.Cot.10 -	G.Cot.10	310	Crosses were not successful.	-
{(G-6 X *G.anomalum*) X *G.tomentosum*} X G.Cot.10	GN.Cot.22	620	Four bolls were set and picked successfully. To be grown next year	7
(Karnugani-1 X *G.stocksii*) X G.Cot.10 -	GN.Cot.22	680	Two boll set and picked successfully. To be grown row next year	3

Above derivatives will be reciprocally crossed with G.Cot.10 (good general combiner) and GN.Cot.22 (stable inter specific cross derivatives involving four cultivated cotton species and three wild species viz., *G.stocksii*, *G.armouriamum and G.anomalum*) during 2023-24 season.

Activity: 2 Growing of successful crosses and back crossing with cultivated parents

The harvested four seeds from ({(G-6 X *G. anomalum*) X *G. tomentosum*} X G.Cot.10) X GN.Cot.22 and two seeds from ((Karnugani-1 X *G. stocksii*) X G. Cot.10) X GN.Cot.22 of previous year 21-22 were sown in nursery but they were not germinated.

Activity: 3

Following segregating introgression lines were shared with participating centers during 2022-23

GISV 331 X CCH 15-1

GISV 323 X TCH 1716

The segregating introgression lines received from participating centers were evaluated and the detail datasheet was send to the PI – (Plant Breeding) AICRP on Cotton.

Sr. No.	Code	Plant Height (cm)	Seed Cotton Yield (Kg/ha)	Boll Weight (g)	No. of Bolls/ Plant	Lint Index (g)	Seed Index (g)	Ginning outturn (%)	UHML (mm)	UI (%)	Mic (MV)	Tenacity (3.2mm g/t)	Elg %	No of sym-podia	No of mono-podia
1	SP 134-1	162.6	652	2.2	15.9	2.9	6.2	31.5	24.6	80	5.0	25.8	5.6	12.3	3.0
2	SP 115-1	173.4	675	2.3	15.8	3.3	6.5	34.0	23.5	80	5.0	24.4	5.4	12.0	2.7
3	SP 118-1	155.6	467	2.4	10.7	3.0	6.0	33.2	22.7	79	5.4	23.9	5.4	9.7	2.3
4	SP 126-1	161.6	316	2.3	7.5	2.6	5.5	32.4	22.8	79	3.9	23.8	5.3	10.7	2.0
5	SP 113-5	155.2	428	2.0	11.7	2.8	5.8	32.5	24.5	81	5.1	26.4	5.6	12.3	2.3
6	SP 125-2	157.8	347	2.5	7.4	2.8	6.0	31.9	25.6	79	3.8	26.0	5.5	8.0	2.3
7	SP 119-1	179.4	540	2.8	10.4	2.9	6.0	32.8	24.2	80	5.0	25.3	5.5	10.0	3.3
8	SP 122-1	167.0	301	2.0	8.1	2.5	5.0	33.6	22.7	80	5.0	23.5	5.4	8.7	2.0
9	SP 82-2	174.2	694	2.2	16.9	2.7	5.8	32.0	23.8	81	5.1	25.8	5.5	13.0	2.7
10	SP 99-1	172.4	500	2.1	12.7	2.6	6.0	29.9	23.7	81	4.7	25.5	5.4	12.7	2.0
11	*G arboreum X G. anomalum*	186.8	718	2.2	17.8	2.6	6.0	30.2	26.5	84	5.0	27.8	5.8	12.0	3.0
12	(GISV 323 X TCH 1716) F4	148.0	838	3.0	15.3	3.6	5.6	38.8	25.1	81	3.5	26.1	5.4	11.0	1.0
13	(GISV 331 X CCH -15-1) F3	130.0	424	2.4	9.8	3.6	5.5	39.3	24.3	82	2.9	26.4	5.5	9.7	2.0

MPKV, Rahuri

A) Embryo Rescue of tri-species hybrid in cotton

Back ground information:

In this study, we crossed *G. arboreum* and *G. anomalum*. Chromosome-doubled plants were obtained by colchicine treatment of the interspecific hybrid seeds of *G. arboreum* and *G. anomalum*. This Interspecific hybrid was crossed with either *G. hirsutum* or *G. barbadense* to obtained two types of tri species hybrids {(G. hirsutum x 2 (*G. arboreum* X G. anomalum) and *G. barbadense* X 2(*G. arboreum X G. anomalum*)}. However, these plants were highly sterile and produced no seeds by either selfing or backcrossing during the ten successive years (whether used as a paternal or maternal parent).

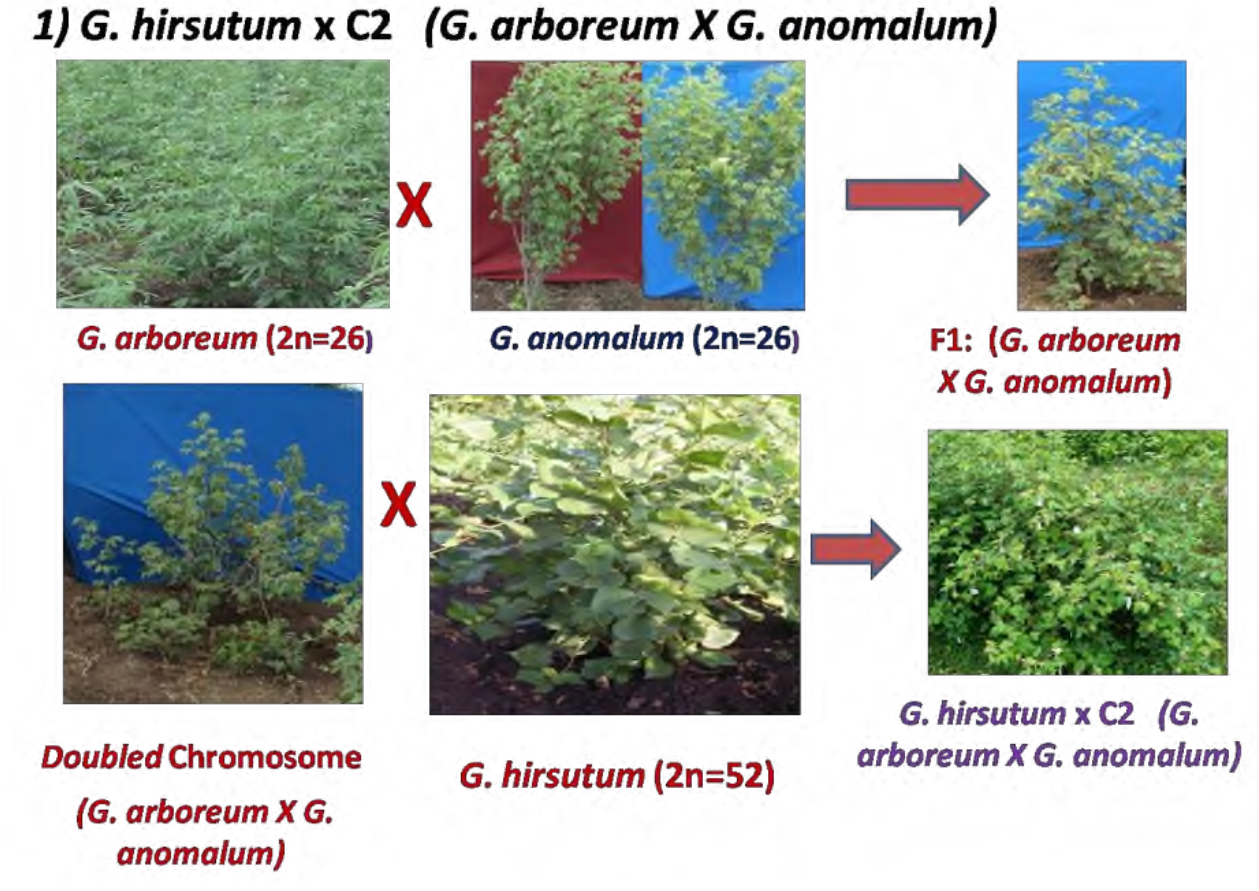

Figure 1 Development of tri species hybrids {(G. hirsutum x 2 (G. arboreum X G. anomalum)

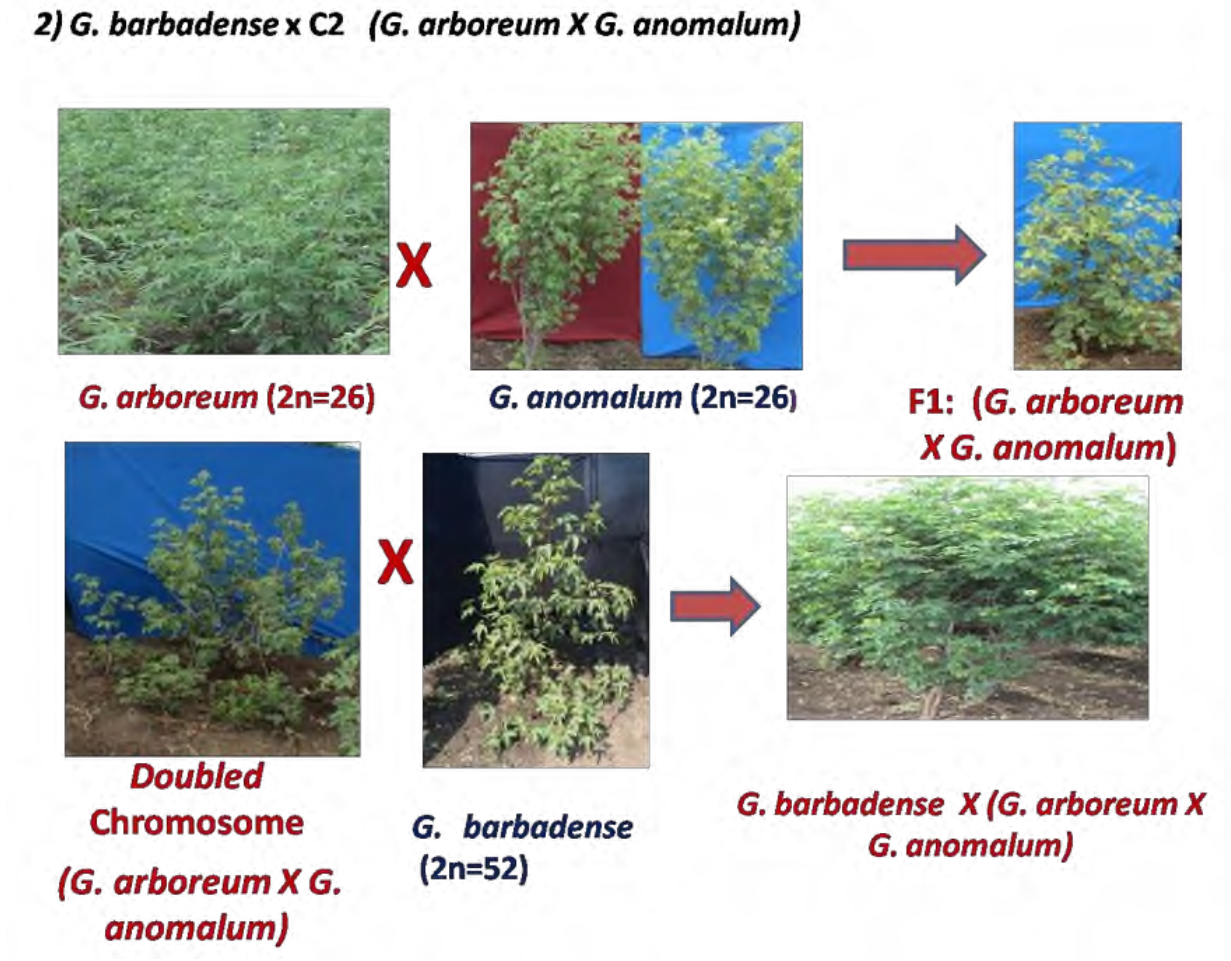

Figure 2 Development of tri species hybrid: *G. barbadense X2(G. arboreum X G. anomalum*)

Figure 3. All the plants obtained from above two crosses were sterile.

Flowers of tri species hybrids {(*G. hirsutum* x 2(*G. arboreum* X *G. anomalum*) were pollinated with pollens of G. hirsutum. Flowers of another and tri species hybrids G. barbadense X 2(*G. arboreum X G. anomalum*) were pollinated with pollens of G. barbadense. A mixture of growth regulators (100 mg/l NAA and 50 mg/l GA) was applied to the base of the pedicel of the

cross-pollinated flowers. The developing bolls were harvested 15 DAP for embryo culture. At first, various combinations and concentrations of growth regulators were tested to standardized embryo rescue protocol. Initials studies with embryo culture showed promising results. Standardization of embryo rescue protocol is still in progress. The embryo rescue programme will be continued for the year 2023-24.

The early abscission of the young bolls was prevented by repeated application of growth regulators (100 mg/l NAA and 50 mg/l GA). However most of the bolls do not produced any seeds or produce empty seeds (Figure 3). We were able to obtained 5 big size immature embryos from the cross of G. hirsutum x 3Gh {(*G. hirsutum x 2 (G. arboreum X G. anomalum*) and 6 big size immature embryos from the cross G. barbadense X 3Gb {*G. barbadense X 2(G. arboreum X G. anomalum*)}. These embryos were being germinated *in vitro*. One plant was obtained from each cross.

Figure 4a-c: No seed or empty seed formation in back cross of tri-species cross. 4d-f: *In vitro* establishment of embryos obtained from backcross of tri-species cross.

***Figure 5: Primary hardened plantlet of G. barbadense* X 3Gb. {*G. barbadense X 2(G. arboreum X G. anomalum*)}**

Details of embryo rescue programme of tri-species hybrid

Cross	***G. hirsutum* x 3Gh. {(*G. hirsutum x 2 (G. arboreum X G. anomalum*)}**	***G. barbadense* X 3Gb. {*G. barbadense X 2(G. arboreum X G. anomalum*)}**
Flowers Pollinated	2276	2235
Number of immature embryos cultured (3DPA-10DPA)	1478	1276
Boll Formation	896	735
Immature Embryos Cultured (30DPA<)	5	6
No. of Plantlets Hardened	0	1

B) Individual plant selection of Pre-breeding material received from ICAR-Central Institute for Cotton Research, Regional Station, Coimbatore

- Seeds obtained from Selfing of F1 of eleven lines of were sown on 18/06/2022 with 8 Rows of 6-meter length, each with 90x60 cm spacing.
- Optimum germination was observed in all the lines.
- Flowering was observed in all the sixteen lines, and self-pollination was done in all the lines.
- Optimum seed set was observed in 11 lines, and seeds were collected from selfed flowers.
- Individual plants showing tolerance to sucking pest were selected for further studies.

Table 2. Details of lines used for is given in the table below

Sr. No.	Prebreeding Material Selfed F1	Seed Germination	Seed Set after Selfing
1.	*G. a* x *G. r. 99-1*	Optimum	Yes
2.	*G. a* x *G. r. 125-2*	Optimum	Yes
3.	*G. a* x *G. r. 113-5*	Optimum	Yes
4.	*G. a* x *G. r. 126-1*	Optimum	Yes
5.	*G. a* x *G. r. 122-1*	Optimum	Yes
6.	*G. a* x *G. r. 118-1*	Optimum	Yes
7.	*G. a* x *G. r. 115-2*	Optimum	Yes
8.	*G. a* x *G. r. 119-1*	Optimum	Yes
9.	*G. a* x *G. r. 134-2*	Optimum	Yes
10.	*G. a* x *G. r. 82-2*	Optimum	Yes
11.	G.N. cot-22(GISV-218)	Optimum	Yes
12.	GISV 322x CCH-15-1 (Seg. Line)	Optimum	Yes
13.	GISV-316 x BGDS-1033 (Seg. Line)	Optimum	Yes

C) Interspecific hybridization

I. Six Interspecific crosses were attempted. Optimum seed set was observed after crossing. Details of Crosses are enlisted below

- *G. arboreum X G. devidsonii*
- *G. hirsutum X G. devidsonii*
- *G. barbadense X G. devidsonii*
- *G. arboreum X G. raimondi*
- *G. hirsutum X G. raimondi*
- *G. barbadense X G. Raimondi*

CICR, Nagpur

Twenty-one (21) accessions of exotic seeds of *Gossypium* species under Import Permit No. 100/2021 and IQ No. 275/2021 were imported from USDA, USA and were sown in pots in the green house of wild species. All precautions were taken to prevent spread of exotic disease(s)/ pest(s). The entire material was sown in pots while few seeds were used for tissue culture at ICAR-CICR, Nagpur. Seeds of all the accessions germinated. Plants of all 16 accessions have been established in pots except for four accessions i.e *Gossypium costulatum* (EC1092750, PI 499771)), *Gossypium nobile*, *Gossypium tomentosum* (EC1092266, PI 530711) and *Gossypium sturtianum* (EC1092264, PI 530751) mentioned in the table below as the seedlings could not survive after germination.

List of wild species received from USDA :

S. No.	Accession	Species name	Inventory	Accession	No of plants established
1	EC1092748	*Gossypium areysianum*	E33	PI 695422	3
2	EC1092749	*Gossypium costulatum*	K1 5	K1 5	1
3	EC1092750	*Gossypium costulatum*	CFC 40 / K1 3	PI 499771	Nil
4	EC1092751	*Gossypium darwinii*	AP 0985 / AD 5 7	PI 499695	2
5	EC1092252	*Gossypium darwinii*	AP 0985/ AD5 18	PI 499706	4
6	EC1092253	*Gossypium darwinii*	AP 0985/ AD5 20	PI 499708	2
7	EC1092255	*Gossypium gossypioides*	D6 3	PI 530956	4
8	EC1092254	*Gossypium gossypioides*	D6 1	PI 530954	6
9	EC1092256	*Gossypium gossypioides*	US-43/ D6 7	PI 631061	1
10	EC1092257	*Gossypium gossypioides*	US-46/ D6 8	PI 631062	2
11	EC1092258	*Gossypium incanum*	E4 4	PI 695424	1
12	EC1092260	*Gossypium mustelinum*	AD4 10	PI 695432	2
13	EC1092261	*Gossypium mustelinum*	AD 4 17	PI 695434	5
14	EC1092262	*Gossypium mustelinum*	AD4 8	PI 695446	1
15	-	*Gossypium nobile*	K10 2	-	Nil
16	EC1092265	*Gossypium sturtianum*	C1 8	PI 695543	1
17	EC1092264	*Gossypium sturtianum*	C1 4	PI 530751	Nil
18	EC1092263	*Gossypium sturtianum*	C1 5	PI 464861	1
19	EC1092268	*Gossypium tomentosum*	AD3 33	PI 698271	3
20	EC1092266	*Gossypium tomentosum*	AD3 5	PI 530711	Nil
21	EC1092267	*Gossypium tomentosum*	AD3 17	PI 530723	5

Potted plant of was very delicate and could not survive.

The plants free from listed cotton pests and also weeds as per PQ Order (2003) with amendments till June 2021:

Fungi

1. *Colletotrichum gossypii* var. *cephalosporioides*(Witches broom)

Bacteria

1. *Xanthomonas campestris*pv*malvacearum* – African strain (Bacterial blight)

Insect:

1. *Anthonomusgrandis*
2. *Anthonomus spp.*
3. *Amblycerus spp.*
4. *Megacerus spp.*
5. *Spermophagus spp*.

Among the above species, only *G.sturtainum, G.gossypioides, G. mustelinum & G. areysianum* flowered during the reported period and selfed seeds were collected. Only five flowers of *G. mustelinum* were utilised in crossing program with *G. hirsutum* race Latifolium while *G. tomentosum* is yet to flower.

Selfing and Back crossing with recurrent parent were attempted to advance the generation for the F1 crosses of [G. *stocksii* (drought tolerance) – 61 crosses attempted], [*G. capitis virides* (Bacterial Blight tolerance)- 86 crosses attempted and [*G. davidsonii* (tolerance to sucking pests, salinity & Bacterial blight) – 10 crosses attempted] but due to excess rains the crosses were washed out. These crosses will be repeated again in the next season.

Identified two best lines among the 10 lines of *G. arboreum* x *G. longicalyx* which were evaluated at various centres during 2021-22 for registration as Genetic stock.

Sample	UHML(mm)	UI(%)	MIC(ug/inch)	BS(g/tex)	EI(%)
21615-Sp82-2	25.4	79	4.9	25.0	6.3
21615-Sp99-1	26.4	79	4.7	26.3	6.0
21615-Sp113-5	25.3	79	5.2	24.3	6.5
21615-Sp115-2	24.2	79	5.2	23.6	5.7
21615-Sp118-1	25.0	79	5.3	25.1	6.1
21615-Sp119-1	26.1	79	5.1	24.8	6.0
21615-Sp122-1	24.0	79	5.1	22.2	6.1
21615-Sp125-2	27.4	79	5.0	25.6	6.1
21615-Sp126-1	26.2	79	5.2	24.7	6.0
21615-Sp134-2	26.6	79	5.1	26.3	6.1

Evaluation of the following material for second year:

S. No.	Details	Centre	Trait	
1	Segregating material of the cross *G. hirsutum x G. armourianum*	PAU, Faridkot	Sucking pest tolerance	Sterile
2	Stable line of the cross *G. arboreum x G. anomalum*	MPKV, Rahuri	Fibre quality	Fertile
3	Segregating line of the cross GISV 322 X CCH 15-1	NAU, Surat	Jassid tolerance	Fertile
4	Segregating line of the cross GISV 316 x BGDS 1033	NAU, Surat	High Ginning Outturn	Fertile
5	Notified variety GISV 218 (G. N. Cot. 22)	NAU, Surat	Jassid tolerance	Fertile

Fibre properties of lines obtained from other centres:

Pre-Breeding lines	**UHML (mm)**	**UI (%)**	**MIC (ug/inch)**	**BS (g/tex)**	**EI (%)**
Stable line of the cross *G. arboreum x G. anomalum*	25.1	79	4.8	24.3	6.3
Segregating line of the cross GISV 322 X CCH 15-1(21174)	25.1	79	3.7	25.1	5.9
Segregating line of the cross GISV 316 x BGDS 1033(21173)	25.4	79	3.8	26.5	6.3
Notified variety GISV 218 (G. N. Cot. 22)	27.0	79	3.9	26.8	6.1

Introgressed derivatives shared with other AICRP centres in 2022-23

1. Twenty (20) introgressed lines with fairly good fibre fineness combined with tolerance to major pests and diseases
2. Ten (10) stable progenies of *G. arboreum* race Indicum x *G. davidsonii* *[Special traits of *G. davidsonii* - tolerance to sucking pests, salinity & Bacterial blight]

TNAU, Coimbatore

Evaluation of Pre- breeding materials

- Stabilized lines of *G. arboreum x G. longicalyx* cross combination, *G. arboreum x G. anomalum,* GISV 318 (GN Cot 22) and GISV 316 x BGDS 1033 were raised and selfing was done for seed multiplication. Fibre quality analysis was done in Statex compact high volume instrument and the results of the same are furnished below

Table Fibre quality parameters of pre breeding materials (*G. arboreum x G. longicalyx*)

Entry	UHML (mm)	Micronaire value (µg/inch)	Bundle strength(g/tex)	Uniformity Index (%)	Elongation %
SP- 88-2	24.4	5.6	19.2	49.2	5.3
SP- 99-1	26.2	5.04	20.1	47.2	5.4
SP-113-5	26.9	4.34	23.5	48.0	5.6
SP-115-2	23.8	5.7	18.6	50.4	5.3
SP-118-1	22.9	6.42	18.9	51.1	5.4
SP-119-1	25.1	5.77	20.1	49.0	5.5
SP-122-1	25.8	5.34	19.6	48.1	5.3
SP-125-2	25.6	4.83	20.5	48.4	5.5
SP-126-1	24.2	5.53	18.5	49.2	5.2
SP-134-2	25.4	5.01	20.6	47.6	5.6
GISV 318 (GN Cot 22)	26.3	4	20.3	48.3	5.4
GISV 316 x BGDS 1033	28.4	4.51	22.7	47.5	5.8
G. arboreum x G. anomalum	26.3	5.45	19.9	47.9	5.6

- F1 plants of F Bt 1908 x *G.armourianum*, PAU Bt 3 x *G. armourianum and* F Bt 1904 x *G. armourianum* are maintained in wild species garden of Dept. of Cotton. Hybridization with *G. hirsutum* variety CO 14 was attempted with all the above three crosses. Among the them, CO14 x (F Bt 1908 x *G. armourianum*) resulted in setting of a singe boll and all the others were unsuccessful
- Seeds collected from selfed bolls of *G. arboreum x G. anomalum*(Stable line), segregating material GISV 316 x BGDS 1033 and GISV 318 (G.N. Cot.22) have been sown in wild species garden and were selfed.

CICR, Coimbatore

Generation advancement and evaluation of F2 lines: Among the lines maintained at CICR, RS, Coimbatore GISV 316 X BGDS 1063 was identified for more number of bolls per plant (76 Nos), followed by G.a x G.l (113-5) (73 Nos). The line NDLH x barbadense Race was found to be free from all diseases and sucking pests except Alternaria leaf spot.

Evaluation of stable lines from Nagpur: Among the 60 stable genotypes evaluated, NLSD 21052 was found to have significantly higher boll numbers (70) followed by NLSD 21022 (66 nos), and NLSD 21063, NLSD 21055, NLSD 21024 with 62 bolls on an average per plant. These lines were found to be early maturing, with big bolls and uniform maturing. The twenty stable lines developed from *G. arboretum* x *G. davidsoni* were found to be late maturing with very few boll number per plant ranging from 9 to 33 per plant.

Evaluation of segregating lines from Surat: The segregating lines viz., GISX 331 x CCH 15-1 (F3) and GISV 323 x DCH 1716 (F4) were found to have fertility ranging from 20-84 per cent with 26 to 78 bolls per plant.

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CROP PRODUCTION

AGRONOMY, PHYSIOLOGY AND BIOCHEMISTRY

The following Experiments were undertaken during *Kharif*-2022-23 at various centers of AICRP on Cotton.

AGRONOMY

Agronomy I	Agronomic requirements of promising pre-release/recently released *hirsutum/ arboreum/ barbadense* genotypes including compact / hybrids of both interspecific and *desi* hybrids of cotton
Agronomy II	Augmenting ELS cotton production
Agronomy IV	Technology for Organic Cotton Production
Agronomy V	Conservation Agriculture.
Agronomy VII	Input use pattern & cost of cultivation
Agronomy IX	Standardisation of geometry for Bt varieties(HDPS)
Agronomy X	Multi-tier intercropping
Agronomy XI	Bio stimulant on growth and development of cotton
Agronomy XII	Drought and water logging management

PHYSIOLOGY and BIOCHEMISTRY

PHY 1	PGR for optimum morpho- frame and enhanced yield
PHY2	Preparing for climate change - Growth and development of *arboreum* cotton in response to growth regulators
PHY 3	Effect of growth retardant on physiological parameters and productivity of compact genotypes
PHY 4	Use of Defoliants to facilitate mechanical picking
BIO CHEM1	Screening of cotton genotypes for abiotic stress tolerance, estimation of seed oil, gossypol and protein and analysis of biochemical constituents of organic trial
BIO CHEM2	Analysis of biochemical constituents of organic cotton experiment (Agronomy IV), morpho frame (Phy:1), climate change (Phy :2) growth retardants (Phy:3) and defoliants (Phy:4)

The trials conducted zone-wise were as follows:

North zone	Faridkot, Bathinda, Sirsa, Hisar and Sriganganagar
Central Zone	Surat, Akola, Rahuri, Nanded, Khandwa, Junagadh and Bhawanipatna
South Zone	Lam (Guntur), Nandyal, Dharwad**,** Chamrajanagar, Coimbatore, Srivilliputtur and Raichur

The project-wise findings and salient highlights of the research pertaining to North, Central and South zones are summarized below.

Agronomy IA: Agronomic requirements of promising pre-release/recently released *hirsutum/ arboreum /barbadense* genotypesha^{-1}ybrids of cotton

Adequate plant population facilitates the efficient use of applied fertilizers and irrigation. As far as fertilizers are concerned judicious use of nitrogenous fertilizer is more important. Nitrogen is an essential nutrient for cotton that affects plant growth, fruiting and yield. Nitrogen plays a dominant role in growth processes as it is an integral part of chlorophyll molecule, a constituent of enzyme molecules, protein and nucleic acids. Nitrogen fertilizer requirements depend on many factors including yield goal, soil type and numerous environmental factors.

Agronomy IA: Agronomic requirements of promising pre-release *hirsutum* genotypes of cotton in Central Zone (rainfed)

TVH 007, Akola

The results of spacing and nutrient requirement of pre released *hirsutum* genotypes studies revealed that plant height, number of symopodia, number of bolls per square meter, length of sympodial branches was significantly influenced by plant geometry except, monopodial branches and bolls weight.

The seed cotton yield (SCY) was significantly highest (2220 kg ha^{-1}) with plant density (0.74 lakh ha^{-1})i.e. with 60 x 22.5 cm^2 spacing which was found significantly superior over wider spacing of 60X30cm (1938 kg ha^{-1}) with plant density of 0.56 lakh /ha and 0.37 lakh/ha i.e.at spacing of 60x45 cm (1617 kg ha^{-1}).There was significant response to nitrogen levels in respect of plant height, number of sympodia, length of sympodia, number of bolls per square meter and seed cotton yield except monopodial branches and boll weight. The highest SCY (2156 kg ha^{-1}) was recorded in 125 % N level which was found significantly superior over 100 % N(1852 kg ha^{-1}) and 75 % N(1766 kg ha^{-1}). All the interaction effect of spacing x fertilizer dose with regards to all growth parameters were found non-significant except number of bolls per square meter and seed cotton yield. The seed cotton yield of genotype TVH-007 (2610 kg ha^{-1}) was significantly highest at 60 x 22.5 cm with a plant population of 0.74 lakh ha^{-1}and N level of 125 % N (Table1).

Table 1. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nutrient levels (TVH 007) at Akola

Treatments	S1.60X22.5	S2.60X30	S3.60X45	Mean (Nitrogen)	ANOVA	SE d	CD (5%)
N_1. 75% RDN	1919	2006	1374	**1766**	Spacing	95	202
N_2. 100% RDN	2132	1902	1522	**1852**	Nitrogen	95	202
N_3. 125% RDN	2610	1904	1955	**2156**	S X N	165	349
Mean (spacing)	**2220**	**1938**	**1617**				
AKH 9-5 , Spacing : 60x30 cm RDF: 60:30:30 Kg NPK ha^{-1}.				1860			

Recommended spacing: 60X30 cm, Recommended Fertilizer dose: 60:30:30 Kg NPK/ha, Environment: Rainfed, Cotton Species: *Hirsutum Varieties of* Cotton, Total Rainfall during Cropping period :1161 mm in 51 rainy days Soil parameters :pH value: 7.80, EC (dSm^{-1}): 0.12, O.C.(g kg $^{-1}$) : 3.95, Available N : 236 kgha^{-1}, P_2O_5 : 16.70 kgha^{-1}, K2O : 380 kgha^{-1}

GJHV 566, Surat

The results revealed that seed cotton yield was significantly influenced by genotype and nitrogen levels. Spacing S1 (120 x 30 cm) recorded significantly higher seed cotton yield (2800 kg/ha) as compared to S3.120 x 60 cm (2432 kg/ha) but it was at par with spacing S2.120 x 45 cm (2717 kg/ha). Nitrogen level $N_{3.}$ 125 % RDN recorded significantly higher seed cotton yield (2819 kg/ha) which was found at par with nitrogen level $N_{2.}$100 % RDN (2708 kg/ha) (Table 2). All the interactions did not show any significant effect on seed cotton yield.

Table 2. Total seed cotton yield (kgha^{-1}) as influenced by spacing levels and nutrient levels (GJHV 566) at Surat

Treatments	S_1: 120 x 30 cm	S_2: 120 x 45 cm	S_3: 120 x 60 cm	Mean (Nitrogen)	ANOVA	SE d	CD (5%)
N_1. 75% RDN	2624	2471	2172	2422	Spacing	76	227
N_2. 100% RDN	2773	2824	2527	2708	Nitrogen	76	227
N_3. 125% RDN	3003	2857	2597	2819	S X N	131	NS
Mean (spacing)	2800	2717	2432				
G. Cot. 40 (LC) with RDF (160:00:00 kg NPK/ha) and spacing (120 x 45 cm)				2096			
75 % RDN + MBF+x120x 45 cm				2505			

P^H:8.4, EC(Dsm^{-1}): 0.54, OC(%):0.60, Avail. N(kg/ha):278, Avail.P2O5(kg/ha):486, Recommended spacing: 120 x 45 cm, Recommended nutrients: 160:00:00 NPK kg/ha, Cotton species/type: Gossypium hirsutum, Environment: Irrigated, Total rainfall: 1493mm.

CNH-18529, Junagadh

The results of different spacing treatments significantly influenced the seed cotton yield. Significantly the highest seed cotton yield 1914 kg/ha and was obtained when cotton sown with 120 X 45 cm. All other growth characters and yield attributes were not significantly influenced by different spacing treatments, except number of boll per square meter. Among different nitrogen management treatments, treatment N_2. 100% RDN gives significantly the highest seed cotton yield (1901 kg/ha). This treatment was statistically at par with treatment of N_3-125% RDN (200-00-120 NPK kg/ha) (Table 3). All other growth characters and yield attributes were not significantly influenced by different spacing treatments, except number of boll per square meter.

Table 3. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nutrient levels (CNH-18529) at Junagadh

Treatments	S_1- 120 X 30 cm	S_2- 120 X 45 cm	S_3- 120 X 60 cm	Mean (Nitrogen)	ANOVA	SE d	CD (5%)
N_1- 75%RDN (120-00-120 NPK kg/ha)	1489	1787	1588	1621	Spacing	72	214
N_2-100%RDN (160-00-120 NPK kg/ha)	1794	2048	1861	1901	Nitrogen	71.50	214
N_3-125%RDN (200-00-120 NPK kg/ha)	1686	1905	1635	1742	S X N	124	NS
Mean (spacing)	1656	1914	1695				
Control- G.Cot.38+120x45 cm+100 % RDN				2202			

Soil parameters of pH:7.80, Soil Ec(dSm^{-1}): 0.35, OC(%): 0.85, available 279 kg/ha N, P_2O_5 :44.11 kg/ha & K_2O :491 kg/ha, recommended spacing :120 X 45 cm, recommended nutrients :160:00:120 NPK kg/ha, Cotton species/type: CNH-18529, environment: irrigated and total rainfall: 1319 mm during cropping periods

CNH 18529, Nanded

The results on plant density observed that closer spacing of **S1. 60 x 22.5 cm** has increased bolls m^{-2} and seed cotton yield ha^{-1} colour *hirsutum* variety, CNH 18529 (2582 kg ha^{-1}) over lower density with wider spacing (S3.60 x 45 cm - 2055 kg ha^{-1}). The wider spacing (S3.60 x 45 cm, 37,037 plants ha^{-1}) recorded significantly higher per plant yield (57.38 g) and significantly lowest number of bolls m^{-2} (72.56). Boll weight was not affected statistically. Spacing S2.60 x 30 cm (2499 kg ha^{-1}) was at par with S1.60 x 22.5. cm (2582 kg ha^{-1}) in seed cotton yield (Table 4).Increase in nitrogen level has increased bolls m^{-2} and seed cotton yield of colour *hirsutum* variety, CNH 18529. The N3.125% RDN (2514 kg ha^{-1}) was significantly superior over N1.75% RDN (2191 kg ha^{-1}) and was on par with N2.100% nitrogen level (2431 kg ha^{-1}) for seed cotton yield, yield plant^{-1} and bolls m^{-2}. Increase in nitrogen level didn't affect boll weight statistically.

Table 4. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nutrient levels (CNH 18529) at Nanded

Treatments	S1. 60 x 22.5 cm	S2. 60 x 30 cm	S3. 60 x 45 cm	Mean (Nitrogen)	ANOVA	SE d	CD (5%)
N_1- 75% RDN (45:30:30)	2377	2276	1921	**2191**	Spacing	105.40	225.37
N_2- 100%RDN (60:30:30)	2651	2556	2086	**2431**	Nitrogen	105.40	225.37
N_3- 125% RDN (75:30:30)	2717	2665	2159	**2514**	S X N	182.56	N.S.
Mean (spacing)	**2582**	**2499**	**2055**				
Check with rec. spacing and N level				1915			

Soil parameters: pH : 8.05, EC(dSm$^{-1)}$:0.27, OC(%): 0.46, available N : 146.2 kg ha^{-1}, P_2O_5 : 11.48 kg ha^{-1}, K_2O : 432.86 kg ha^{-1}. Recommended spacing :60 x 30 cm, Recommended nutrients : 60:30:30 NPK kg ha^{-1}, Cotton species/type : colour *G. hirsutum*, environment : rainfed, total rainfall : 1494 mm

Agronomy IA: Agronomic requirements of promising pre-release *hirsutum* genotypes of cotton in South Zone (rainfed)

DHCC 1901, CCHC 19-1, CCHC 19-2, Dharwad (Coloured cotton)

The data on seed cotton yield as influenced by genotypes, spacing levels, and nitrogen levels. The results revealed that among the three colour genotypes, G_1-DHCC 1901 recorded significantly higher seed cotton yield (2110kg/ha). This may be attributed to the increased yield parameters viz. no of bolls per plant, No of bolls Sq m and seed cotton yield per plant. Increasing N-levels of 125% RDN significantly increased seed cotton yield (1800 kg/ha) as compared to 75% and 100% RDN (Table 5). It showed that these colour cotton genotypes responding to produce higher yields with increased N-levels. This may be attributed to significantly increase of yield attributes. Different planting geometry did not affect seed

cotton yield. Similar trend was observed in no of bolls per plant and single boll weight. None of the interactions were found significant.

Table 5: Effect of planting geometry and N levels on Seed cotton yield/ha of Colour cotton genotypes at Dharwad

Treatments	G_1:DHCC 1901			G_2 :CCHC 19-1			G_3 :CCHC 19-2			
Nutrients	**S1: 60X30 CM**	**S2: 75X30 CM**	**s3: 90X30CM**	**S1: 60X30 CM**	**S2: 75X30 CM**	**s3: 90X30CM**	**S1: 60X30 CM**	**S2: 75X30 CM**	**s3: 90X30CM**	**Mean for N**
N_1.75%N	2043	1906	1959	1247	1432	1340	1201	1343	1472	1549
N_2.100%N	2038	2095	2169	1373	1665	1339	1418	1410	1596	1678
N_3.125%N	2180	2252	2353	1496	1725	1454	1515	1571	1652	1800
mean GXS	**2087**	**2084**	**2160**	**1372**	**1607**	**1378**	**1378**	**1441**	**1573**	
Interaction	**S1: 60X30 CM**	**S2: 75X30 CM**	**s3: 90X30CM**	**G_1:DHCC 1901**	**G_2 :CCHC 19-1**	**G_3 :CCHC 19-2**		**S1: 60X30 CM**	**S2: 75X30 CM**	**s3: 90X30CM**
N_1.75%N	1497	1560	1590	1969	1340	1338	**G_1:DHCC 1901**	2086.7	2084.2	2160.0
N_2.100%N	1609	1723	1701	2100	1459	1474	**G_2 :CCHC 19-1**	1371.8	1607.2	1377.5
N_3.125%N	1730	1849	1820	2262	1558	1579	**G_3 :CCHC 19-2**	1377.5	1441.2	1572.8
Mean	**1612**	**1711**	**1703**	**2110**	**1452**	1464				
ANOVA	**Genotype**	**Spacing**	**Nitrogen**	**GXS**	**GXN**	**SXN**	**GXSXN**			
S. Em	**58**	**36**	**22**	**63**	**39**	**39**	**67**			
S Ed	**82**	**51**	**31**	**89**	**55**	**55**	**94**			
CD (5%)	**358.18**	**NS**	**66.15**	**NS**	**NS**	**NS**	**NS**			

Soil type: Medium deep black, pH: 7.2, OC (%): 0.45, Soil fertility status, N: 230 kg ha^{-1}, P_2O_5 : 27.0 kg ha^{-1}, K_2O: 425 kg ha^{-1}, Environment: Rainfed, Recommended Nutrient levels :60:30:30 kg NPKha^{-1}, Total rainfall received: 1077mm

NDLH-2056-4, Nandyal

The results revealed that number of bolls per square meter differs significantly among different spacing and nitrogen levels. The closer spacing (S3.60 x 30 cm) registered higher number of bolls per square meter (20.7/m^2). Amongst nitrogen levels, higher number of bolls per square meter (20.8/ m^2) was found with 125% RDN. The results found that significantly higher seed cotton yield (893 kg ha^{-1}) was recorded with spacing of 60 cm x 30 cm (Table 6). The least seed cotton yield (612 kg ha^{-1}) was recorded with spacing of 90 cm x 60 cm. There was significant effect of different nitrogen levels tested on seed cotton yield. Higher seed cotton yield (796 kg ha^{-1}) was recorded with 125% RDN and was on par with 100 % RDN (763 kg ha^{-1}). Significantly lower seed cotton yield (644 kg ha^{-1}) was noticed with75% RDN.

Table 6. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nitrogen levels. (NDLH-2056-4) at Nandyal

Treatments	N_1: 75 % RDN	N_2: 100 % RDN	N_3: 125 % RDN	Mean	Anova	SE d	SE m±	CD (5%)
S1: 90X60 cm	561	637	639	612	**Spacing**	35.7	25.2	76.4
S2: 90X45 cm	619	686	788	698	**Nitrogen levels**	35.7	25.2	76.4
S3: 60X30 cm	754	965	959	893	**S X N**	61.9	43.7	NS
Mean	644	763	796					
CV(%): 13								

Soil type : Deep black soil, Clay soil, pH: 8.3,OC (%):0.38%,Soil fertility status, N 137 kg ha^{-1}, P_2O_5 : 32 kg ha^{-1}, K_2O : 365 kg ha^{-1}, Environment: Rainfed, Recommended Nutrient levels : 40-20- 20 NPK kg ha^{-1} Genotypes (G): NDLH-2056-4

CCH 19-2, Nandyal

The agronomic requirement studies of pre released genotype (CCH 19-2) found that number of bolls per square meter differed significantly by spacing and nitrogen levels. The closer spacing, 60x 30 cm (25.8/m2) and higher nitrogen application, 125% RDN (26.4/m2) registered significantly higher number of bolls per square meter. The similar trend was observed with respect to seed cotton yield. Significantly higher seed cotton yield (756 kg ha^{-1}) was recorded with spacing of 60 x 30 cm and the least seed cotton yield (584 kg ha^{-1}) was recorded with spacing of 90 x 60 cm (Table 7). Application of 125 % RDN recorded higher seed cotton yield (801 kg ha^{-1}) and significantly lower seed cotton yield (527 kg ha^{-1}) was noticed with 75% RDN.

Table 7. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nitrogen levels at Nandyal

Treatments	N_1: 75 % RDN	N_2: 100 % RDN	N_3: 125 % RDN	Mean	Anova	SE d	SE m±	CD (5%)
S1.90X 60 cm	470	611	672	584	**Spacing**	25	18	54
S2.90X 45 cm	465	692	845	667	**Nitrogen levels**	25	18	54
S3.60X 30 cm	645	736	886	756	**S X N**	43	31	NS
Mean	527	680	801					
CV(%): 10								

Soil type: Deep black soil, Clay soil, pH: 8.4, O.C(%): 0.38 %, Soil fertility status, N: 131 kg ha^{-1}, P_2O_5: 29 kg ha^{-1}, K_2O: 358 kg ha^{-1}, Environment: Rainfed Recommended Nutrient levels: 40:20: 20 NPK kg ha^{-1} ,Genotypes (G): CCH 19-2

Agronomy IA: Agronomic requirements of promising pre-release *hirsutum* genotypes of cotton in South Zone (irrigated)

CPD 1902, Raichur

The experimental results revealed that significantly higher seed cotton yield was recorded with 90 cm x 45 cm spacing (3030kg/ha) compared to other spacings. The increase in higher seed cotton yield was mainly due to increased number of sympodia/plant (25.2), number of bolls/sq.m. (12.8) and higher boll weight (4.52g). Among nitrogen levels, higher seed cotton yield was obtained with 125% recommended N/ha (2869 kg/ha) which was on par with 100% recommended N/ha (2762 kg/ha) as compared to 75% recommended N/ha (2593 kg/ha) (Table 8). This could be attributed to higher sympodia/plant, higher boll number/plant and boll weight. Interaction effect was found non-significant.

Table 8. Total Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nutrient levels (CPD 1902) at Raichur

Treatments	CPD 1902			Mean (N levels)
	S1: 75 X 30 cm	S2: 90 X 30 cm	S3: 90 X 45 cm	
F1.75% rec. N/ha (60:40:40 kg NPK/ha)	2348	2551	2881	**2593**
F2.100% rec. N/ha (80:40:40 kg NPK/ha)	2458	2771	3056	**2762**
F2.125% rec. N/ha (100:40:40 kg NPK/ha)	2552	2899	3154	**2869**
Mean (spacing)	**2453**	**2740**	**3030**	
ANOVA	**Spacing**	**N levels**	**Interaction**	
SE d	**102**	**102**	**176**	
CD (5%)	**215**	**215**	**NS**	

Medium Black soils, Shallow and fine textured, pH :8.10,Soil fertility status: N : 258kg/ha, P_2O_5 : 32 kg/ha, K_2O : 268 kg/ha ,O.C.(%) : 0.51,Recommended Nutrient level 80:40:40 kg NPK/ha, Recommended spacing 90 X 30 cm, Environment : Irrigated

CCH 19-2, Raichur

The experimental results indicated that spacing and nitrogen level exerted significant influence on yield of cotton. Significantly higher seed cotton yield was recorded with S3.90 cm x 45 cm spacing (3028 kg/ha) followed by S2.90 cm x 30 cm spacing (2866 kg/ha) compared to S1.70 cm x 30 cm spacing (2671 kg/ha) (Table 9). The increase in higher seed cotton yield was mainly due to increased sympodia/plant, higher boll number and boll weight. Among nitrogen doses, higher seed cotton yield was obtained with 125% recommended N/ha (3007 kg/ha) followed by 100% recommended N/ha (2866 kg/ha) compared to 75% recommended N/ha (2661 kg/ha). Interaction effect was found non-significant.

Table 9. Total Seed cotton yield (kg ha^{-1}) of as influenced by spacing levels and nutrient levels (CCH 19-2) at Raichur

Treatments	CCH 19-2			Mean (N levels)
	S1: 75 X 30 cm	S2: 90 X 30 cm	S3: 90 X 45 cm	
F1.75% RDN (60:40:40 kg NPK/ha)	2463	2660	2859	**2661**
F2.100% RDN (80:40:40 kg NPK/ha)	2677	2866	3055	**2866**
F2.125% RDN/ha (100:40:40 kg NPK/ha)	2874	3055	3169	**3007**
Mean (spacing)	**2671**	**2866**	**3028**	
ANOVA	**Spacing**	**N levels**	**Interaction**	
SE d	**97**	**97**	**168**	
CD (5%)	**206**	**206**	**NS**	

Medium Black soils, Shallow and fine textured, pH:8.10,Soil fertility status: N : 258kg/ha, P_2O_5 : 32 kg/ha,K_2O : 268 kg/ha, O.C.(%) : 0.51,Recommended Nutrient level 80:40:40 kg NPK/ha, Recommended spacing 90 cm X 30 cm, Environment : Irrigated

CCHC 19 – 1, Srivilliputhur

The results of agronomic requirement studies found that the highest seed cotton yield of 1827 kg/ha was recorded with the spacing of 75 x 30 cm (S1) and it was comparable with the spacing of 75 x 45 cm (S2, 1741 kg/ha). The lowest seed cotton yield of 1586 kg / ha was recorded with the wider spacing of 75 x 75 cm (S4) (Table 10).Application of 100% RDN (N2) registered the highest seed cotton yield of 1769 kg/ha and was significantly superior to the rest of the nitrogen levels. This was followed by application of 125% RDN (100 kg N/ha). The interaction effect was not significant.

Table 10. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nutrient levels (CCHC 19 – 1) at Srivilliputhur

Treatments	S1.75 x 30 cm	S2.75 X 45 cm	S3.75 x 60cm	S4.75 X 75cm	Mean	Anova	SE d	CD (5%)
N1.75 % RDN	1807	1693	1609	1524	1658	Spacing	66.0	162.0
N2.100% RDN	1849	1815	1748	1661	1768	Nitrogen levels	30.0	63.0
N3.125% RDN	1824	1714	1693	1573	1701	S X N	82.1	NS
Mean	1827	1741	1683	1586	1709			

Clay loam, pH:8.26, Available nutrient status N: 196 (Low) P_2O_5 :40 (High) K_2O : 446 (High) O.C.(%) : 7.2, Recommended fertilizer level :80 : 40 : 40 Kg NPK / ha, Irrigated, Recommended spacing :75 x 30 cm

CCHC 19 – 2, Srivilliputtur -

The results of spacing and nitrogen level trial revealed that the highest seed cotton yield of 2010 kg/ha was recorded with the spacing of 75 x 30 cm (S1) and it was comparable with 75 x 45 cm spacing (S2, 1915 kg/ha) and 75 x 60 cm (S3, 1852 kg/ha). Wider spacing of 75 x 75 cm (S4) registered the lowest seed cotton yield of 1747 kg/ha (Table 11). The nitrogen levels revealed that application of 100% RDN (80 kg/ha) (N2) registered the highest seed cotton yield of 1946 kg / ha and was comparable with 125% RDN (N3, 1873 kg/ha). The interaction between spacing and fertilizer was found to be non significant

Table 11. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nutrient levels (CCHC 19 – 2) at Srivilliputtur

Treatments	S1.75 x 30 cm	S2.75cm X 45	S3.75 x 60 cm	S4.75 X 75 cm	Mean	Anova	SE d	CD (5%)
N1.75 % RDN	1988	1863	1770	1676	1824	Spacing	72.0	177.0
N2.100% RDN	2034	1997	1923	1827	1945	Nitrogen levels	33.0	69.0
N3.125% RDN	2007	1886	1862	1737	1873	S X N	90.0	NS
Mean	2010	1915	1852	1747	1881			

Clay loam, pH:8.26, Available nutrient status N: 196 (Low) P_2O_5 :40 (High) K_2O : 446 (High), O.C.(%) : 7.2, Recommended fertiliser level :80 : 40 : 40 Kg NPK / ha, Irrigated, Recommended spacing :75 x 30 cm

DHCC 1901, Srivilliputtur -

The results revealed that the highest seed cotton yield of 1699 kg/ha was recorded with the normal spacing of 75 x30 cm (S1) and it was comparable with (S2) 25% higher spacing (75 x 45 cm). Wider spacing of 75 x 75 cm (S4) registered the lowest seed cotton yield of 1475 kg/ha and it was comparable with 75 X 60 cm, (S3) Spacing (Table 12). Application of 100% RDN (80 kg N / ha) registered the highest seed cotton yield of 1645 kg/ha and was significantly superior to rest of the nitrogen N levels. The lowest seed cotton yield of 1542 kg/ha was recorded with 75% RDN (F1). The interaction effect was not significant.

Table 12. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nutrient levels (DHCC 1901) at Srivilliputtur

Treatments	S1.75 x 30 cm	S2.75 X 45 cm	S3.75 x 60 cm	S4.75 X 75 cm	Mean	Anova	SE d	CD (5%)
N1.75 % RDN	1681	1574	1496	1417	1542	**Spacing**	61.4	151.0
N2.100% RDN	1720	1688	1626	1545	1645	**Nitrogen levels**	28.0	59.0
N3.125% RDN	1696	1594	1574	1463	1582	**S X N**	76.4	NS
Mean	1699	1619	1565	1475	1590			

Clay loam, pH:8.26, Available nutrient status N: 196 (Low) P_2O_5 :40 (High) K_2O : 446 (High) O.C.(%) : 7.2, Recommended fertilizer level :80 : 40 : 40 Kg NPK / ha, Irrigated, Recommended spacing :75 x 30 cm

Agronomy IA: Agronomic requirements of promising pre-release hirsutum genotypes of cotton in North Zone (irrigated)

PBD 88, Bathinda

The results of agronomic requirement studies of tested desi cotton genotype PBD 88 varied significantly under different planting geometries and fertilizer levels. The genotype, PBD 88 produced significantly higher seed cotton yield under planting geometry of 67.5 x 30 cm (3136 kg/ha) followed by 67.5 x 45 cm (2991 kg/ha). Significantly the least yield was recorded under 67.5 x 60 cm (2600 kg/ha) (Table 13). Among the nitrogen levels, the highest seed cotton yield was recorded under 125% RDN (3086 kg/ha) which was on par with 100% RDN (2937 kg/ha). Significantly least yield was recorded under nitrogen level of 75% RDN. Interaction among the different planting geometries and fertilizer levels was non-significant.

Table 13. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nutrient levels at Bathinda

Treatments	S1.67.5 X 30	S2.67.5X 45	S3. 67.5X 60	Mean (Nitrogen)	Anova	SE d	CD (5%)
N_1. 75% RDN	2841	2832	2437	2704	Spacing	122	259
N_2. 100% RDN	3219	3015	2578	2937	Nitrogen	122	259
N_3. 125% RDN	3347	3125	2785	3086	S X F	212	NS
Mean (spacing)	3136	2991	2600				
C1: 75%RDN+ application of MBF (67.5 x 45 cm)				2915			
C2: LD 949 (control genotype) at 67.5 x 45 cm (RND 100%)				2847			

Soil parameters: pH: 8.80, EC(dsm^{-1}):0.24, OC (%):0.26, Available N : 162 kg/ha, AvailableP_2O_5 : 13.1 kg/ha& Available K_2O : 289 kg/ha, Recommended nutrients: 75 kg N /ha, Environment: irrigated; Total rainfall during cropping period: 318 mm

Agronomy IA: Agronomic requirements of promising pre-release *arboreum* of cotton in Central Zone

NDLA 3116-3, AKA 2013-8 andPA-873Akola

The results found that the seed cotton yield was significantly highest in genotype AKA 2013-8(1772 kg ha^{-1}) which was found significantly superior over genotype NDLA3116-3 (1528 kg ha^{-1}) and was found at par with genotype PA-873(1677 kg ha^{-1}). Significantly lowest seed cotton yield was registered in genotype NDLA 3116-3. Amongst spacing attempted, the significantly highest seed cotton yield (1854 kg ha^{-1}) with spacing of 60x10 cm with plant density of 1.66 lakh ha^{-1} which was found significantly superior over wider spacing of 60X15 (1669 kg ha^{-1}) cm and 60x30 (1453 kg ha^{-1}) cm with plant density of 1.11 lakh ha^{-1} and 0.55 lakh ha^{-1}respectively. The highest seed cotton yield of 1835 kg $ha^{-1}$was recorded in 125 % N level and which was found significantly superior over 100 % RDN (1617 kg ha^{-1}) and also found significantly superior over dose of 75 % RDN which recorded lower yield of 1524 kg ha^{-1} (Table 14). Interaction effect of plant spacing of 60x10 cm (plant density of 1.66 lakh ha^{-1}) with nitrogen dose of 125% RDN was significantly superior over other spacing and nitrogen level in case of seed cotton yield. Genotype AKA 2013-8 with spacing of 60x15 cm was also found significantly superior over other genotype and spacing interaction.

Table 14. Seed cotton yield (kg ha^{-1}) as influenced by genotypes, spacing levels and nutrient levels (V_1 :NDLA 3116-3, V_2 :AKA 2013-8 and V_3 :PA-873) at Akola

Treatments	V1: NDLA 3116-3			V2: AKA 2013-8			V3: PA 873			Grand Mean
	S1.60X 10	S2.60x 15	S3.60 x30	S1.60X10	S2.60x15	S3.60x 30	S1.60X 10	S2.60x 15	S3.60x30	
N1.75% RDN	1992	1089	1306	1151	1950	1562	1623	1526	1516	1524
N2.100% RDN	1761	1367	1142	2015	1817	1402	1731	1794	1522	1617
N3.125% RDN	1877	1737	1476	2331	1943	1776	2200	1801	1377	1835
Interaction (two way)	S1. 60X10	S2. 60x15	S3. 60x30	V1:NDLA 3116-3	V2: AKA 2013-8	V3: PA 873	Interaction	V1:NDLA 3116-3	V2: AKA 2013-8	V3: PA 873
N1.75% RDN	1589	1522	1462	1462	1555	1555	S1.60X10	1877	1833	1851
N2.100% RDN	1836	1659	1355	1423	1745	1683	S2.60x15	1398	1903	1707
N3.125% RDN	2136	1827	1543	1697	2017	1793	S3.60x30	1308	1580	1472
Mean	1854	1669	1453	1528	1772	1677		1528	1772	1677
ANOVA	Genotype	Spacing	Fertilizers	VXS	VXF	SXF	VXSXF			
SE d	36	36	36	62.99	63.06	63.06	109.23			
CD (5%)	109	109	105	188.86	NS	181.03	313.56			

Soil parameters :pH : 7.9, EC (dSm^{-1}): 0.13, O.C.(%) : 3.87, Available N : 232 $kgha^{-1}$, P_2O_5 : 17.40 $kgha^{-1}$, K_2O : 372 $kgha^{-1}$, Recommended spacing: 60X15cm, Recommended Fertilizer dose : 40:20:20 Kg NPK/ha, Environment : Rainfed, Cotton Species :*Arboreum* Cotton, Total Rainfall during Cropping period :1161 mm in 51 rainy days

DDCC 1901, Nanded

The agronomic requirement study results revealed that plant height, number of monopodia and sympodial length of colour *arboreum* variety, DDCC 1901 didn't affected due to spacing significantly. The plant spacing (45 x 17.5 cm) had been observed higher yield $plant^{-1}$ (19.47 g) significantly over wider spacing (45 x 30 cm). The same treatment of 45 x 17.5 cm had highest number of bolls m^{-2} (90.33) and seed cotton yield (1420 kg ha^{-1})

significantly over wider spacing of 45 x 30 cm (1261 kg ha^{-1}) (Table 15). It was at par with spacing of 45 x 22.5 cm - 1321 kg ha^{-1}. Boll weight was significantly reduced in closer spacing (1.65 g) over wider spacing (2.05 g).Increase in nitrogen level has increased bolls m^{-2} and seed cotton yield of colour *arboreum* variety, DDCC 1901. The 125% RDN (1395 kg ha^{-1}) was significantly superior over 75% RDN (1243 kg ha^{-1}) and was on par with 100% nitrogen level (1363 kg ha^{-1}) for seed cotton yield, yield $plant^{-1}$ and bolls m^{-2}. Increase in nitrogen level didn't affect boll weight statistically.

Table 15. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nutrient levels (DDCC 1901) at Nanded

Treatments	S1. 45 x 17.5 cm	S2. 45 x 22.5 cm	S3. 45 x 30 cm	Mean (Nitrogen)	ANOVA	SE d	CD (5%)
N_1- 75% RDN (37.5:25:25)	1327	1227	1175	**1243**	Spacing	50.10	107.13
N_2- 100%RDN (50:25:25)	1455	1342	1293	**1363**	Nitrogen	50.10	107.13
N_3- 125% RDN (62.5:25:25)	1479	1393	1314	**1395**	S X N	86.78	N.S.
Mean (spacing)	**1420**	**1321**	**1261**				
Check with rec. spacing and N level				1557			

Soil parameters : pH : 8.05, EC(dSm^{-1}): 0.27, OC(%): - 0.46, available N : 146.2 kg ha^{-1}, P_2O_5 : 11.48 kg ha^{-1} & K_2O :432.86 kg ha^{-1}, Recommended spacing : 45 x 22.5 cm, recommended nutrients : 50:25:25 NPK kg ha^{-1}, Cotton species : *Arboreum*, type - colour, environment : rainfed and total rainfall :1494 mm

Agronomy IA: Agronomic requirements of promising pre-release *arboreum* of cotton in South Zone

NDLA 3104-4, Dharwad

The data on seed cotton yield as influenced by planting geometry and nitrogen levels on different genotypes is presented in table 16. The results found that number of bolls was significantly affected by planting geometry and N Levels. Planting geometry of 60 x 30 cm significantly increased no of bolls per Sq m (102.5) as compared to other levels. However, it was on par with 75x30 cm spacing. Similarly boll no's significantly increased with 125% N levels (94.7 /Sq m) but was on par with 100 % N (86.4Sq.m). Seed Cotton yield was significantly increased with planting geometry of 60 x 30cm (907 Kg/ha). But, it was on par with 75 x 30 cm (884 Kg/ha). Among the N Levels 125% N recorded significantly higher seed cotton yield (961 Kg/ha) as compared to any other levels. There is an increase of 13.3% seed cotton yield with 25% increased level of N over recommendation.

Table 16 : Effect of planting geometry and N levels on Seed cotton yield/ha in *G. arboreum* cotton (NDLA 3104-4) at Dharwad

Treatments	60x30 cm	75x30 cm	90x30 cm	Mean	ANOVA	S.Ed	CD
N1.75% RDN	727	843	620	730	Spacing	74	NS
N2.100% RDN	919	878	746	848	N levels	40	89
N3.125% RDN	1076	933	873	961	NXS	70	NS
Mean	907	884	746		SXN	93	NS

Cotton Genotypes: NDLA 3104-4, Medium deep black, pH: 7.2 , OC (%): 0.45, Available nutrient status: N: 230 kg/ha, P_2O_5 : 27.0 kg/ha, K_2O : 425 kg/ha, Recommended Nutrient :40:25:25 kg NPK/ha, Environment: Rainfed, Total rainfall: 1070 mm, No of rainy days: 74

Nandyal

The results of agronomic requirement study conducted under rainfed condition found that number of bolls per square meter differs significantly among different spacing and nitrogen levels. Higher number of bolls per square meter (57.5) was noticed with 60 × 30 cm. Significantly lower number of bolls per square meter (47.9) was found with 60 cm × 15 cm. There was significant effect of different nitrogen levels on number of bolls per square meter. Higher number of bolls per square meter (61.8) was found with 125% RDN. Significantly lower number of bolls per square meter (43.1) was noticed with 75 % RDN. The wider spacing of 60 x 30 cm recorded significantly higher seed cotton yield (2029 kg ha^{-1}) . Lower seed cotton yield (1780 kg ha^{-1}) was recorded with spacing of 60 x 15 cm. There was significant effect of different nitrogen levels on seed cotton yield. Higher seed cotton yield (2074 kg ha^{-1}) was recorded with 125% RDN. Significantly lower seed cotton yield (1665 kg ha^{-1}) was noticed with 75% RDN (Table 17).

Table 17. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nitrogen levels (DDCC 1901) at Nandyal

Treatments	S1.60 X 30 cm	S2.60 X 20 cm	S3.60 X 15 cm	Mean	Anova	SE d	CD (5%)
N1: 75 % RDN	1,916	1,592	1,487	1,665	Spacing	73	156
N2: 100 % RDN	1,944	1,897	1,878	1,906	Nitrogen levels	73	156
N3: 125 % RDN	2,226	2,021	1,974	2,074	S X N	127	NS
Mean	2,029	1,837	1,780				

Soil type : Deep black soil, Clay soil , pH: 8.3, OC(%) : 0.37, Soil fertility status N: 130 kg ha^{-1}, $P_2O_5$28kg ha^{-1} , K_2O: 364kg ha^{-1}, Recommended Nutrient levels : 20-20-0 NPK kg ha^{-1}, Environment: Rainfed

Agronomy IA: Agronomic requirements of promising pre-release barbadense of cotton in South Zone

DB 1901, Coimbatore

The experiment was conducted under irrigated ecosystem in the department of cotton farm, TNAU, CBE. With respect to seed cotton yield, among the nitrogen levels, fertilizer N applied at the rate of 125% recorded significantly hgher seed cotton yield (2363 kg/ha) (Table 17 A) . The numerically higher seed cotton yield (1939 kg/ha harvested with spacing levels (150 cm X 60 cm) .ha) Spacing and fertilizer levels interactions has no significance

Table 17A. Seed cotton yield (kg ha^{-1}) as influenced by spacing and nutrient levels (DB 1901**) at Coimbatore**

Treatments	S_1- 90 X 60 cm	S_2- 120 X 60 cm	S_3: 150 X 60 cm	Mean	ANOVA	SE d	CD (5%)
F1.75%RDN	1445	1452	1518	1471	Spacing	68.3	NS
F2.100%RDN	1805	1835	1839	1826	Fertilizers	71.2	150.2
F3.125%RDN	2238	2393	2459	2363	S X F	120.4	NS
Mean	1829	1893	1939	1887			

Soil: Brown (mixed type), pH: 8.35, Soil fertility: available N : 224 kg/ha, P_2O_5 :28 kg/ha,K_2O : 730 kg/ha, O.C.(%) : 0.54 , Rec.nutrients: 208:91:99 kg of NPK/ha, Rec. spacing: 120 X 60 cm, Environment: Irrigated, total rainfall received during cropping period : 360 mm in 34 rainy days

AGR II: Augmenting ELS Cotton production

Preamble: The demand for the textile products made out of ELS cotton (32 mm and above) is growing exponentially. Despite of good harvest, there is mismatch in demand & supply of different staple group of cotton particularly in ELS cotton. The country is still importing ELS cotton annually from Egypt, Sudan, U.S.A and others. The demand for ELS cotton in India is about 9 lakh bales against the availability of only about 4 lakh bales. Chamrajnagar station is recently established under AICRP (cotton) to address the region specific problem of ELS cotton cultivation under rainfed condition. TNAU, Coimbatore execute irrigated trial and CRS Perambalur allotted rainfed trial .

Perambalur

In recent years, few barbadense varieties were released through AICRP system. The cumulative evaluation of barbadense genotypes in comparison with control (Suvin) and interspecific Bt hybrid was attempted. The results obtained from the experiment showed that G8.Control (HxB BG II - Bahubali) had produced higher seed cotton yield (1158 kg/ha), gross return (Rs. 138960), net return (Rs. 87,146) and B:C ratio (2.68) . Amongst barbadense genotypes G6.CO 18 registered the highest seed cotton yield (820 kg/ha), gross return (Rs. 12,3000/ha), net return (Rs66,369/ha) and benefit cost ratio (2.17) (Table 18)

Table 18. Growth characters, Seed cotton yield (kg ha^{-1}) and economics of barbadense genotypes at Perambalur

Treatments	Plant height (cm) at harvest	No. of monopodia at harvest	No. of sympodia at harvest	No of bolls/ sqm	Boll weight (g)	Seed cotton yield (kg/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	Benefit Cost Ratio
G1.DB1601	137.4	3.0	25.7	37.1	2.67	353	52950	-3681	0.94
G2.DB1602	128.9	3.0	24.5	37.7	2.84	814	122100	65469	2.16
G3.ARBB1502	137.0	2.7	23.4	33.4	2.75	715	107250	50619	1.89
G4.CICR B cotton 37	137.4	2.0	25.7	25.7	2.98	718	107700	51069	1.90
G5.CICR B cotton 45	151.7	2.2	24.5	24.7	2.26	406	60900	4269	1.08
G6.CO 18	128.2	3.0	26.0	45.1	3.01	820	123000	66369	2.17
G7.Control (suvin)	153.5	1.5	27.2	24.8	2.7	512	76800	20169	1.36
G8.Control (HxB BG II)	187.7	2.0	31.3	55.0	3.63	1158	138960	87146	2.68
SEd	7.6	0.4	1.5	3.5	0.27	106			
CD (5%)	16.3	NS	3.3	7.5	0.58	228			

Bt hybrid: **Bahubali,** Soil type: Black cotton, Deep, Clay loam soil, pH value:7.5, Soil EC (dSm-1):0.35, OC (%) : 0.4, Environment: Rainfed, Spacing followed90x60 cm, Rainfall (mm) received during cropping periods 630 mm

AGR II B Developing Package for inter specific ELS Bt hybrid

Chamrajnagar

The data revealed that the growth and yield parameters were significantly influenced by the genotypes, spacing and nutrient levels. Between the cotton genotypes Bahubali has recorded significantly higher plant height (131.3 cm), a greater number of monopodial and sympodial branches per plant (1.1 and 21.4, respectively), sympodial length (35.2 cm), bolls/m^2 (83.4), boll weight (5.12 g) and seed cotton yield (1525 kg/ha) than DCH-32Bt cotton. All the growth and yield parameters studied were found to be lower in DCH-32 Bt (1244 kg/ha) compared to Bahubali. Between the spacings, sowing at recommended spacing (90 x 60 cm) has recorded significantly maximum number of monopodial and sympodial branches per plant (1.0 and 17.2, respectively), sympodial length (34.8 cm) and single boll weight(4.22g). Whereas, the plant height (122.8 cm), bolls/m^2 (74.6) and seed cotton yield (1447 kg/ha) were maximum in 75% of recommended spacing (67.5 x 45 cm). The boll weight didn't differ between the spacings.

Among the nutrients levels application of 150 % RDN significantly recorded maximum plant height (124.2 cm), monopodial branches (1.0/plant), sympodial branches (18.0/plant), sympodial length (35.5 cm), bolls/m^2 (80.7) and seed cotton yield (1573 kg/ha), followed by 125% RDN (Table 19). However, all the growth and yield parameters are found to be on par with 125% RDN. While, the boll weight didn't differ among the nutrient levels. The interaction effect was found to be significantly influenced by spacing and nitrogen levels. With respect to number of sympodial/plant, sympodial length and bolls/m^2. While the interactions of other parameters were found to be non-significant. The cost of cultivation (Rs 69, 674/ha), gross return (Rs 1,29,664/ha) and net return (Rs 60,210/ha) and befit cost ratio (1.86) were higher with MRC 7918 BG II. The closer spacing of 67.5 x 45 cm registered the higher cost of cultivation (Rs 69,517/ha) , gross return (Rs 1,23, 035/ha) and net return (Rs 53,519/ha) and befit cost ratio (1.76). Amongst nitrogen levels, application of 150 % RDN registered higher net return (Rs 63,173/ha) (Table 20)

Table 19 Seed cotton yield (kg ha^{-1}) of ELS genotypes influenced by spacing levels and nutrient levels at Chamrajnagar

Treatments	G1.DCH 32 Bt		G2. BahubaliBt		Grand Mean
Nutrients	S1. Rd spacing	S2.75% Rd spacing	S1. Rd spacing	S2.75% Rd spacing	
F_0. Control (No N)	815	968	1144	1325	1063
F_1.100%RDN	1192	1343	1458	1618	1403
F_2.125% RDN	1335	1415	1566	1689	1501
F_3.150% RDN	1423	1465	1647	1758	1573
Interaction (two way)	S1. Rd spacing	S2.75% Rd spacing	G1.DCH 32 Bt	G2. BahubaliBt	
F_0. Control (No N)	979	1147	891	1235	1063
F_1.100% RDN	1325	1480	1267	1538	1403
F_2.125% RDN	1451	1552	1375	1627	1501
F_3.150% RDN	1535	1611	1444	1702	1573
Mean	1322	1447	1244	1525	1385

Anova	Genotype (G)	Spacing (S)	Nutrient (F)	GXS	GXF	SXF	GXSXF
SE d	35.83	35.83	50.68	50.68	71.68	71.68	101.37
CD (5%)	73.22	73.22	103.55	NS	NS	NS	NS

Table 20. Economics of ELS genotypes influenced by spacing levels and nutrient levels at Chamrajnagar

Genotypes	Cost of cultivation (Rs. ha^{-1})	Gross return (Rs. ha^{-1})	Net return (Rs. ha^{-1})	B:C ratio
G1.DCH 32 Bt	65020	105772	40752	1.61
G2. MRC 7918 BG II	69674	129664	60210	1.86
Mean	67347	117718	50481	1.7
SE d	437.7	3046.8	2612.6	0.03
CD (5%)	889.1	6224.2	5337.1	0.07
S1. 90 x 60 cm	64958	112401	47443	1.72
S2.67.5x45 cm	69517	123035	53519	1.76
Mean	67238	117718	50481	1.7
SE d	437.7	3046.8	2612.6	0.03
CD (5%)	889.1	6224.2	5337.1	NS
Nutrients				
F0. Control(No N)	61462	90353	28891	1.46
F1.100%RDN	67649	119222	51573	1.76
F2.125% RDN	69307	127592	58286	1.84
F3.150% RDN	70532	133705	63173	1.89
Mean	67237.5	117718	50480.75	1.7375
SE d	619.0	4308.9	3694.8	0.05
CD (5%)	1264.4	8802.3	7547.8	0.10

Soil type: Medium black clay loamy, pH: 8.10, EC(dSm^{-1}):0.401, OC (%):0.47 Soil fertility status: N:193.8 (kg/ha), P2O5: 42.9 kg/ha, K2O:677.0 kg/ha

Agronomy IV: Technology for organic cotton Production

Preamble: India is the largest producer of organic cotton in the world. India's contribution to global organic cotton production is 51 per cent. Evolving organic nutrient management strategy is very much required to support our organic production system. Market prices of organic manures are costly. Hence evolving low-cost organic nutrient management strategy is proposed by integrating different sources of nutrients.

Central Zone

The result of organic nutrient management revealed that significantly highest seed cotton yield was recorded with package includes application of 100 % RDF of nutrient through organic based on P equivalent basis at Bhawanipatna (1418 kg ha^{-1}), Surat (1193 kg/ha) , Nanded(999 kg ha^{-1}) and Khandwa (759 kg/ha). (Table 21) The same method realized higher net return of Rs.34,729, 41,758, 13,580, and 18,580 respectively at Surat, Bhawanipatna, Rahuri and Khandwa (Table 23). The higher enhanced organic carbon status at Bhawanipatna (0.67%) and Nanded (0.62%) estimated with same package includes application of 100 % RDF of nutrient through organic based on P equivalent basis (T_3) (Table 22).

Seed treatment and Soil application of recommended bio fertilizers, foliar application of PPFM at flowering, soil application of neem cake @ 250 kg ha-1 and raising of intercrop green gram (T11) registered significantly higher seed cotton yield at Junagadh (1552 kg ha-1). The same package (T11) registered enhanced organic carbon status at Junagadh (1.05%) and Rahuri (0.66%) and available P2O5(15.2 kg/ha) at Khandwa (Table 22).The significantly higher available nitrogen (235 kg/ha) and P_2O_5 (36.14 kg/ha) status were estimated at Junagadh with Seed treatment and Soil application of recommended bio fertilizers, foliar application of PPFM at flowering, soil application of neem cake @ 250 kg ha-1 and raising of Raising of Sun hemp between rows incorporated before flowering (Table 25)

Table 21. Seed cotton yield (kg ha^{-1}) as influenced by organic nutrient management packages in Central Zone

Treatments	Surat	Bhawani patna	Nanded	Rahuri	Junagadh	Khandwa
T1. Absolute control (No organic& inorganic)	720	786	786	1434	883	350
T2. Control (RDN through inorganic)	1252	1448	1061	1970	1594	799
T3. RD of Nutrient through organic based on P equivalent basis	1193	1418	999	2083	1161	759
T4.Seed treatment and soil application recommended bio fertilizers and foliar application of PPFM	776	941	806	1936	1302	424
T5.Neem cake 250 kg ha^{-1}	816	1044	920	2206	1293	367
T6.Raising of Sun hemp between rows incorporated before flowering	896	1002	918	1529	1240	407
T7.Intercropping with green gram	763	885	741	1473	1086	419
T8.T4+T5	1011	1278	983	1686	1329	530
T9.T4+T6	1072	1231	942	1442	1433	508
T10.T4+T5+T6	1129	1170	932	1527	1489	550
T11.T4+ T5 + T7	1103	1142	775	1627	1552	584
SEd	60	48.86	69.69	104	91	107.6
CD (5%)	178	101.92	145.37	218	268	224.2

Table 22 . Soil organic carbon (%) as influenced by organic nutrient management packages in Central Zone

Treatments	Bhawani		Junagadh		Akola		Nanded		Rahuri	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
T1. Absolute control (No organic& inorganic)	0.52	0.53	0.7	0.88	0.502	0.502	0.42	0.5	0.6	0.52
T2.Control (RDN through inorganic)	0.67	0.68	0.71	0.82	0.502	0.503	0.42	0.52	0.6	0.55
T3.RD of Nutrient through organic based on	0.66	0.67	0.72	0.92	0.502	0.528	0.42	0.63	0.6	0.63
T4.Seed treatment and soil application of recommended bio fertilizers and foliar application of PPFM	0.58	0.59	0.74	1.02	0.502	0.503	0.42	0.46	0.6	0.62
T5.Neem cake 250 kg ha^{-1}	0.62	0.63	0.7	0.98	0.502	0.505	0.42	0.51	0.6	0.64
T6.Raising of Sun hemp between rows incorporated before flowering	0.59	0.6	0.71	0.98	0.502	0.529	0.42	0.56	0.6	0.62
T7.Intercropping with green gram	0.59	0.6	0.73	1.00	0.502	0.527	0.42	0.53	0.6	0.63
T8.T4+T5	0.58	0.59	0.7	0.96	0.502	0.516	0.42	0.47	0.6	0.65
T9.T4+T6	0.62	0.63	0.72	1.03	0.502	0.529	0.42	0.59	0.6	0.66
T10.T4+T5+T6	0.62	0.63	0.73	1.01	0.502	0.534	0.42	0.56	0.6	0.65
T11.T4+ T5 + T7	0.59	0.6	0.74	1.05	0.502	0.528	0.42	0.56	0.6	0.66
SEd	0.02	0.02	-	0.03	-	0.004		0.04		-
CD (5%)	0.05	0.05	-	0.10	-	0.007 *		0.08		-

Table 23a. Net Return (Rs ha^{-1}) and Benefit Cost Ratio as influenced by organic nutrient management packages in Central Zone

Treatments	Surat		Bhawanipatna		Nanded	
	Net Return (Rs ha^{-1})	BCR	Net Return (Rs ha^{-1})	BCR	Net Return (Rs ha^{-1})	BCR
T1.Absolute control (No organic& inorganic)	13246	1.33	5297	1.12	25541	1.6
T2.Control (RDN through inorganic)	42820	1.84	46849	2	40967	1.81
T3.RD of Nutrient through organic (FYM) based on P equivalent basis	34729	1.63	41758	1.88	-1009	0.99
T4.Seed treatment and soil application of recommended bio fertilizers and foliar application of PPFM	14257	1.32	14252	1.32	23694	1.52
T5.Neem cake 250 kg ha^{-1}	15330	1.33	20067	1.44	30281	1.61
T6.Raising of Sun hemp between rows incorporated before flowering	23979	1.55	16045	1.35	33242	1.72
T7.Intercropping with green gram	15726	1.38	10450	1.23	38480	1.87
T8.T4+T5	25833	1.52	34164	1.74	31555	1.59
T9.T4+T6	33173	1.7	30518	1.65	35162	1.76
T10.T4+T5+T6	34116	1.67	34265	1.71	27209	1.51
T11.T4+ T5 + T7	31634	1.62	26107	1.57	34992	1.67
SEd			3346.3	0.07	5245	0.09
CD (5%)			6980.4	0.15	10940	0.2

Table 23b. Net Return (Rs ha^{-1}) and Benefit Cost Ratio as influenced by organic nutrient management packages in Central Zone

Treatments	Rahuri		Junagadh		Khandwa	
	Net Return (Rs ha^{-1})	BCR	Net Return (Rs ha^{-1})	MBCR	Net Return (Rs ha^{-1})t	BCR
T1.Absolute control (No organic& inorganic)	-3047	0.889	35989	1.76	-3047	0.889
T2.Control (RDN through inorganic)	22284	1.663	85953	1.61	22284	1.663
T3.RD of Nutrient through organic (FYM) based on P equivalent basis	13580	1.343	61211	1.67	13580	1.343
T4.Seed treatment and soil application of recommended bio fertilisers and foliar application of PPFM	-808	0.974	67814	1.68	-808	0.974
T5.Neem cake 250 kg ha^{-1}	-4332	0.856	69727	1.62	-4332	0.856
T6.Raising of Sun hemp between rows incorporated before flowering	-3263	0.897	72469	1.5	-3263	0.897
T7.Intercropping with green gram	-2053	0.935	67210	1.43	-2053	0.935
T8.T4+T5	4118	1.125	77773	1.53	4118	1.125
T9.T4+T6	866	1.025	72416	1.76	866	1.025
T10.T4+T5+T6	1269	1.034	75722	1.75	1269	1.034
T11.T4+ T5 + T7	4032	1.11	72284	1.87	4032	1.11
SEd			-	-		
CD (5%)			-	-		

Table 24a. Available nutrient status (kg ha^{-1}) as influenced by organic nutrient management packages in Central Zone

Treatments	Bhawanipatna					
	Initial			Final		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
T1 : Absolute control (No organics & inorganic)	118.4	36.3	223.4	120	34.2	236.2
T2 : Control (RDN through inorganic)	123.7	40.7	239.4	126.9	38.5	243
T3 : RD of Nutrient through organic	118.7	40.3	236	124.2	38.1	242.1
T4 : Seed treatment bio fertilisers and foliar application of PPFM at flowering and Boll Development Stage	116.7	33.8	228.8	125	32.5	229.2
T5 : Neem cake 250 kg ha^{-1}	118.5	36.9	220.4	124.2	34.2	224
T6 : Raising of Sun hemp between rows incorporated before flowering (2.5-3.0 tha^{-1})	112.7	35	229.7	118.9	33.2	199.4
T7 : Intercropping with black gram and crop residue application after harvest of pods (1.5 tha^{-1})	117.7	33.9	235.4	122.6	31.7	239
T8 : T4 + T5	123.1	34.5	230.6	130	32.3	238
T9 : T4 + T6	119.7	36.8	230.3	125.9	36.3	229.6
T10 T4 + T5 + T6	122.2	35.8	239.2	129.3	33.5	239
T11 : T4 + T5 + T7	119.1	36.5	223.7	124.6	34.7	227.3
SE d	3.19	1.24	3.5	4.19	1.51	15.13
C.D.at 5%	6.65	2.58	7.3	8.74	3.15	31.56

Table 24b. Available nutrient status (kg ha^{-1}) as influenced by organic nutrient management packages in Central Zone

Treatments	Khandwa					
	Initial			Final		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
T1 : Absolute control (No organics & inorganic)	210.7	11.4	308.5	189.3	13.0	349.3
T2 : Control (RDN through inorganic)	210.7	11.4	308.5	205.2	14.1	368.7
T3 : RD of Nutrient through organic	210.7	11.4	308.5	193.7	14.1	349.8
T4 : Seed treatment bio fertilisers and foliar application of PPFM at flowering and Boll Development Stage	210.7	11.4	308.5	196.1	13.4	399.7
T5 : Neem cake 250 kg ha^{-1}	210.7	11.4	308.5	194.5	14.0	359.5
T6 : Raising of Sun hemp between rows incorporated before flowering (2.5-3.0 tha^{-1})	210.7	11.4	308.5	213.4	14.0	352.9
T7 : Intercropping with black gram and crop residue application after harvest of pods (1.5 tha^{-1})	210.7	11.4	308.5	206.3	13.8	364.1
T8 : T4 + T5	210.7	11.4	308.5	201.7	15.1	367.1
T9 : T4 + T6	210.7	11.4	308.5	191.3	15.0	374.1
T10 T4 + T5 + T6	210.7	11.4	308.5	204.1	14.0	360.2
T11 : T4 + T5 + T7	210.7	11.4	308.5	200.4	15.2	367.7
SE d				11.2	0.9	24.5
C.D.at 5%				23.4	2.0	51.1

Table 25a. Available nutrient status (kg ha^{-1}) as influenced by organic nutrient management packages in Central Zone

Treatments	Junagadh					
	Initial			Final		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
T1 : Absolute control(No organics & inorganic)	233	48.73	349	203	24	280
T2 : Control (RDN through inorganic)	235	47.19	382	205	37.75	314
T3 : RD of Nutrient through organic	219	51.46	353	193	29.33	254
T4 : Seed treatment bio fertilisers and foliar application of PPFM at flowering and Boll Development Stage	241	54.12	338	215	21.78	277
T5 : Neem cake 250 kg ha^{-1}	245	51.72	316	220	31.31	273
T6 : Raising of Sun hemp between rows incorporated before flowering(2.5-3.0 tha^{-1})	238	52.58	343	208	28.74	278
T7 : Intercropping with black gram and crop residue application after harvest of pods (1.5 tha^{-1})	214	57.45	351	186	32.84	248
T8 : T4 + T5	234	45.65	332	203	35.44	264
T9 : T4 + T6	209	45.74	346	180	35.48	268
T10 T4 + T5 + T6	261	53.01	353	235	36.14	276
T11 : T4 + T5 + T7	232	49.24	368	204	35.88	271
SE d	16	4.21	27.6	14.9	2.06	12.83
C.D.at 5%	NS	NS	NS	NS	6.07	NS

Table 25b. Available nutrient status (kg ha^{-1}) as influenced by organic nutrient management packages in Central Zone

Treatments	Rahuri					
	Initial			Final		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
T1 : Absolute control(No organics & inorganic)	156	8.83	470	141	20	492
T2 : Control (RDN through inorganic)	163	9.16	492	152	22	531
T3 : RD of Nutrient through organic	153	8.18	470	151	21	536
T4 : Seed treatment bio fertilisers and foliar application of PPFM at flowering and Boll Development Stage	147	7.21	481	151	18	529
T5 : Neem cake 250 kg ha^{-1}	153	8.18	515	176	22	521
T6 : Raising of Sun hemp between rows incorporated before flowering(2.5-3.0 tha^{-1})	144	8.51	582	141	21	526
T7 : Intercropping with black gram and crop residue application after harvest of pods (1.5 tha^{-1})	141	9.16	459	144	21	515
T8 : T4 + T5	159	8.83	504	152	18	538
T9 : T4 + T6	163	8.18	504	172	16	532
T10 T4 + T5 + T6	156	7.86	571	170	18	504
T11 : T4 + T5 + T7	172	7.57	604	166	16	528
SE d	--	--	--	--	--	--
C.D.at 5%	--	--	--	--	--	--

Surat- Pest Observation

The sucking pests population (leafhopper, aphid, thrips and whitefly) was recorded lower in treatments T11 (Seed treatment and soil application of recommended bio-fertilizers and foliar application of PPFM + Neem cake 250 kg/ha + Intercropping with green gram). Jassid population was found low and moderate in all treatment. Lowest jassid population was recorded T11 (Av. 2.30 jassid/3 leaves) which was comparable to T10 (Av. 3.28 jassid/3 leaves). Lowest aphid population was observed in T11 (Av. 7.01 aphid/3 leaves) which was statistically at par with T10 (Av. 8.09 aphid/3 leaves) and T9 (8.59 aphid/3 leaves) (Table 25 A). Thrips population was found below ETL in all treatment except T1 and T3. Thrips population was found significantly lowest in T11 (Av. 17.60 thrips/3 leaves) and was comparable to T10, T9, T8, T7, T6 and T4 (17.84 to 20.22 thrips/3leaves). Whitefly population was very low and below ETL in all treatments and T11 and T10 recorded lower populations (1.65 to 2.39 whiteflies/3leaves). The mealybug incidence was found lower in T11 (0.87 grade/plant) which was at par with T10 and T9 (0.33 to 0.46 grade/plant). Square damage by bollworm was found below ETL in T11, T10 and T9 (6.66 to 7.36 per cent) and comparable to one another. Open boll damage by bollworms was found above ETL in all treatment except T11 (8.17%), T10 (8.37%) and T9 (8.72%) and all three treatments were comparable to each other (Table 25 B). Locule damage by bollworms was found below ETL in all the treatments. The locule damage was found lower in T11, T10, T9, T8 and T7 (4.09 to 5.69 per cent) and were comparable.

Table 25 A: Effect of different treatments on sucking pest population under organic cotton production (G.Cot.20)

Treatments	Av. Jassids/3 leaves		Av. Aphids/3 leaves		Av. Thrips/3 leaves		Av. Whitefly/3 leaves		Mealy bug (Grade/ plant)	
	OV	TV*	OV	TV*	OV	TV*	OV	TV*	OV	TV*
T_1.Absolute Control (No organic & Inorganic)	6.85	2.71	32.86	5.78	33.37	5.82	5.72	2.49	1.07	1.25
T_2.Control (RDN through inorganic) (RDN-180-00-00) –Urea	6.46	2.64	28.04	5.34	23.03	4.85	5.58	2.47	0.93	1.20
T_3.RD of Nutrient through organic based on P equivalent basis (00-40-00)	6.73	2.69	32.84	5.77	30.58	5.58	5.63	2.48	1.00	1.23
T_4.Seed treatment and soil application of rec.bio fertilizers and foliar application of PPFM	5.66	2.48	12.16	3.56	20.22	4.55	5.69	2.49	0.78	1.13
T_5.Neem cake 250 kg/ha	6.12	2.57	18.23	4.33	22.54	4.80	5.93	2.54	0.86	1.17
T_6.Raising of sun hemp between rows incorporated before flowering	5.52	2.45	11.69	3.49	20.06	4.53	5.52	2.45	0.73	1.11
T_7.Intercropping with green gram sowing	4.93	2.33	11.55	3.47	20.04	4.53	4.59	2.26	0.66	1.08
T_8.T4+T5	3.50	2.00	8.83	3.05	19.98	4.53	4.79	2.30	0.59	1.05
T_9.T4+T6	3.71	2.05	8.59	3.02	19.20	4.44	3.65	2.04	0.46	0.98
T_{10}.T4+T5+T6	3.28	1.94	8.09	2.93	17.84	4.28	2.39	1.70	0.33	0.91
T_{11}.T4+T5+T7	2.30	1.67	7.01	2.74	17.60	4.25	1.65	1.47	0.26	0.87
Mean	4.89	2.32	15.13	3.95	21.99	4.74	4.53	2.24	0.69	1.09
S. Em. ±	-	0.10	-	0.21	-	0.14	-	0.11	-	0.05
CD at 0.05%	-	0.30	-	0.62	-	0.40	-	0.33	-	0.14
CV%	-	7.47	-	9.17	-	4.98	-	8.59	-	7.49

OV- Original mean values TV* and TV** Arc sin transformed values; JIG- Jassid Injury Grade

Table 25 B: Effect of different treatments on Square damage (%), Open boll damage (%) and Locule damage (%) under organic cotton production (G.Cot.20)

Treatments	Square damage (%)		Open boll damage (%)		Locule damage (%)	
	OV	TV**	OV	OV	TV**	OV
$T_{1.}$Absolute Control (No organic & Inorganic)	18.50	25.47	20.59	26.99	10.41	18.83
$T_{2.}$Control (RDN through inorganic) (RDN-180-00-00) –Urea	15.64	23.30	18.44	25.43	9.32	17.77
$T_{3.}$RD of Nutrient through organic based on P equivalent basis (00-40-00)	18.33	25.35	18.73	25.64	9.31	17.76
$T_{4.}$Seed treatment and soil application of rec.bio fertilizers and foliar application of PPFM	15.51	23.19	15.72	23.36	7.45	15.84
$T_{5.}$Neem cake 250 kg/ha	15.67	23.32	16.36	23.86	8.11	16.55
$T_{6.}$Raising of sun hemp between rows incorporated before flowering	13.80	21.81	15.30	23.03	7.37	15.76
$T_{7.}$Intercropping with green gram sowing	13.33	21.41	11.79	20.08	5.69	13.80
$T_{8.}$T4+T5	13.09	21.21	11.13	19.49	5.28	13.29
$T_{9.}$T4+T6	7.36	15.75	8.72	17.18	4.39	12.09
$T_{10.}$T4+T5+T6	6.79	15.10	8.37	16.82	4.15	11.76
$T_{11.}$T4+T5+T7	6.66	14.96	8.17	16.61	4.09	11.67
Mean	12.83	20.99	13.65	21.68	6.71	15.01
S. Em. ±	-	0.93	-	1.32	-	0.85
CD at 0.05%	-	2.76	-	3.91	-	2.51
CV%	-	7.71	-	10.58	-	9.81

OV- Original mean values TV* and TV** Arc sin transformed values; JIG- Jassid Injury Grade

South Zone

The organic nutrient management packages including seed treatment and soil application of recommended bio fertilizers, foliar application of PPFM at flowering, soil application of neem cake @250 kg ha^{-1} and intercropping of black gram (T_{11}) had registered significantly higher seed cotton yield at Nandiyal (1926 kg ha^{-1}) (Table 26).The same method (T_{11}) had been estimated higher net return of **Rs.** 20,082 and 1,03,475 ha^{-1} at Raichur and Nandyal respectively (Table 27) and high organic carbon (0.60 %) at Raichur (Table 28. The same treatment was estimated higher available nitrogen , P2O5 and K2O of 265, 33.7 and 377 kg/ha respectively at Raichur. The significantly higher seed cotton yield at Sriviiliputhur (1268 kg/ha), Raichur (1077 kg/ha) and Coimbatore (1268 kg/ha) recorded with package including seed treatment and soil application of recommended bio fertilizers, foliar application of PPFM at flowering, soil application of neem cake @250 kg ha^{-1} and raising of Raising of Sun hemp between rows incorporated before flowering (T10)

Table 26. Seed Cotton Yield (kg ha^{-1}) as influenced by organic nutrient management packages in South Zone

Treatments	Srivilliputhur	Raichur	Nandyal	Coimbatore
T1.Absolute control (No organic & Inorganic)	939	722	1,206	939
T2.Control (RDN through inorganic)	1383	1102	2,057	1383
T3.RD of Nutrient through organic based on P equivalent basis	1062	747	1,854	1062
T4. Seed treatment and soil application of rec. bio fertilisers and foliar application of PPFM	1033	785	1,438	1033
T5.Neem cake @250 kg ha^{-1}	1050	798	1,440	1050
T6.Raising of .Sunnhemp / fodder cowpea between rows incorporated before flowering	1061	789	1,381	1061
T7.Intercropping with green gram/black gram/ ground nut/soybean	1009	830	1,587	1009
T8.T4+T5	1113	881	1,508	1113
T9.T4+T6	1232	922	1,800	1232
T10.T4+T5+T6	1268	1077	1,384	1268
T11: T4+ T5 + T7	1195	1055	1,926	1195
SEd	73.76	56	135	73.76
CD at 5 %	153.8	162	284	153.8

Table 27. Net return (Rs. ha^{-1}) and Benefit Cost ratio as influenced by organic nutrient management packages in South Zone

Treatment schedule	Srivilliputhur		Raichur		Nandyal		Coimbatore	
	NR (Rs. ha^{-1})	B:C	NR (Rs. ha^{-1})	B:C	NR (Rs. ha^{-1})	B:C	NR (Rs. ha^{-1})	B:C
T1.Absolute control (No organic & Inorganic)	13185	1.28	12972	0	57315	3.1	13185	1.28
T2.Control (RDN through inorganic)	34895	1.63	28919	4.23	113601	4.7	34895	1.63
T3.RD of Nutrient through organic based on P equivalent basis	6180	1.1	3052	-0.95	92323	3.5	6180	1.10
T4. Seed treatment and soil application of rec. bio fertilisers and foliar application of PPFM	16695	1.33	12808	-0.11	72251	3.5	16695	1.33
T5.Neem cake @250 kg ha^{-1}	6320	1.1	10822	-0.52	71995	3.5	6320	1.10
T6.Raising of .Sunnhemp / fodder cowpea between rows incorporated before flowering	14875	1.28	13918	0.47	68356	3.4	14875	1.28
T7.Intercropping with green gram/black gram/ ground nut/soybean	10775	1.2	15115	1.22	82749	3.9	10775	1.20
T8.T4+T5	8215	1.13	14658	0.3	75451	3.5	8215	1.13
T9.T4+T6	23590	1.42	17622	1.34	96382	4.3	23590	1.42
T10.T4+T5+T6	10570	1.15	19032	1.16	65562	3.1	10570	1.15
T11: T4+ T5 + T7	8815	1.13	20082	0.96	103475	4.3	8815	1.13
SEd			1832	--				
CD at 5 %			5327	--				

Table 28. Organic carbon (%) status as influenced by organic nutrient management packages in South Zone

	Raichur	
	Initial	Final
T1 : Absolute control (No organic & inorganic)	0.45	0.42
T2 : Control (RDN through inorganic)	0.45	0.41
T3 : RD of Nutrient through organic based on P equivalent basis	0.45	0.54
T4 : Seed treatment with bio fertilizers and foliar application of PPFM at flowering and Boll Development Stage	0.45	0.52
T5 : Neem cake 250 kg ha^{-1}	0.45	0.55
T6 : Raising of Sun hemp between rows incorporated before flowering	0.45	0.56
T7 : Intercropping with Green gram and crop residue application after harvest of pods	0.45	0.56
T8 : T4 + T5	0.45	0.57
T9 : T4 + T6	0.45	0.58
T10 T4 + T5 + T6	0.45	0.58
T11 : T4 + T5 + T7	0.45	0.6
SEd	-	
CD at 5 %	-	-

Table 29 . Soil available nutrients (kg ha^{-1}) as influenced by organic nutrient management packages in South Zone

Treatments	Raichur					
	Initial			Final		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
T1 : Absolute control(No organics & inorganic)	171	22.5	300	180	21.6	292
T2 : Control (RDN through in organic)	189	22.8	323	216	23.3	326
T3 : RD of Nutrient through organic	208	28.6	350	222	29.6	334
T4 : Seed treatment bio fertilisers and foliar application of PPFM at flowering and Boll Development Stage	188	28.7	354	206	30	358
T5 : Neem cake 250 kg ha^{-1}	209	29.1	355	227	30.3	361
T6 : Raising of Sun hemp between rows incorporated before flowering(2.5-3.0 tha^{-1})	212	29.6	358	238	30.7	366
T7 : Intercropping with black gram and crop residue application after harvest of pods (1.5 tha^{-1})	214	31.6	356	243	32.6	363
T8 : T4 + T5	213	31.7	361	247	33	369
T9 : T4 + T6	217	31.9	361	253	32.9	370
T10 T4 + T5 + T6	220	32.4	365	258	33.3	375
T11 : T4 + T5 + T7	222	32.8	364	265	33.7	377
SE d	7	1.2	13.1	9	1.7	8.9
C.D.at 5%	20	3.4	37.9	26	5	25.9

Agronomy V: Conservation Agriculture in cotton based cropping system

Preamble: Conservation Agriculture (CA) protects the soil from erosion, conserves water and nutrients, promotes soil biological activity and contributes to Integrated Pest Management (IPM), diversification of crops in associations, sequences and rotations to enhance system resilience and controlled traffic that lessen soil compaction. Thus, CA avoids straw burning, improves soil organic carbon (SOC) content, enhances input use efficiency and has the potential to reduce greenhouse gas emissions

North Zone (Irrigated)

Faridkot

The conservation agriculture experimental results revealed that there was a significant decline in productivity when reduced tillage was practiced (T3:1905 kg/ha) over the conventional tillage (T1:2163 kg/ha). However, addition of cotton crop residue or wheat crop residue either 50 % or 100 % has led to improvement in seed cotton yield as evident from higher seed cotton yield under T2 (2390 kg/ha), T4 (2303 kg/ha), T5 (2540 kg/ha), T6 (2326 kg/ha), and T7 (2645 kg/ha) (Table 30). Highest yield increments of 22% in seed cotton yield were observed under T7 over the conventional treatment which indicated that addition of crop residue to be a promising option. Among N treatments, it was observed that SCY increased significantly by addition of any level of nitrogen and its value was 2125,2313 and 2535 kg/ha under 75 %, 100% and 125% N. Response of highest level of applied N might be due to addition of crop residue which could have immobilized nutrient availability in the soil.

Table 30. Seed cotton yield (kg ha^{-1}) as influenced by different (Residue management and tillage) combinations and N levels at Faridkot

Treatments	N1.75 % RDN	N2.100 % RDN	N3.125 % RDN	Mean
T1.Complete removal of wheat residue + conventional tillage for sowing of cotton (Control) (kharif) +Complete removal of cotton residue after picking + conventional tillage for sowing of wheat and drill sowing of wheat crop (Control) (rabi)	1989	2148	2351	2163
T2.Complete removal of wheat residue + conventional tillage for sowing of cotton (Control)) (kharif)+ 100% cotton residue incorporation after picking + sowing of wheat crop through Super seeder in one go(rabi)	2165	2416	2589	2390
T3.Complete removal of wheat residue + minimum tillage for sowing of cotton in rows at 67.5 cm only)(kharif) + Complete removal of cotton residue after picking+ sowing of wheat through zero till drill(rabi)	1766	1854	2095	1905
T4.50% wheat residue incorporation by rotavator (after removal of loose straw) followed by sowing of cotton)(kharif)+Complete removal of cotton residue after picking + sowing of wheat crop through Super seeder(rabi)	2100	2303	2505	2303
T5..50% wheat residue incorporation by rotavator (after removal of loose straw) followed by sowing of cotton)(kharif)+100% cotton residue incorporation after picking + sowing of wheat crop through Super seeder in one go(rabi)	2323	2532	2764	2540
T6.100% wheat residue incorporation by rotavator followed by sowing of cotton) kharif)+Complete removal of cotton residue after picking + sowing of wheat crop through Super seeder(rabi)	2122	2316	2541	2326
T7.100% wheat residue incorporation by rotavator followed by sowing of cotton) (kharif)+100% cotton residue incorporation after picking + sowing of wheat crop through Super seeder in one go(rabi)	2414	2618	2903	2645
Mean	2125	2313	2535	-
ANOVA	RT	N	RT X N	
CD	198.9	130.2	NS	
CV (%)	8.9			

Soil parameters: Sandy loam, Ph:8.6, EC(dsm^{-1}):0.22, OC (%);0.24, Available P_2O_5:8.25 kg/ha& Available K_2O: 300 kg/ha , Recommended spacing: 67.5 X 75 cm, Recommended nutrients: 105 kg N and 30 kg P_2O_5 / ha, Cotton species/type: *Gossypium hirsutum;* Environment: irrigated; Total rainfall during cropping period: 497.1 mm

Bathinda

The conservation experiments of Bathinda results revealed that there was significant variation in cotton crop performance under different conservational treatments. Incorporation of 100 % cotton crop residue with 50 % or 100 % of wheat crop residue lead to improvement in seed cotton yield. Significantly the least SCY was recorded under conventional tillage with no residue and minimum tillage with no residue. The conservation treatments, 100% wheat residue incorporation by rotavator followed by sowing of cotton in kharif and 100% cotton residue incorporation after picking + sowing of wheat crop through Super seeder in one go in rabi registered the significantly highest seed cotton yield (3178 kg/ha) which was on par with all the treatments except in T1 and T3 (Table 31)

Table 31. Yield attributes and Seed cotton yield (kg ha^{-1}) as influenced by conservation treatments at Bathinda

Treat ments	Kharif season (Cotton)	Rabi season (Wheat)	No. of Bolls/m^2	Boll weight (g)	Seed cotton Yield (kg/ha)
T1	Complete removal of wheat residue + conventional tillage for sowing of cotton (Control)	Complete removal of cotton residue after picking + conventional tillage for sowing of wheat and drill sowing of wheat crop (Control)	102.8	3.61	2505
T2	Complete removal of wheat residue + conventional tillage for sowing of cotton (Control)	100% cotton residue incorporation after picking + sowing of wheat crop through Super seeder in one go	114.8	3.85	2921
T3	Complete removal of wheat residue + minimum tillage for sowing of cotton in rows at 67.5 cm only	Complete removal of cotton residue after picking+ sowing of wheat through zero till drill	100.5	3.78	2443
T4	50% wheat residue incorporation by rotavator (after removal of loose straw) followed by sowing of cotton	Complete removal of cotton residue after picking + sowing of wheat crop through Super seeder	111.4	3.73	2832
T5	50% wheat residue incorporation by rotavator (after removal of loose straw) followed by sowing of cotton	100% cotton residue incorporation after picking + sowing of wheat crop through Super seeder in one go	120.9	3.93	3065
T6	100% wheat residue incorporation by rotavator followed by sowing of cotton	Complete removal of cotton residue after picking + sowing of wheat crop through Super seeder	114.0	3.84	2906
T7	100% wheat residue incorporation by rotavator followed by sowing of cotton	100% cotton residue incorporation after picking + sowing of wheat crop through Super seeder in one go	125.2	4.03	3178
	SE d		7.1	0.11	210
	C.D.at 5%		15.5	0.23	458

Soil parameters: pH; 8.82, EC(dsm^{-1}):0.22, OC (%) : 0.33, Available N : 173 kg/ha,P_2O_5: 13.5 kg/ha& Available K_2O: 295 kg/ha, Recommended nutrients: 105 kg N /ha, Environment: irrigated; Total rainfall during cropping period: 318 mm

Rahuri

The results of conservation agriculture revealed that permanent bed system + Zero tillage + 100 % residue management (T_7) recorded significantly higher seed cotton yield (2391 kg ha^{-1}) and it was at par with T_6(Permanent bed system + Zero tillage+ 50 % residue

management) (2249 kg ha^{-1}). The economic indices calculated found that application of 100 % residue on permanent bed system without tillage (T_7) recorded significantly highest gross monetary returns (145379 Rs ha^{-1}), net monetary returns (Rs 58829 ha^{-1}) and B:C ratio (1.68) than rest of other treatments. The same treatment (T_7) recorded significantly highest wheat grain yield (4297 kg ha^{-1}) of rotation crop which was at par results with T_6 (Permanent bed system + Zero tillage+ 50 % residue management) (3949kg ha^{-1}) (Table 32). The similar trend was observed with monetary return and benefit cost ratio of wheat as rotation crop with Bt cotton. The economics of Bt cotton – wheat cropping system under conservation agriculture found that T_7 (Permanent bed system + Zero tillage + 100 % residue management) recorded significantly highest cotton equivalent yield (3893 kg ha^{-1}), gross monetary returns (Rs 2,36,701 ha^{-1}) and net monetary returns (Rs 91,347 ha^{-1}).

Table 32 . Seed cotton yield (kg ha^{-1}), wheat grain yield (kg ha^{-1}) and economics as influenced by conservation treatments at Rahuri

Treatments		Seed cotton Yield (kg/ha)	Yield (kg/ha) of rotation crop	Cotton equivalent Yield (Kg ha^{-1})	Gross Return (Rs/ha)	Cost of cultivation (Rs/ha)	Net Return (Rs/ha)	Benefit Cost ratio
T_1	Conventional tillage+ No residue management	1738	3879	3094	167959	82420	20139	**2.27**
T_2	Zero tillage+ No residue Management	1542	3402	2732	128466	72301	37617	**2.58**
T_3	Zero tillage+ 50 % residue management	2010	3876	3365	132532	82358	72063	**3.06**
T_4	Zero tillage+ 100 % residue management	2123	4113	3444	136209	80329	73197	**3.03**
T_5	Permanent bed system + Zero tillage + No residue management	1663	3355	2836	137030	71302	35389	**2.51**
T_6	Permanent bed system + Zero tillage+ 50 % residue management	2249	3949	3629	141676	83919	78964	**3.08**
T_7	Permanent bed system + Zero tillage+ 100 % residue management	2391	4297	3893	145353	91321	91347	**3.23**
SEd(±)		86.05	**249.68**	249.7	133.7	12082.1	12082.1	12082.1
CD @ 5%		187.49	**544.00**	544.0	291.4	26324.6	26324.6	26324.6

Soil parameters:P^H:7.5, EC(dSm^{-1}):0.28, OC(%):0.57, Available N: 163kg/ha, Available P: 8.18kg/ha, Available K: 526kg/ha, Genotype used:Bhakti Bt cotton, Environment: Irrigated, Total rainfall:1028.4mm

Junagadh

The effect of different treatments of conservation agriculture based cropping system was significantly influenced on seed cotton yield. The significantly highest seed cotton yield was found with treatment of T7. Permanent bed system + Zero tillage+ 100 % residue management (2310 kg/ha) (Table 33). Total weed population per m^2 at 60 DAS before second weeding was found significantly lower in treatment conventional tillage+ no residue management. Conservation agriculture treatments was non-significantly influenced on growth parameters, yield attributes and grain yield of rotation crop of sorghum. The data regarding post-harvest soil bulk density was not significantly influenced by conservation agriculture treatments. The economics worked out by using current market prices of produce and inputs used found that higher gross return (Rs 281573/ha) , net return (Rs 183843/ha) and benefit cost ratio (2.9) were recorded with treatment of PBS + zero tillage + 100 % residue management treatment.

Table 33. Seed cotton yield (kg ha^{-1}), and economics as influenced by conservation treatments at Junagadh

Treatments	Seed cotton Yield (kg ha^{-1})	Sorghum grain yield (kg ha^{-1})	Cotton Equivalent Yield (kg ha^{-1})	Cost of cultivation system (Rs. ha^{-1})	Gross return of system (Rs. ha^{-1})	Net Return of system (Rs. ha^{-1})	BCR
T1. Conventional tillage+ No residue management	2151	1406	2988	101864	270616	168752	2.7
T2. Zero tillage+ No residue management	1448	1121	2116	93005	193413	100408	2.1
T3.Zero tillage+ 50 % residue management	1737	1294	2507	94475	227749	133274	2.4
T4.Zero tillage+ 100 % residue management	1603	1213	2325	95105	212476	117371	2.2
T5.Permanent bed system + Zero tillage + No residue management	1814	1192	2523	95630	228353	132723	2.4
T6.Permanent bed system + Zero tillage+ 50 % residue management	2107	1347	2908	97100	261675	164575	2.7
T7.Permanent bed system + Zero tillage+ 100 % residue management	2310	1381	3132	97730	281573	183843	2.9
SEd	114	99	-				
CD (5%)	351	NS	-				

Soil parameters of pH:7.86, Soil Ec(dSm^{-1}): 0.42, OC(%): 0.90, av. N: 207 kg/ha, P_2O_5 :65.66 kg/ha, K_2O: 453 kg/ha, recommended spacing :120 X 45 cm, recommended nutrients: 240:50:150 NPK kg/ha, Cotton species/type: GTHH-49 BG-II, environment: irrigated , total rainfall :1319 mm during cropping periods.

South Zone

Chamrajnagar

The results of conservation experiment conducted at Chamrajnagar under rainfed condition with two year rotation of cotton- sorghum cropping system indicated that among the conservation practices significantly higher seed cotton yield (1748 kg/ha) and sorghum grain yield (3086 kg/ha) and seed cotton equivalent yield (2474 kg/ha) were recorded in conventional tillage with no residue management (T1) which was at par with permanent bed system with zero tillage and 100 % residue management (T7) (seed cotton yield (1697 kg/ha) and sorghum grain yield (2842 kg/ha) and seed cotton equivalent yield (2366 kg/ha)) (Table 34). Whereas, the lowest seed cotton yield (1085 kg/ha), sorghum grain yield (1734 kg/ha) and seed cotton equivalent yield (1837 kg/ha) were recorded in zero tillage without residue management (T2). Similarly, highest total cost of cultivation (Rs. 97,563 ha) was found with conventional tillage with no residue management (T1), while all the conservation treatments registered lower cost of cultivation. The system net returns (Rs. 139165/ha) was highest with permanent bed system with zero tillage and 100 % residue management (T7). Among the treatments the bulk density was lower in (T7) Permanent bed system + Zero tillage+ 100 %

residue management 1.39 g/cc at 0-15cm depth. while the bulk density at 16-30 cm found to be non significant.

Table 34. Bulk density, seed cotton yield (kg ha^{-1}) , grain yield (kg ha^{-1}), and economics as influenced by conservation treatments at Chamrajnagar

Treatments	Bulk density (0-15 cm)	Bulk Density (16-30sm)	Seed Cotton yield (kg ha^{-1})	Sorghum Yield (kg ha^{-1})	Seed Cotton Equivalent yield (kg ha^{-1})	Cost of cultivation (Rs. ha^{-1})	Gross Returns (Rs. ha^{-1})	Net Returns (Rs. ha^{-1})	B:C Ratio
T1.Conventional tillage+ No residue management	1.51	1.61	1748	3086	2474	97563	219040	121477	4.27
T2.Zero tillage+ No residue management	1.59	1.64	1085	1734	1493	60388	132330	71942	4.14
T3.Zero tillage+ 50 % residue management	1.48	1.56	1346	2086	1837	65830	162860	97030	4.68
T4.Zero tillage+ 100 % residue management	1.46	1.55	1467	2234	1993	66346	176710	110364	5.05
T5.Permanent bed system + Zero tillage + No residue management	1.45	1.59	1432	2376	1991	64521	176400	111879	5.20
T6.Permanent bed system + Zero tillage+ 50 % residue management	1.43	1.57	1538	2618	2154	68130	190780	122650	5.38
T7.Permanent bed system + Zero tillage+ 100 % residue management	1.39	1.54	1697	2842	2366	70405	209570	139165	5.70
SEd	0.024	0.03	91.24	208.1	89.67	835	8014	7247	0.17
CD (5%)	0.053	0.07	198.8	453.50	195.38	1820	17463	15790	0.37

Soil: Medium black clay loam, pH: 7.58, EC(dSm^{-1}): 0.256, OC (%):0.4, Evirnment: Rainfed
Available N (kg/ha):240.8, P2O5:47.2, K2O: 429.7 , Rainfall (mm): 977 mm

Srivilliputhur

The results on the seed cotton yield revealed that the highest seed cotton yield of 1659 kg/ha was recorded in (T1 - Conventional tillage+ No residue management) and it was comparable with (T4 - Zero tillage+ 100 % residue management) and (T7 - Permanent bed system + Zero tillage+ 100 % residue management) (Table 35). This was followed by (T6 - Permanent bed system + Zero tillage+ 50 % residue management) and (T3 - Zero tillage+ 50 % residue management). The lowest cotton yield of 1287 kg/ha was recorded with (T2 - Zero tillage+ No residue management). This was comparable with (T5 - Permanent bed system + Zero tillage + No residue management) (T3 - Zero tillage+ 50 % residue management) and (T6 - Permanent bed system + Zero tillage+ 50 % residue management).The results revealed that the conventional tillage is equal to zero tillage with 100% residue addition. The increased residue addition in (T4 - Zero tillage+ 100 % residue management) and (T7 - Permanent bed system + Zero tillage+ 100 % residue management) might have increase the soil activities due to availability of organic residue in the soil.

Significant reduction in weed density was observed with the treatments. Conventional tillage + no residue management (T1) registered the significantly lowest weed density of 201.4 / m2. This was followed by (T4 - Zero tillage+ 100 % residue management) and (T3 - Zero tillage+ 50 % residue management). The labour use was higher in the conventional tillage system of ridges and furrows formation, where as it was lesser with zero tillage and permanent bed system. Adoption of zero tillage and permanent bed system reduced the

labour use than conventional tillage. The economic analysis revealed that the cost of cultivation was drastically reduced by the zero tillage and permanent bed system as compared to conventional tillage. Higher gross income, net income and BC ratio were in the order of (T7 - Permanent bed system + Zero tillage+ 100 % residue management) followed by (T4 -- Zero tillage+ 100 % residue management)

Table 35 . Effect of conservation treatments on yield of cotton and Maize, Seed cotton equivalent yield an economics of maize - cotton cropping system at Srivilliputhur

Treatments	Seed cotton yield (kg ha^{-1})	Yield (kg ha^{-1}) of rotation crop	Seed cotton equivalent yield (kg ha^{-1})	Cost of cultivation (Rs. ha^{-1})	Gross return (Rs. ha^{-1})	Net Return (Rs. ha^{-1})	B:C ratio
T1.Conventional tillage+ No residue management	1659	4647	1215	132090	214225	84550	1.62
T2.Zero tillage+ No residue management	1287	4176	1092	120154	191072	71550	1.59
T3.Zero tillage+ 50 % residue management	1434	4311	1128	122397	200287	77881	1.64
T4.Zero tillage+ 100 % residue management	1522	4503	1178	123812	205987	83486	1.66
T5.Permanent bed system + Zero tillage + No residue management	1291	4246	1110	116898	189864	73483	1.62
T6.Permanent bed system + Zero tillage+ 50 % residue management	1447	4325	1131	120321	195098	76575	1.62
T7.Permanent bed system + Zero tillage+ 100 % residue management	1486	4365	1142	120564	201947	112382	1.68
SEd	91	159.0	32.3				
CD (5%)	180	313.2	69.7				

Cotton Genotypes :Variety CO 17, Clay loam, pH: 8.03, Soil fertility status : N: 182 (Low),P_2O_5 :50 (High), K_2O : 381 (High), O.C.(%) : 7.5 (Medium), Recommended fertiliser level: 80 : 40 : 40 Kg NPK / ha, Recommended spacing 75 x 30 cm, Environment :Irrigated

Agronomy VII: Input use pattern and Cost of cultivation

Preamble: The objective of collecting input use pattern and cost of cultivation in different region with existing cotton type to create CICR data base and also to understand input use pattern

North Zone

The details of input use and cost of cultivation for different domains of north zone was surveyed and different type of cost (**Rs.** ha^{-1}), cost of production (**Rs.**q^{-1}) and net returns (**Rs.** ha^{-1}) were calculated. The cost of cultivation (Cost C3) was arrived as **Rs.** 88,283, 1,08,250 and 96,136ha^{-1}respectively for Faridkot (Bt hybrid), Hisar (Bt hybrid) and Bathinda (arboreum) .The cost of agro inputs was assessed, which was

22.9,15.8 and 20.0 per cent of cost of cultivation (Cost C3) respectively of Faridkot (Bt hybrid), Hisar (Bt hybrid)and Bathinda (arboreum). The share of labour cost in total cost of cultivation arrived in the range of 49.2, 25.9 and 51.7per cent of Cost C3 of Faridkot (Bt hybrid), Hisar (Bt hybrid) and Bathinda (arboreum) respectively. The mean seed cotton yield of 13.0,16.0 and 19.39 qha^{-1}was attained by survey at Faridkot (Bt hybrid), Hisar (Bt hybrid)and Bathinda (arboreum)respectively (Table 36). The total gross return was ranged **Rs.**96,287, 1,39,200 and 1,20,359ha^{-1}respectively for Faridkot (Bt hybrid), Hisar (Bt hybrid)and Bathinda (arboreum). The different type of costs of cultivation *viz*., Cost A1, Cost A2, Cost B1,Cost B2, Cost C1, Cost C2 and Cost C3 were calculated (Table 36). The cost of cultivation per quintal on the basis of Cost C3 was arrived as **Rs.**7045, 4958 and 4959 respectively for Faridkot (Bt hybrid), Hisar (Bt hybrid) and Bathinda (arboreum) (Table37). The net return from cotton cultivation was ranged from arrived as **Rs.**8004, 58,366 and 23,454ha^{-1}arespectively for Faridkot (Bt hybrid), Hisar (Bt hybrid) and Bathinda (arboreum).

Table 36.Cost of different inputs and labours and their share in cost of cultivation

Centres	Faridkot		Hisar		Bathinda	
Genotypes	Bt hybrid		Bt hybrid		Arboreum	
Inputs	Value (Rs. ha^{-1}.)	%	Value (Rs. ha^{-1}.)	%	Value (Rs. ha^{-1}.)	%
i.Seeds	7000	7.9	3700	3.4	626	0.7
ii.Fertilizers	5876.7	6.7	7405	6.8	5803	6.0
iii.Manures	1750	2.0	0	0.0	644	0.7
iv.Weedicides	3115.4	3.5	0	0.0	1048	1.1
v.Plant protection chemicals	1728.7	2.0	6020	5.6	11046	11.5
vi.Growth regulators/ hormones	745.8	0.8	0	0.0	96	0.1
Total	20216.6	22.9	17125	15.8	19263	20.0
B. Cost of labour (Rs. ha^{-1})				0.0		0.0
i.Field preparation	4130	4.7	3325	3.1	4927	5.1
ii.Sowing	3012.5	3.4	1513	1.4	4288	4.5
Total of application charges for input	6389.7	7.2	11163	10.3	13449	14.0
ix.Weeding	11316.7	12.8	3600	3.3	10060	10.5
x.Interculture	0	0.0	4400	4.1	3575	3.7
xi.Picking& cleaning	16325	18.5	19350	17.9	9514	9.9
xii.Cotton stalk pulling/cutting	2287.5	2.6	900	0.8	3891	4.0
Total	43461.4	49.2	28050	25.9	49704	51.7
Miscelaneous (Rs. ha^{-1})	1947	2.2	0	0.0	769	0.8
Other expenses (rent, interest, depreciation, managerial cost& etc.) (Rs. ha^{-1})	22658	25.7	47074	43.5	26400	27.5
Grand total(Rs. ha^{-1})(C3)	88283	100.0	108250	100.0	96136	100.0
Seed cotton yield	13		16		19.39	
Gross return (Rs. ha^{-1})	96287		139200		120359	

Table 37. Different type of costs, cost of per quintal of production and net return (Rs. ha^{-1})

Centre	Genotypes	Particulars	Cost A1	Cost A2	Cost B1	Cost B2	Cost C1	Cost C2	Cost C3
Faridkot	Bt hybrids	Total cost of cultivation (**Rs.** ha^{-1})	59512	59512	65736	72216	73778	80257	88283
		Cost of production (**Rs.**q^{-1})	4747	4747	5243	5762	5886	6405	7045
		Net Return (**Rs.** ha^{-1})	36775	36775	30551	24071	22510	16030	8004
Hisar	Bt hybrids	Total cost of cultivation (**Rs.** ha^{-1})	47522	66272	73472	73472	81122	81122	89234
		Cost of production (**Rs.**q^{-1})	2640	3682	4082	4082	4507	4507	4958
		Net Return (**Rs.** ha^{-1})	100078	81328	74128	74128	66478	66478	58366
Bathinda	arboreum	Total cost of cultivation (**Rs.** ha^{-1})	70263	75161	81927	81927	87396	87396	96136
		Cost of production(**Rs.**q^{-1})	3624	3877	4226	4226	4508	4508	4959
		Net Return (**Rs.** ha^{-1})	49327	44429	37663	37663	32194	32194	23454

Cost A1 (Variable cost)
Cost A2: Cost A1+rent paid for leased in land
Cost B1: Cost A1 +interest on value of owned capital assets (excluding land)
Cost B2: cost B1+ rental value of owned land
Cost C1: Cost B1+imputed value of family labours
Cost C2: Cost B2+imputed value of family labours
Cost C3:Cost C2x1.10(10% for management cost)

Central Zone

The details of input use and cost of cultivation for different regions of central zone was surveyed and various type of cost (**Rs.** ha^{-1}), cost of production (**Rs.**q^{-1}) and net returns (**Rs.** ha^{-1}) were calculated. The cost of cultivation (Cost C3) was arrived as **Rs.**1,17,940, **Rs.**1,03,547, **Rs.**51,838, **Rs.**1,07,082,**Rs.** 97,829 and **Rs.**1,58,762 ha^{-1} respectively for Akola (Bt hybrid rainfed), Bhawanipatna (non Bt hybrids rainfed), Junagadh (Bt hybrid irrigated), Nanded (Bt hybrid rainfed) , Khandwa (Bt hybrid (irrigated) and Surat (Bt hybrid-irrigated) respectively. The cost of agro inputs was calculated, which was 19.9,17.2,21.9,28.9,21.9, and 16.4 per cent of total cost of cultivation on the basis of Cost C3 respectively for Akola (Bt hybrid rainfed), Bhawanipatna (non Bt hybrids rainfed), Junagadh (Bt hybrid irrigated), Nanded (Bt hybrid rainfed), Khandwa (Bt hybrid (irrigated) and Surat (Bt hybrid-irrigated) respectively. The share of labour cost in total cost of cultivation arrived on the basis of Cost C3 are 44.9,42.2,47.4,52.2,5.1 and 45.0 per cent respectively for Akola (Bt hybrid rainfed), Bhawanipatna (non Bt hybrids rainfed), Junagadh (Bt hybrid irrigated), Nanded (Bt hybrid rainfed) Khandwa (Bt hybrid (irrigated) and Surat (Bt hybrid-irrigated) respectively (Table 38).The mean seed cotton yield of 20.4,18.0,20.0,16.58,22.0 and 29 qha^{-1} were reported by survey at Akola (Bt hybrid rainfed), Bhawanipatna (non Bt hybrids rainfed), Junagadh (Bt hybrid irrigated), Nanded (Bt hybrid rainfed) Khandwa (Bt hybrid (irrigated) and Surat (Bt hybrid-irrigated) respectively. The different types of cost of cultivation (Cost A1, Cost A2, Cost B1, Cost B2, Cost C1, Cost C2 and Cost C3) were calculated (Table 39). The cost of cultivation per quintal on the basis of Cost C3 was arrived as **Rs.** 5,781,5,689,2,592,6,459,4,447 and 5,637ha^{-1} respectively with Akola (Bt hybrid rainfed), Bhawanipatna (non Bt hybrids rainfed), Junagadh (Bt hybrid irrigated), Nanded (Bt hybrid rainfed) Khandwa (Bt hybrid (irrigated) and Surat (Bt hybrid-irrigated) .The net return from cotton cultivation was ranged from **Rs.**55,460, **Rs.**31,133, **Rs.**1,43,461, **Rs.**30,466, **Rs.**56,172 and 83,017 ha^{-1}ª on the basis of cost C3 in respectively with at Akola (Bt hybrid rainfed), Bhawanipatna (non Bt hybrids rainfed), Junagadh (Bt hybrid irrigated), Nanded (Bt hybrid rainfed) and Khandwa (Bt hybrid (irrigated),and Surat (Bt hybrid).

Table 38. Cost of different inputs and labours and their share in cost of cultivation in Central zone

Centres	Akola		Bhawanipatna		Junagadh		Nanded		Khandwa		Surat	
Genotypes	Bt hybrid		Non Bt		Bt hybrid		Bt hybrid		Bt hybrid (irr)		Bt hybrid	
Inputs	Value (Rs. ha^{-1}.)	%	Value (Rs. ha^{-1}.)	%	Value (Rs. ha^{-1}.)	%	Value (Rs. ha^{-1}.)	%	Value (Rs. ha^{-1}.)	%	Value (Rs. ha^{-1}.)	%
i.Seeds	4050	3.4	2,000	1.9	4040	2.3	3371	3.1	2890	3.0	4263	2.7
ii.Fertilizers	5200	4.4	6,500	6.3	5522	3.1	10358	9.7	6530	6.7	6965	4.4
iii.Manures	3500	3.0	3,000	2.9	12011	6.8	4604	4.3	5000	5.1	3827	2.4
iv.Weedicides	3000	2.5	1,000	1.0	2700	1.5	1238	1.2	1750	1.8	473	0.3
v.Plant protection chemicals	4500	3.8	5,000	4.8	6375	3.6	9194	8.6	3240	3.3	6224	3.9
vi.Growth regulators/ hormones	3200	2.7	350	0.3	0	0.0	1307	1.2	2000	2.0	0	0.0
Irrigation charges	0	0.0	0	0.0		0.0	556	0.5	0	0.0	4350	2.7
Total	23450	19.9	17,850	17.2	38848	21.9	30991	28.9	21410	21.9	26100	16.4
B. Cost of labour (Rs. ha^{-1})								0.0				
i.Field preparation	9200	7.8	3,260	3.1	3750	2.1	10135	9.5	2925	3.0	10796	6.8
ii.Sowing	3700	3.1	3,260	3.1	3150	1.8	2252	2.1	3000	3.1	2300	1.4
Total of application charges for input	6500	5.5	9,780	9.4	11400	6.4	7736	7.2	7400	7.6	10593	6.7
ix.Weeding	8000	6.8	3,260	3.1	4200	2.4	4423	4.1	6000	6.1	17250	10.9
x.Interculture	5200	4.4	3,912	3.8	4685	2.6	7174	6.7	2000	2.0	2516	1.6
xi.Picking& cleaning	18360	15.6	16,300	15.7	17000	9.6	17978	16.8	11000	11.2	25897	16.3
xii.Cotton stalk pulling/cutting	2000	1.7	3,912	3.8	950	0.5	6199	5.8	1200	1.2	2068	1.3
Total	52960	44.9	43,684	42.2	83983	47.4	55897	52.2	5000	5.1	71419	45.0
Miscelaneous (Rs. ha^{-1})	0	0.0	2,000	1.9	4000	2.3	0	0.0	59935	61.3	0	0.0
Other expenses (rent, interest, depreciation, managerial cost& etc.) (Rs. ha^{-1})	41522	35.2	40,013	38.6	42848	24.2	20194	18.9	37894	38.7	61243	38.6
Grand total (Rs. ha^{-1})(C3)	117940	100.0	1,03,547	100.0	177204	100.0	107082	100.0	97829	100.0	158762	100.0
Seed cotton yield	20.4		18		20		16.58		2200		29	
Gross return (Rs. ha^{-1})	173400		1,34,680		183768		137506		154000		244715	

Table 39. Different type of costs, cost of per quintal of production and net return (Rs. ha^{-1}) Central Zone

Akola	Cost calculation	Cost A1	Cost A2	Cost B1	Cost B2	Cost C1	Cost C2	Cost C3
	Total CC (Rs. ha^{-1})	76418	76418	92418	99418	100218	107218	117940
	Cost of production (Rs.q^{-1})	3746	3746	4555	4873	4913	5256	5781
	Net Return (Rs. ha^{-1})	96982	96982	80982	73982	73182	66182	55460
Bhawani	Total CC (Rs. ha^{-1})	75,634	75,634	80,634	90,134	84,634	94,134	1,03,547
	Cost of production (Rs.q^{-1})	4,156	4,156	4,430	4,952	4,650	5,172	5,689
	Net Return (Rs. ha^{-1})	59,046	59,046	54,046	44,546	50,046	40,546	31,133
Junagadh	Total CC (Rs. ha^{-1})	26385	26385	32885	40885	39125	47125	51838
	Cost of production (Rs.q^{-1})	1319	1319	1644	2044	1956	2356	2592
	Net Return (Rs. ha^{-1})	174894	174894	166867	156987	159161	149281	143461
Nanded	Total CC (Rs. ha^{-1})	84352	84352	92672	92812	97207	97347	107082
	Cost of production (Rs.q^{-1})	5088	5088	5590	5599	5864	5872	6459
	Net Return (Rs. ha^{-1})	53196	53196	44876	44736	40341	40201	30466
Khandwa	Total CC (Rs. ha^{-1})	80935	81935	83935	85935	86935	88935	97829
	Cost of production (Rs.q^{-1})	36.79	37.24	38.15	39.06	39.52	40.43	44.47
	Net Return (Rs. ha^{-1})	73065	72065	70065	68065	67065	65065	56172
Surat	Total CC (Rs. ha^{-1})	105907	105907	128835	135010	138154	144329	158762
	Cost of production (Rs.q^{-1})	3761	3761	4573	4792	4905	5124	5637
	Net Return (Rs. ha^{-1})	135872	135872	112944	106769	103624	97449	83017

Cost A1 (Variable cost)

Cost A2: Cost A1+rent paid for leased in land
Cost B1: Cost A1 +interest on value of owned capital assets (excluding land)
Cost B2: cost B1+ rental value of owned land
Cost C1: Cost B1+imputed value of family labours
Cost C2: Cost B2+imputed value of family labours
Cost C3:Cost C2x1.10(10% for management cost)

South Zone

The details of input use and cost of cultivation for different domains of South zone was surveyed and different type of cost (**Rs.** ha^{-1}), cost of production (**Rs.**q^{-1}) and net returns (**Rs.** ha^{-1}) were calculated. The cost of cultivation (Cost C3) was arrived as **Rs.**87,788, **Rs.**1,15,844, Rs.92,341,Rs.1,62,118 and Rs. 95,909 ha^{-1}respectively for Nandyal (Bt hybrid rainfed), Raichur (Bt hybrid),Chamrajnagar (ELS Bt hybrid), LAM (Bt hybrid) and Coimbatore (Bt hybrid) .The cost of agro inputs was assessed, which was 24.0, 34.2, 21.4, 34.9 and 16.4 per cent respectively of total cost of cultivation on the basis of Cost C3 for Nandyal (Bt hybrid rainfed), Raichur (Bt hybrid),Chamrajnagar (ELS Bt hybrid), LAM (Bt hybrid) and Coimbatore (Bt hybrid) (Table 40.) The share of labour cost in total cost of cultivation arrived as 47.2, 31.4, 46.1,43.6 and 43.3 per cent of cost C3 respectively for Nandyal (Bt hybrid rainfed), Raichur (Bt hybrid),Chamrajnagar (ELS Bt hybrid), LAM (Bt hybrid) and Coimbatore (Bt hybrid). The mean seed cotton yield of 21.0, 23.5, 13.8, 18.4 and 321.0 q $ha^{-1}$was attained by survey at Nandyal (Bt hybrid rainfed), Raichur (Bt hybrid), Chamrajnagar (ELS Bt hybrid), LAM (Bt hybrid) and Coimbatore (Bt hybrid) (Table 40). The different type of cost of cultivation (Cost A1, Cost A2, Cost B1, Cost B2, Cost C1, Cost C2 and Cost C3) were calculated (Table 41). The cost of cultivation per quintal on the basis of Cost C3 was arrived as Rs.4181, 8811, 6691, 4930 and 4567 ha^{-1} respectively with Nandyal (Bt hybrid rainfed), Raichur (Bt hybrid),Chamrajnagar (ELS Bt hybrid), LAM (Bt hybrid) and Coimbatore (Bt hybrid).

Agronomy IX: Standardisation of geometry for Bt varieties

Preamble: Bt-cotton technology is only expected to protect the cotton crop from bollworm attacks. Clearly the yield benefits should come from the hybrids or varieties. For best yield benefits, it is important that the hybrids or varieties must be ideally suited for specific agro-eco-zones. For example the best options for rainfed regions would be early-maturing short duration straight varieties, which are amenable for high-density planting system also. The newly released Bt varieties are taken for evaluation and suitability and geometry requirement.

Table 40. Cost of different inputs and labours and their share in cost of cultivation in South zone

Centres	Nandyal		Raichur		Chamrajnagar		LAM		Coimbatore	
Genotypes	Bt hybrid (rainfed)		Bt hybrid		ELS Bt hybrid		Bt hybrid		Bt hybrid	
Inputs	Value (Rs. ha^{-1}.)	%	Value (Rs. ha^{-1}.)	%	Value (Rs. ha^{-1}.)	%	Value (Rs. ha^{-1}.)	%	Value (Rs. ha^{-1}.)	%
i.Seeds	2750	3.1	3650	3.2	3000	3.2	5559	3.4	2160	2.3
ii.Fertilizers	7193	8.2	14970	12.9	4966	5.4	12515	7.7	4235	4.4
iii.Manures	1000	1.1	9688	8.4	9000	9.7	0	0.0	4800	5.0
iv.Weedicides	0	0.0	1700	1.5	0	0.0	5897	3.6	2275	2.4
v.Plant protection chemicals	9381	10.7	9125	7.9	2830	3.1	31517	19.4	1800	1.9
vi.Growth regulators/ hormones	750	0.9	4100	3.5	0	0.0	1025	0.6	500	0.5
vii.Irrigation charges		0.0	0	0.0	0	0.0	0	0.0	-	-
Total	21075	24.0	39583	34.2	19796	21.4	56513	34.9	15770	16.4
B. Cost of labour (Rs. ha^{-1})										
i.Field preparation	6875	7.8	4800	4.1	5000	5.4	12747	7.9	3500	3.6
ii.Sowing	3000	3.4	2650	2.3	5500	6.0	3857	2.4	3500	3.6
Total of application charges for input	7646	8.7	7000	6.0	8850	9.6	11177	6.9	16100	16.8
ix.Weeding	5125	5.8	9000	7.8	2400	2.6	8048	5.0	6300	6.6
x.Interculture	4086	4.7	4200	3.6	4000	4.3	15211	9.4	3500	3.6
xi.Picking& cleaning	13860	15.8	7500	6.5	12000	13.0	22426	13.8	7000	7.3
xii.Cotton stalk pulling/cutting	875	1.0	1200	1.0	4800	5.2	3129	1.9	1600	1.7
Total	41467	47.2	36350	31.4	42550	46.1	76594	47.2	41500	43.3
Miscellaneous (Rs. ha^{-1})	0	0.0	0	0.0	0	0.0	0	0.0	0	0
Other expenses (rent, interest, depreciation, managerial cost& etc.) (Rs. ha^{-1})	25245	28.8	39911	34.5	29995	32.5	29011	17.9	38639	40.3
Grand total (Rs. ha^{-1})(C3)	87788	100.0	115844	100.0	92341	100.0	162118	100.0	95909	100.0
Seed cotton yield (q ha^{-1})	21		23.5		13.8		18.4		21	
Gross return (Rs. ha^{-1})	115473		178600		117300		136822		199500	

Table 41 . Different type of costs, cost of per quintal of production and net return (Rs. ha^{-1}) in South Zone

	Cost calculation	Cost A1	Cost A2	Cost B1	Cost B2	Cost C1	Cost C2	Cost C3
Nandyal	Total CC(Rs. ha^{-1})	57509	57509	57880	78820	58868	79808	87788
	Cost of production (Rs.q^{-1})	2739	2739	2757	3754	2803	3801	4181
	Net Return(Rs. ha^{-1})	57963	57963	57593	36653	56605	35665	27684
LAM	Total CC(Rs. ha^{-1})	123122	145243	123122	145243	125259	147380	162118
	Cost of production(Rs.q^{-1})	6691	7894	6691	7894	6808	8010	8811
	Net Return(Rs. ha^{-1})	13701	-8421	13701	-8421	11563	-10558	-25296
Chamrajnagar	Total CC(Rs. ha^{-1})	54946	54946	57696	77696	63946	83946	92341
	Cost of production(Rs.q^{-1})	3982	3982	4181	5630	4634	6083	6691
	Net Return(Rs. ha^{-1})	62354	62354	59604	39604	53354	33354	24959
Raichur	Total CC(Rs. ha^{-1})	82513	82513	82513	102513	102513	102513	115844
	Cost of production(Rs.q^{-1})	3511	3511	3511	4362	4362	4362	4930
	Net Return(Rs. ha^{-1})	96087	96087	96087	76087	76087	76087	62756
Coimbatore	Total CC(Rs. ha^{-1})	74890	74890	79390	79990	86590	87190	95909
	Cost of production(Rs.q^{-1})	3566	3566	3780	3809	4123	4152	4567
	Net Return(Rs. ha^{-1})	124610	124610	120110	119510	112910	112310	103591

North Zone

The agronomic requirement and performance of Bt varieties was assessed under irrigated condition in North Zone. The trial includes Bt varieties of G1. PAU Bt1, G2. PAU Bt2, G3. PAU Bt3 and G4. CICR Bt 6 were planted in different spacing levels (S1.67.5 x 15 cm, S2.67.5X 30 cm, S3.80 x 15 cm and S4.67.5 x 60 cm) and compared with Bt hybrids (RCH 776 BG II Bt) planted with recommended spacing and applied recommended nutrients of the regions. The significantly higher seed cotton yield was registered with Bt hybrid at Faridkot (3596 kg/ha) and Bathinda (3665 kg/ha). Among Bt varieties, PAU Bt 3 registered the significantly highest seed cotton yield of 2735 and 3014 kg ha^{-1}, gross return of **Rs.** 1,50,417 and 1,80,846 ha^{-1}, net return of **Rs.** 1,00,961 and 1,30,907 ha^{-1} and benefit cost of 2.02 and 2.34 at Faridkot and Bathinda respectively. When comparing with Bt hybrid, the yield reduction of 23.9 and 17.8 per cent respectively calculated with PAU Bt 3 at Faridkot and Bathinda. The results on spacing attempted revealed that wider planting geometry (67.5 x 60 cm) resulted in significantly the least seed cotton yield, gross return , net return and benefit cost ratio in both Faridkot and Bathinda. The reduction of seed cotton yield was 29.4 and 17.3 per cent were calculated as compared to high performing narrow geometry respectively at Faridkot, and Bathinda. Among narrow geometries, the spacing level of S1.67.5 x 15 cm registered the highest seed cotton yield 2539 and 2771 kg ha^{-1}, gross return of **Rs.** 1,39,647 and 1,66,240 and ha^{-1}, net return of **Rs.** 90,875 and 1,16,971 $ha^{-1}$and benefit cost ratio of 1.84 and 2.25 at Faridkot and Bathinda respectively (Table42).The narrow planted geometries (S1.67.5 x 15 cm, S2.67.5X 30 cm, and S3.80 x 15 cm) within were not differed significantly with respect to seed cotton yield, gross return, net return and benefit cost ratio in all the centres.The interaction effect were found non-significant.

Table 42. Seed cotton yield (kg ha^{-1}), Gross Return (Rs. ha^{-1}), Net return (Rs. ha^{-1}) and Benefit Cost ratio of Bt varieties planted under different spacing levels North Zone

Genotypes	Faridkot				Bathinda			
	Seed cotton yield (kg ha^{-1})	Gross Return (Rs. ha^{-1})	Net Return (Rs. ha^{-1})	B:C ratio	Seed cotton yield (kg ha^{-1})	Gross Return (Rs. ha^{-1})	Net Return (Rs. ha^{-1})	B:C ratio
G1. PAU Bt1	2360	129815	83355	1.78	2554	153248	106299	2.36
G2. PAU Bt2	2168	119213	74295	1.63	2882	172911	123831	2.38
G3. PAU Bt3	2735	150417	100961	2.02	3014	180846	130907	2.34
G4. CICR Bt 6	1763	96983	55299	1.32	2026	121534	78020	2.08
RCH 776 BG II Bt	3596	197801	139321	2.31	3665	213900	159977	2.96
SE d	85	4675	3995	0.06	91	5442	4854	0.07
CD (5%)	176	9706	8295	0.13	187	11236	10019	0.15
Spacing								
S1.67.5 x 15 cm	2539	139647	90875	1.84	2771	166240	116971	2.25
S2.67.5X 30 Cm	2435	133917	87229	1.84	2704	162269	114649	2.51
S3.80 x 15 cm	2262	124392	78239	1.68	2709	162541	114192	2.62
S4.67.5 x 60 cm	1790	98473	57566	1.39	2291	137489	93244	1.78
SE d	133	7335	6268	0.09	79	4777	4260	0.06
CD (5%)	333	18299	15637	0.24	195	11692	10425	0.15

Faridkot: Soil parameters: pH: 8.5, EC(dsm^{-1}):0.25, OC (%) :0.21, Available P_2O_5: 13.8 kg/ha,Available K_2O: 530kg/ha, Recommended spacing: 67.5 X 60 cm, Recommended nutrients: 92.5 kg N and 30 kg P_2O_5/ha, Cotton species/type: *Gossypium hirsutum* , Environment: irrigated; Total rainfall during cropping period: 497.1 mm

Bathinda: Soil parameters: pH: 8.92, EC(dsm^{-1}):0.23 , OC (%) : 0.30, Available N : 167 kg/ha,Available P_2O_5: 14.2 kg/ha,Available K_2O: 310 kg/ha, Recommended nutrients: 92.5 kg N/ha, Environment: irrigated; Total rainfall during cropping period: 318 mm

Hisar

The agronomy of Bt varieties trial revealed that significantly higher seed cotton yield (3861 kg ha^{-1}) was recorded for RCH 776 BG II Bt hybrid as compared to all other Bt variety . The yield reduction of 73.6,36.9 and 61.7 per cent were calculated with PAU1 Bt, PAU2 Bt and CICR 6 Bt respectively. Planting geometry with 67.5 x 15 cm (2418 kg/ha) , 67.5 x 30 cm (2106 kg/ha) and 80 x Bt and 15 cm (2454 kg/ha) recorded significantly higher seed cotton yield as compared to 67.5 x 60 cm (1818 kg/ha) (Table 43).

Table 43. Seed cotton yield (kg ha^{-1}), as influenced by spacing levels and nutrient levels at Hisar

Treatments	V_1(PAU 1 *Bt*)	V_2(PAU 2 *Bt*)	V_3(CICR6 *Bt*)	V_4(RCH 776 BG II)	Mean (spacing)	ANOVA	SE (d)	CD (5%)
S_1(67.5x15 cm)	1276	2963	1262	4170	2418	Spacing	253.03	NS
S_2(67.5x30 cm)	1098	2593	1605	3128	2106	Genotype	253.03	519.25
S_3(80x15 cm)	1261	2523	2025	4005	2454	G X S	506.06	NS
S_4(67.5x60 cm	439	1660	1029	4143	1818			
Mean **(Genotype)**	1019	2435	1480	3861				

Sandy loam, pH : 7.89 , OC(%) :0.44, EC(dSm^{-1}) : 0.52, Soil fertility status : N: 172 Kg/ha, P_2O_5 : 16 Kg/ha, K_2O : 262 Kg/ha, Recommended Nutrient levels:90:30:0:25 kg/ha N:P:K and $ZnSo_4$, Environment: Irrigated, Recommended spacing :67.5x30 cm, Total Rainfall (mm) received during cropping periods:596 mm

Sriganganagar

The results of Bt varietal trial of Sriganganagar found that the crop geometry 67.5 x15 cm gave maximum seed cotton yield (1455 kg/ha) which was at par 67.5 x 30 cm (1442 kg/ha) and 80 x 15 cm (1351 kg/ha) . The significantly least seed cotton yield was harvested with 67.5 x 30 cm geometry (1192 kg/ha) . In case of genotypes control hybrid (RCH-776 BG II Bt) recorded significantly higher seed cotton yield (1681 kg/ha) followed by PAU Bt 1 (1236 kg/ha) PAU Bt 2 (1410 kg/ha) and PAU 3 Bt (1209 kg/ha) and CICR 6 Bt (1585 kg/ha). However, the interaction results revealed that HDPS planting of CICR 6 Bt with 67.5 x 15 cm registered higher seed cotton yield (1716 kg/ha) than RCH 776 Bg II Bt followed recommended spacing (67.5 x 90 cm) (Table 44)

Table 44 .Seed cotton yield (kg ha^{-1}), as influenced by genotypes and spacing levels at Sriganganagar

Treatments	G_1. PAU1Bt	G_2. PAU2Bt	G_3. PAU 3 Bt	G_4. CICR Bt 6	Mean (Spacing)	ANOVA	SE d	CD (5%)
S_1. 67.5 X 15 cm	1438	1380	1286	1716	1455	Spacing	46.0	132.8
S_2. 67.5X 30 Cm	1325	1644	1236	1564	1442	Genotypes	51.5	148.5
S_3. 80 X 15 cm	1232	1302	1301	1568	1351	S X G	102.9	296.9
S_4. 67.5 X 60 cm	948	1316	1013	1492	1192			
Mean	1236	1410	1209	1585	1360			
Existing Bt hybrids	1681							

Soil:P^H:7.8,EC(dSm^1):0.25,OC(%):0.29,P_2O_5:38kg/ha,K_2O:354kg/ha,S(ppm):14,Mn(ppm):6,Zn(ppm):0.5 ,Fe(ppm):4.5,Cu(ppm):0.4,FC(%):16.7,P.W.P(%):6.2,B.D(g/cm3):1.59

Perambalur

The performance of Bt variety (CICR 23 Bt) in south Zone under HDPS as compared to ruling Bt hybrid studied revealed that spacing, S_2-60X30 cm significantly recorded higher number of bolls per square meter, seed cotton yield of 1062 kg/ha, gross return (Rs. 95,580), net return (Rs. 44,020) and B:C ratio(1.85) (Table 45).Regarding nitrogen levels, N_3-150% RDN (105:20:30 kg NPK /ha) significantly recorded higher number of bolls per square meter and higher seed cotton yield (1134 kg/ha) and was on par with N_2-125% RDN (1029 kg/ha). Also, N_3-150% RDN (105:20:30 kg NPK /ha) significantly recorded higher gross return (Rs. 1,02,083), net return (Rs.49,641) and B:C ratio(1.95).Hence, a spacing 60x30 cm and a fertilizer of 105:20:30 kg NPK /ha may be recommended for CICR Bt 23.The similar trend was observed with Net return(Rs./ha) and benefit cost ratio

Table 45. Seed cotton yield (kg ha^{-1}) and Gross return (Rs./ha)as influenced by genotypes and spacing levels at Perambalur

	Seed cotton yield (Kg/ha)					Gross return (Rs./ha)				
Treatments	N1.100%RDN	N2.125%RDN	N3.150%RDN	N4. Control	Mean	N1.100%RDN	N2.125%RDN	N3.150% RDN	N4. Control	Mean
S1.60 X 15 cm	864	908	1072	783	907	77760	81720	96480	70470	81608
S2.60 X 30 cm	841	1281	1332	794	1062	75690	115290	119880	71460	95580
S3.90 X 15 cm	910	1003	1038	609	890	81900	90270	93420	54810	80100
S4.90 X 60 cm	737	924	1095	725	870	66330	83160	98550	65250	78323
Mean (Genotypes)	838	1029	1134	728		75420	92610	102083	65498	83903
Existing Bt hybrid with 90x90 cm 120:60:60 kg NPK/ha	2143					192870				
ANOVA	SE d	CD (5%)				SE d	CD (5%)			
Spacing	45	111				1290	3156			
Nitrogen	37	106				1488	3071			
S X N	79	174				2882	6170			

Recommended level of nutrients : 70:20:30 kg NPK /ha, Deep soil, Clay loam soil, Soil pH: 8.1, Soil Ec(dSm^{-1}):0.38, Organic Carbon (%): 0.4% ,Soil available nutrients N : 178 kg/ha, P_2O_5 : 16.2, K_2O : 302 kg/ha, Rainfed :630 mm

Table 46. Net return(Rs./ha) and benefit cost ratio as influenced by genotypes and spacing levels at Perambalur

	Net return (Rs./ha)					B:C ratio				
Treatments	**N1.100%RDN**	**N2.125%RDN**	**N3.150%RDN**	**N4. Control**	**Mean**	**N1.100%RDN**	**N2.125%RDN**	**N3.150%RDN**	**N4. Control**	**Mean**
S1.60 X 15 cm	25120	29530	43288	18970	29227	1.48	1.57	1.81	1.37	1.56
S2.60 X 30 cm	24050	63380	67688	20960	44020	1.47	2.22	2.3	1.42	1.85
S3.90 X 15 cm	30060	38160	41028	4110	28340	1.58	1.73	1.78	1.08	1.54
S4.90 X 60 cm	14860	31450	46558	14950	26955	1.29	1.61	1.9	1.3	1.52
Mean (Genotypes)	23523	40630	49641	14748		1.45	1.78	1.95	1.29	
Existing Bt hybrid with 90x90 cm 120:60:60 kg NPK/ha	130370					3.08				
ANOVA	SE d	CD (5%)				SE d	CD (5%)			
Spacing	1302	3187				0.02	0.05			
Nitrogen	1439	2970				0.02	0.05			
S X N	2812	6036				0.05	0.11			

Recommended level of nutrients : 70:20:30 kg NPK /ha, Deep soil, Clay loam soil, Soil pH: 8.1, Soil Ec(dSm^{-1}): 0.38, Organic Carbon (%): 0.4, Soil available nutrients N : 178 kg/ha, P_2O_5 : 16.2, K_2O : 302 kg/ha, Rainfed: 630 mm

Dharwad

The performance of Bt variety (CICR 23 Bt) in south Zone under HDPS found that growth parameters significantly affected due to planting geometry and N levels. Among the yield parameters no of bolls per plant (15.4), seed cotton yield per plant (42.5 g/plant) and single boll weight (3.14g) were significantly increased with 60x 30 cm spacing as compared to other levels. However, it was on par with 90x 30 cm spacing. Whereas no of bolls per Sq m. were significantly increased with 60x15cm (114.1 /Sq m) as compared to any other levels. None of the interactions were significant. Seed cotton yield significantly increased with planting geometry of 90x30cm (1402 kg/ha) as compared to any other levels. Increased yield can be attributed to increased no of bolls per plant and boll weight. Increasing N levels from 100% to 150% (N_3) significantly increased seed cotton yield (1391 Kg/ha). Increased yield of seed cotton may be attributed to increased yield per plant (39.4 g/plant) boll weight (3.62g) and no of bolls per plant (14.9).Among the interactions S_4N_3 produced significantly higher seed cotton yield (1659 kg/ha) as compared to any other levels. However, it was on par with S_4N_2 (1639 kg/ha) level (Table 47). The existing Bt hybrid (Ajeet 155 Bg-II) with recommended spacing (90x60cm) and nutrients (100N, 50 P2O5, 50 K2O kg/ha) recorded the seed cotton yield 1501 kg/ha. The combination of S_4N_3 (1639 kg/ha) and S_4N_2 (1639 kg/ha) produced better yield than Bt hybrid

Nandyal

The performance of Bt variety (CICR 23 Bt) in south Zone under HDPS at Nandyal revealed that number of bolls per square meter differs significantly among different spacing and nitrogen levels. Higher number of bolls per square meter (28.2) was noticed with 60 × 15 cm, which was comparable with 90 x15 cm (26.3). Significantly less number of bolls per square meter (24.0) was found with 90 × 60 cm. There was significant effect of different nitrogen levels on number of bolls per square meter. Higher number of bolls per square meter (28.0) was found with 150% RDN and was on par with 125 % RDN (27.4). Significantly the least number of bolls per square meter (23.1) was noticed with control . Significantly higher seed cotton yield (824 kg ha^{-1}) was recorded with spacing of 60 x 15 cm and the least seed cotton yield (564 kg ha^{-1}) was recorded with spacing of 90 cm x 60 cm (Table 48). There was significant effect of different nitrogen levels on seed cotton yield.

The significantly highest seed cotton yield (769 kg ha^{-1}) was observed in 150% RDN and was on par with 125 % RDN (748 kg ha^{-1}) and the significantly least seed cotton yield (512 kg ha^{-1}) was found with control

Table 47 : Effect of planting geometry and N levels on Seed Cotton Yield (kg ha^{-1}) of Bt variety CICR 23 Bt) at Dharwad

	Planting geometry								
	S1:60x15	S2:60x30	S3:90x15	S4:90x30	MEAN	ANOVA	S.Em	S.Ed	CD
N1:100%RDN	891.7	1224.7	1318.0	1426.0	**1215.1**	**Spacing**	**34.4**	**48.6**	**121.3**
N2:125%RDN	967.0	1240.3	1351.0	1638.7	**1299.3**	**N levels**	**26.7**	**37.8**	**78.5**
N3:150%RDN	1126.3	1413.0	1367.0	1659.0	**1391.3**	**NXS**	**68.8**	**75.6**	**168.3**
N4: control	628.3	627.7	753.0	886.0	**723.8**	**SXN**	**57.7**	**81.6**	**181.5**
MEAN	**903.3**	**1126.4**	**1197.3**	**1402.4**					
Existing Bt hybrid with recommended spacing (90x60cm) and nutrients (100N, 50 P2O5, 50 K2O kg/ha) Ajeet 155 Bg-II					1501				

Medium deep black, pH: 7.2 , OC (%): 0.45, N : 230 kg/ha, P2O5 : 27.0 kg/ha, K2O : 425 kg/ha, Recommended level of nutrients 60:30:30 kg NPK/ha, Total rainfall : 1070 mm , No of rainy days: 74

Table 48 . Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nitrogen levels

Treatments	N_1: 100 % RDN	N_2: 125 % RDN	N_3: 150 % RDN	N4: Control (No nitrogen)	Mean	Anova	SE d	SE m±	CD (5%)
S1:60X15 cm	833.7	929.3	912.0	622.7	824.4	**Spacing**	30.6	21.7	62.9
S2:60X30 cm	619.0	692.7	714.0	460.0	621.4	**Nitrogen levels**	30.6	21.7	62.9
S3:90X15 cm	738.7	759.3	771.7	580.6	712.6	**S X N**	61.3	43.3	NS
S4: 90X60 cm	583.7	611.3	678.6	382.7	564.1				
Mean	693.7	748.2	769.1	511.5					

Deep black soil, Clay soil, Recommended level of nutrients 40:20: 20 NPK kg/ha,
P_H : 8.3, N : 148 kg/ha, P_2O_5 : 32 kg/ha , K_2O : 351 kg/ha, OC.(%) : 0.37

Agronomy x: Multi-tier cropping system to enhance resource utilization, profitability and sustainability of *Bt* cotton *(Gossypium hirsutum)* production system

Akola

The results of multitier cropping system revealed that the significantly highest seed cotton yield of 2065 kg ha^{-1} recorded in sole cotton. Cotton + Green gram in 1:1 row proportion (T9) recorded next best treatment in respect of seed cotton yield (2031 kgha^{-1}). The seed cotton yield was reduced with paired row cotton with intercrops viz. black gram, soybean and pigeonpea. The yield reduction in cotton due to different intercrops ranged from 1.65 to 18.11 per cent. However, the yield reduction in cotton was compensated by the yield of companion crops. Among the intercrops combinations grown in paired row cotton, two rows of green gram (T2) produced higher seed cotton equivalent yield of 2676 kgha^{-1} followed by cotton+ green gram intercropping system (T9) (2601 kgha^{-1}) at 1:1 row proportion . The present investigation, sole cotton grown at 90x60 cm row spacing recorded significantly higher number of weeds/m^2.(57.09) as compared to other intercropping system in paired row cotton. Lowest weed population was recorded in cotton+ greengram at 1:1 row

proportion (T9). Multitier cropping system enhanced the relative production efficiency (8.16 to 29.63 %), relative economic efficiency (16.14 to 55.59 %), land equivalent ratio (1.25 to 1.56 and system profitability (394-528 Rs/ha/day).Amongst the multitier intercropping systems evaluated paired row planting of Bt cotton with two rows of green gram (T2)was having the highest RPE,REE,LER and system profitability. The significantly highest GMR of Rs. 162726/ha., NMR of Rs. 118736/ha and B:C ratio of 3.70 was registered in paired row planting of Bt cotton with two rows of green gram (T2). The lowest GMR (Rs. 125532 /ha), NMR(Rs. 76312/ha.) and B:C ratio of 2.55 was registered in sole Bt cotton (Table 49). Among the various intercropping system, cotton + green gram at 1:1 row proportion (217.32 kg ha^{-1}), paired row cotton intercropped with two rows of green gram (218.07 kg ha^{-1}) and paired row of cotton with two rows of black gram (214.39 kg ha^{-1}) recorded significantly higher available nitrogen in the soil as compared to sole cotton (201.83 kg ha^{-1}).Similar trend was also recorded in respect of phosphorus and potassium where higher nutrient status was noticed in all intercropping systems as compared to sole cotton.

Table 49 . Seed Cotton yield (kg ha^{-1}), Seed cotton equivalent yield (kg ha^{-1}) and economics as influenced by multitier cropping system at Akola

Treatments	Seed cotton Yield (kg/ha)	Seed cotton equivalent yield (kg/ha)	Relative Production Efficiency (RPE) %	Relative Economic Efficiency (REE) %	LER	Net Return (Rs/ha)	BCR
T_1: Sole Bt cotton (90x60 cm)	2065	2065	--	--	--	76312	2.55
T_2: Paired row planting of Bt cotton with two rows of Green gram(A)	1855	2676	29.63	55.59	1.56	118736	3.70
T_3:Paired row planting of Bt cotton with two rows of Black gram (B)	1776	2314	12.10	26.75	1.48	96727	3.20
T_4:Paired row planting of Bt cotton with two rows of Soybean (C)	1714	2233	8.16	16.14	1.25	88625	2.88
T_5:Paired row planting of Bt cotton with one row of Green gram (A)+one row of Black gram (B)	1858	2418	17.09	33.24	1.54	101681	3.24
T_6:Paired row planting of Bt cotton with one row ofBlack gram (B)+ one rows of Soybean (C)	1691	2319	12.32	23.33	1.38	94112	3.01
T_7:Paired row planting of Bt cotton with one rows of Soybean (C)+one row of Green gram(A)	1769	2443	18.34	33.23	1.42	101666	3.17
T_8: Cotton + Pigeonpea (6:2) (90x60 cm)	1739	2394	15.96	31.65	1.35	100465	3.23
T_9: Cotton + Greengram (1:1) (90x60 cm)	2031	2601	25.99	45.86	1.45	111305	3.38
SE d	64.78	65.85	--	--	--	4004	--
CD (5%)	237.85	241.79	--	--	--	14701	--

Recommended spacing in sole cotton : 90x60 cm, Recommended Fertilizer dose : 60:30:30 Kg NPK/ha , Environment : Rainfed, Cotton Species : Bt Hybrid, Total Rainfall during Cropping period : 1161.0 mm in 51 rainy days, Soil parameters : pH: 7.80, EC (dSm-1): 0.13, O.C.(%) : 3.95, Available N: 214 $kgha^{-1}$, P_2O_5 : 17.90 $kgha^{-1}$, K_2O : 354 $kgha^{-1}$

Junagadh

An appraisal of data presented in Table 50 showed that seed cotton yield and yield attributes of Bt cotton were significantly influenced by different treatment of multi-tier cropping system.

However, paired row planting of Bt cotton with two rows of intercrop groundnut (T4) was produce significantly higher seed cotton yield (2885 kg/ha) which was statistically at par with treatment T_2, T_3, T_5, T_6 and T_7. The data furnished in Table 50 showed that among the different treatments of multi-tier cropping system, treatment T_6 (Paired row planting of Bt cotton with one row each of intercrop soybean and groundnut) were reported higher in seed cotton equivalent yield 3984 kg/ha, followed by paired row planting of Bt cotton with two rows of intercrop groundnut T4(3679 kg/ha). For the relative production efficiency, relative economic efficiency and land equivalent ratio. Bt cotton paired row planting and intercropping were found superior than sole cotton crop and other treatment.The system of $T_{3.}$ paired row planting of Bt cotton with two rows of intercrop soybean registered higher relative economic efficiency (63.25 %) , net return (Rs 208535/ha) and B:C (2.96).

Table 50. Seed cotton yield (kg ha-1), intercrop yield, Seed cotton equivalent yield (kgha^{-1})and economics as influenced by multitier cropping system at Junagadh

Treatments	Intercrop yield (kg/ha)	Seed cotton Yield (kg/ha)	Seed cotton equivalent yield (kg/ha)	Relative production efficiency (RPE)	Relative economic efficiency	Land equivalent ratio	Gross return (Rs./ha)	Net Return (Rs./ha)	BCR
T_1. Sole Bt cotton	00	2035	2035	-		-	171816	127743	2.42
T_2.Paired row planting of Bt cotton with two rows of intercrop sesamum	00	**2652**	2652	11.39	20.09	-	223777	153409	2.68
T_3.Paired row planting of Bt cotton with two rows of intercrop soybean	1139	**2757**	3537	15.19	**63.25**	1.73	295335	**208535**	**2.96**
T_4.Paired row planting of Bt cotton with two rows of intercrop groundnut	1159	**2885**	3679	15.80	29.28	1.85	327342	165145	2.48
T_5.Paired row planting of Bt cotton with one rows sesamum +one row soybean	00 + 927	**2675**	3310	14.21	37.49	1.63	276727	175637	**2.77**
T_6Paired row planting of Bt cotton with one rows soybean +one row groundnut	989+805	**2756**	3984	**17.11**	38.73	1.67	345074	177215	2.64
T_7Paired row planting of Bt cotton with one rows groundnut + one row sesamum	814+00	**2771**	3328	14.29	17.27	1.65	292620	149800	2.48
T_8.Farmers practice	00	1912	1912	-8.21	-17.36	-	161435	105563	2.14
T_9.Recommended intercropping	00	2318	2318	9.95	4.84	-	195614	133924	2.55
SEd		208							
		625							

Soil parameters of pH:7.91, Soil Ec(dSm^{-1}): 0.36, OC (%):0.87, av. N :201 kg/ha, P_2O_5 :38.50 kg/ha, K_2O: 405 kg/ha, recommended spacing As per treatment, recommended nutrients 240-:50:150 NPK kg/ha, Cotton species/type: G.Cot. Hy. 8 BG-II, environment: irrigated and total rainfall :1319 mm during cropping periods.

Khandwa

The results of experiment on multitier cropping systems showed that the significantly highest seed cotton yield was observed under sole cotton(1242 kg/ha) followed by intercropping of cotton with green gram and black gram (T5, 1197 kg/ha) .The significantly highest seed cotton equivalent yield (1940 kg/ha) relative production efficiency (56.5%) , relative economic efficiency (137.2 %), gross return (Rs135816/ha), net return (Rs75847/ha) and benefit cost ratio (2.3) were reported with T9.Two row of cotton+ two row of soybean (Table 51). The intercropping system also suppressed the weeds. The highest weed smothering efficiency (32.8 %) was registered with T_2: Paired row planting of Bt cotton with two rows of Soybean

Table 51 Seed cotton yield (kg ha^{-1}), intercrop yield, Seed cotton equivalent yield (kg ha^{-1}) and economics as influenced by multitier croppingsystem at Khandwa

Treatments	Seed cotton yield (kg/ha)	Intercrop yield (kg/ha)	Seed cotton equivalent yield (kg/ha)	Relative production efficiency (RPE)	Relative Economic efficiency	Land equivalent ratio	Weed smothering efficiency	Diversification index	Gross return (Rs/ha)	Net Return (Rs./ha)	BCR
T1: Sole Bt Cotton	1242	-	1242	0	0	1	0	1	86973	32605	1.6
T2: Paired row planting of Bt cotton with two rows of Soybean	905	1.45	1243	0.7	-17.8	1.1	32.8	2.5	87020	25651	1.4
T3: Paired row planting of Bt cotton with two rows of Black gram	1050	1.17	1281	4.0	-2.8	1.3	25.2	0.6	89688	29919	1.5
T4: Paired row planting of Bt cotton with two rows of Green gram	843	1.06	1117	-9.9	-46.2	1.2	27.0	1.9	78191	17222	1.3
T5: Paired row planting of Bt cotton with one row of Green gram + one row Black gram	1197	1.07	1441	16.3	26.7	1.4	32.2	0.6	100874	40505	1.7
T6: Paired row planting of Bt cotton with one row of Soybean + one row Green gram	911	1.17	1195	-3.3	-23.8	1.1	23.8	0.3	83640	23772	1.4
T7: Paired row planting of Bt cotton with one row of Black gram + one row Soybean	971	1.0	1185	-4.4	-28.3	1.1	27.2	0.4	82934	23066	1.4
T5: Farmers Practice: 2 Cotton + 1 Pigeonpea	808	1.52	1260	2.0	-9.4	0.7	21.8	0.9	88189	28220	1.5
T9: Recommended Intercropping : 2 Cotton +2 Soybean	1196	2.5	1940	56.5	137.2	1.0	17.2	0.5	135816	75847	2.3
SEd	129.15		139.779	11.1	30.0	0.1	5.3	1.0	9785	9785	0.2
CD (5%)	273.8		296.3						20742	20742	0.34

Soil parameters pH :7.79, Ec(dSm^{-1}) : 0.504, Organic Carbon (%) : 0.620, Available N, P_2O_5 & K_2O (kg/ha) – 212.7 (N), 12.5 (P_2O_5)& 380.6 K_2O, Recommended spacing :90 X 60 cm, Nutrients applied – NPK @ 125:60:40 kg/ ha, Cotton species/type :Hirsutum (Hybrid), Environment – Rainfed and total rainfall (mm) during cropping periods :1044 mm.

Surat

The results of multitier cropping system revealed that seed cotton yield was not affected significantly due to different systems. Significantly lowest weed count (26.67 per sqm) weed biomass (56.82 g per sqm) was recorded in treatment T_5 : Paired row planting of *Bt* cotton with one row of Cowpea + one row of Indian bean. Among intercropping systems, higher seed cotton equivalent yield was recorded in T_3 : Paired row planting of *Bt* cotton with two rows of Indian bean (2885 kg/ha) and lower seed cotton equivalent yield was recorded in treatment T_4 : Paired row planting of *Bt* cotton with two rows of Soybean(2227 kg/ha). Multi-tier cropping system treatments recorded range of relative production efficiency (RPE) from 4.95 (T4) to 35.96 % (T3), relative economic efficiency (REE) from 3.6 % (T4) to 47.9 % (T3), land equivalent ratio (LER) from 1.56 (T2) to 2.11 (T3) and diversity index (DI) from 1.19 (T8) to 1.57 (T6)(Table 52). The system T_5 : Paired row planting of *Bt* cotton with one row of Cowpea + one row of Indian bean T_5 registered the highest weed smothering efficiency of 42.63 %. The maximum gross and net returns were found with T_3 : Paired row planting of *Bt* cotton with two rows of Indian bean which worked out to be Rs. 216375/- and Rs. 145184/- per hectare, respectively. The highest BCR was also found with same system T_3 (3.04).

Table 52 . Seed Cotton yield (kg ha^{-1}), intercrop yield, Seed cotton equivalent yield (kg ha^{-1}) and economics as influenced by multitier croppingsystem at Surat

Treatments	SCY (kg/ha)	Seed cotton equivalent yield (kg/ha)	Gross return (Rs/ha)	Net Return (Rs/ha)	BCR	Relative production efficiency (RPE) (%)	Relative Economic efficiency (%)	Land equivalent ratio	Diversification index
T_1 : Sole *Bt Cotton* (Paired row planting)	2122	2122	159150	98148	2.61	0.00	0.0	1.00	1.00
T_2 : Paired row planting of *Bt* cotton with two rows of Cowpea	1978	2252	168890	102744	2.55	6.12	4.7	1.56	1.20
T_3 : Paired row planting of *Bt* cotton with two rows of Indian bean	1725	2885	216375	145184	3.04	35.96	47.9	2.11	1.51
T_4 : Paired row planting of *Bt* cotton with two rows of Soybean	1805	2227	167025	101690	2.56	4.95	3.6	1.62	1.52
T_5 : Paired row planting of *Bt* cotton with one row of Cowpea + one row of Indian bean	1854	2551	191345	122659	2.79	20.23	25.0	1.81	1.38
T_6 : Paired row planting of *Bt* cotton with one row of Indian bean + one row of Soybean	1746	2513	188450	120320	2.77	18.41	22.6	1.83	1.57
T_7 : Paired row planting of *Bt* cotton with one row of Soybean + one row of Cowpea	1953	2311	173340	107169	2.62	8.92	9.2	1.63	1.29
T_8 : Farmers practices : *Bt* Cotton hybrid sown at 120 cm x 45 cm spacing + One row of intercrop (Soybean)	1996	2437	182800	116128	2.74	14.86	18.3	1.74	1.19
T_9 : Recommended intercropping : *Bt* Cotton hybrid sown at 120 cm x 45 cm spacing + One row of intercrop (Green gram)	2061	2455	184115	118038	2.79	15.69	20.3	1.63	1.33
SEd	148								
CD (5%)	NS								

P^H :7.40, EC(dsm^{-1}):0.58, OC(%):0.48, Available N: 247kg/ha, Available P_2O_5: 34.0kg/ha, Available K_2O: 554kg/ha, Recommended spacing: Cotton pair row: 180 x 60 x 45 cm, Recommended nutrients: Cotton: 240:40:00 NPK kg/ha, Inter crops: 20/25:40/50:00/00 NPK kg/ha, Cotton species type: Gossypium hirsutum Bt Cotton Hybrid, Environment: Irrigated, Total rainfall:1493mm

Nanded

The results of multitier cropping system revealed that the highest seed cotton yield ha^{-1} was recorded in Sole cotton in paired row (T10 3170 kg ha^{-1}). It was significantly superior over farmers practice, recommended intercropping and intercropping two rows of foxtail millet and coriander. Lowest weed count and weed dry weight was recorded in recommended intercropping of Cotton + Green gram (1:2) in conventional spacing (T_9). By virtue of intercrop yield, recommended intercropping of Cotton + Green gram (1:2) in conventional spacing recorded highest seed cotton equivalent yield (3321 kg ha^{-1}) (Table 53). The GMR of the intercropping systems was non-significant. The intercropping one row each of coriander and green gram in paired row of cotton (T_7) has recorded highest NMR (Rs 181858/ha) and was closely followed by recommended intercropping (T_9 - cotton + green gram in 1:2 proportion - Rs180428/ha). The recommended intercropping system of cotton + green gram in 1:2 proportion (T_9) was the most remunerative with highest BCR of 2.70. The paired row planting of Bt cotton with one row each of coriander and gram in wider row (T_7) recorded highest Relative production efficiency (6.74) and Relative Economic efficiency (0.13) followed by recommended intercropping of Cotton + green gram in 1:2 row proportion (T9). However recommended intercropping of Cotton + green gram in 1:2 row proportion in conventional spacing (T9) was the most efficient in terms of Land equivalent ratio (1.62), Weed smothering efficiency (25.07) and Diversification index (1.383).

Table 53. Seed Cotton yield (kg ha^{-1}), intercrop yield, Seed cotton equivalent yield (kg ha^{-1})and economics as influenced by multitier cropping system at Nanded

Treatments	Intercrop yield(kg /ha)	Seed cotton Yield (kg/ha)	Seed cotton equivalent yield (kg/ha)	Relative production efficiency (RPE)	Relative Economic efficiency	Land equivalent ratio	Diversification index	Gross return (Rs/ha)	Net Return (`/ha)	BCR
T1. Sole Bt cotton	-	3119	3119	0.00	0.00	1.00	1.000	269292	160966	2.48
T2.Paired row planting of Bt cotton with two rows of intercrop - Green gram (A)	490	2879	3266	4.21	0.09	1.37	1.234	281936	175046	2.64
T3.Paired row planting of Bt cotton with two rows of intercrop - Foxtail millet (B)	285	2793	2918	-8.07	-0.09	1.24	1.086	251935	146331	2.38
T4.Paired row planting of Bt cotton with two rows of intercrop - Coriander (C)	604	2798	2962	-5.34	-0.07	1.22	1.111	255739	149916	2.42
T5.Paired row planting of Bt cotton with one rows Green gram (A) +one row (B)	394 + 216	2804	3210	2.51	0.06	1.51	1.256	277095	171248	2.62
T6Paired row planting of Bt cotton with one rows (B) +one row (C)	239 + 324	2874	3067	-2.05	-0.02	1.38	1.128	264771	158190	2.48
T7Paired row planting of Bt cotton with one rows (C) +one row Green gram (A)	397 + 384	2941	3352	6.74	0.13	1.51	1.249	289386	181858	2.69
T8 Farmers practice (Cotton Pigeon pea)	513	2718	3104	-0.42	0.01	1.16	1.245	267980	163019	2.55
T9. Recommended intercropping (Cotton + Green gram; 1:2)	837	2660	3321	6.04	0.12	1.62	1.383	286716	180428	2.7
T10. Paired row planting of Bt cotton (sole) 150-90 x 45 cm	-	3170	3170	1.09	0.02	1.02	1.000	273666	164707	2.51
SEd	-	145.28	145.1					12526	10716	-
CD (5%)	-	305.22	304.84					N.S.	22513	-

Soil parameters : of pH : 8.08, Soil Ec (dSm$^{-1)}$: 0.26, Organic Carbon(%) - 0.48, Available N : 148.30 kg ha^{-1}, P_2O_5 : 12.14 kg ha^{-1} & K_2O :435.82 kg ha^{-1}, recommended spacing :120 x 45 cm, recommended

nutrients : 120:60:60 NPK kg ha^{-1}, Cotton species/type :hirsutum *Bt* hybrid, environment : rainfed and total rainfall : 1294 mm

Rahuri

The multi intercropping results revealed that Sole Bt cotton (T1, 2411 kg/ha) recorded the significantly highest seed cotton yield; which was on par with intercropping system (T_2) of Paired row planting of Bt cotton with two rows of intercrop green gram (2285kg/ha). The highest net return (Rs.85,065 ha^{-1}), B:C ratio (2.0) and seed cotton equivalent yield (2812 Kg ha^{-1}) were recorded with (T_2) of Paired row planting of Bt cotton with two rows of intercrop green gram (Table 54).The weed smothering effect of soybean, green gram and pigeon pea on 2:1:1:1 ratio ($T_{8,}$ 55.86 %) is maximum as compared to rest of the treatments at 45 days after sowing. The system T2.Paired row planting of Bt cotton with two rows of intercrop green gram same system calculated the highest system indices as relative production efficiency (16.63 %), relative economic efficiency (37.17 %) and system profitability (Rs.945/ha/day) . The economic indices also revealed that system (T_2) registered higher gross monetary returns (Rs.170976.6/ha), net monetary returns (Rs. 85065.0/ha.) and B: C ratio (2.0)

Table 54. Seed Cotton yield (kg ha^{-1}), intercrop yield, Seed cotton equivalent yield (kg ha^{-1}) and economics as influenced by multitier cropping system at Rahuri

Treatments	Seed cotton Yield (kg/ha)	Seed cotton equivalent yield (kg/ha)	Relative production efficiency (RPE)	Relative Economic efficiency	Land equivalent ratio	Gross return (Rs/ha)	Net Return (Rs/ha)	BCR
T1. Sole Bt cotton	2411	2411	0.0	0.0	0.0	146595	62012	1.7
T2.Paired row planting of Bt cotton with two rows of intercrop (Green Gram)	2285	2812	16.6	37.2	1.4	170977	85065	2
T3.Paired row planting of Bt cotton with two rows of intercrop (Soybean)	1829	2601	7.9	-40.2	1.2	124558	37081	1.4
T4.Paired row planting of Bt cotton with two rows of intercrop (Pigeonpea)	1000	2091	-13.3	-116.2	0.9	76273	-10027	0.9
T5.Paired row planting of Bt cotton with one rows (Green Gram) +one row (Soybean)	1450	2362	2.5	-10.6	1.2	150233	55419	1.6
T6Paired row planting of Bt cotton with one rows (Soybean) +one row (Pigeonpea)	1133	2329	-3.4	-24.4	1.0	141595	46877	1.5
T7Paired row planting of Bt cotton with one rows (Pigeonpean) +one row (Green Gram)	1567	2499	3.7	-0.2	1.2	154660	61884	1.7
T8. Paired row planting of Bt cotton with one rows (Green Gram) +one row (Soybean) + one row (Pigeon pea)	1314	2535	5.1	-12.2	1.2	149675	54478	1.6
T9. Farmers practice (one row pigeonpea)	1582	2411	0.0	-1.2	1.0	146613	61276	1.7
T10. Recommended intercropping (one row Green gram)	2124	2748	14.0	30.8	1.4	167048	81136	1.9
SEd(±)	128	181				10208	10208	0.1
CD @ 5%	3	380				21445	21445	0.2

P^H:7.5, EC(dsm^{-1}):0.22, OC(%):0.48, Available N: 150kg/ha, Available P: 9.80kg/ha, Available K: 64kg/ha, Genotype used:Ajeet-155 Bt cotton, Environment:Irrigated, Total rainfall:1028.4mm

Bhawanipatna

The evaluation of multi tier system revealed that different growth and yield parameters and seed cotton yield were significantly affected by different system. The significantly higher seed cotton yield (2154 kg/ha) was recorded sole cotton (T1). However, Seed cotton equivalent yield was maximum in T5 (2317 kg/ha) i,e. Paired row of Bt cotton with one rows (Arhar) +one row (Black gram) followed by T_2.Paired row of Bt cotton with two rows of intercrop(Arhar) with 2277 kg/ha. The highest return of Rs. 88057/ha and benefit cost ratio of 2.52 were obtained in T5 (Paired row of Bt cotton with one rows (Arhar) +one row (Black gram) (Table 55). The higher relative production efficiency (RPE, 7.6%) and relative economic efficiency (REE, 12.3 %) were calculated with same T5 (Paired row of Bt cotton with one rows (Arhar) +one row (Black gram) . Land equivalent ratio (LER) was maximum in T6 (1.34) followed by T4(1.32) and T5(1.31). Weed smothering efficiency (WSE) was maximum in T6 (Paired row of Bt cotton with one rows (Black gram) +one row (Soybean) at all the three dates of observation i,e. 30 DAS (24.9), 60 DAS (23.5) and 90 DAS (22.8). Diversity index (1.59) was also higher with T6 (Paired row of Bt cotton with one rows (Black gram) +one row (Soybean)

Table 55. Seed Cotton yield (kg ha^{-1}), intercrop yield, Seed cotton equivalent yield (kg ha^{-1}) and economics as influenced by multitier cropping system at Bhawanipatna

Treatments	Seed cotton yield (kg/ha)	Intercrop yield	Seed cotton equivalent yield	Relative production efficiency (RPE)	Relative Economic efficiency	Land equivalent ratio	Diversity index	Gross return	Net Return (Rs/ha)	BCR
T1. Sole Bt cotton	2154	-	2154	-	-	1	1	135702	78419	2.37
T2.Paired row of Bt cotton with two rows of intercrop (Arhar)	1828	435.3	2277	5.7	9.2	1.27	1.54	143440	85671	2.48
T3.Paired rowof Bt cotton with two rows of intercrop (Black gram)	1762	390	2258	4.8	7.1	1.29	1.54	142227	84009	2.44
T4.Paired row of Bt cotton with two rows of intercrop (Soybean)	1739	613.3	2129	-1.2	-2.7	1.32	1.52	134111	76318	2.32
T5.Paired row of Bt cotton with one rows (Arhar) +one row (Black gram)	1764	270 + 217	2317	7.6	12.3	1.31	1.55	145992	88057	2.52
T6. Paired row of Bt cotton with one rows (Black gram) +one row (Soybean)	1749	230 + 317	2242	4.1	6.3	1.34	1.59	141246	83328	2.44
T7. Paired row of Bt cotton with one rows (Soybean) +one row (Arhar)	1747	300 + 217	2161	0.3	-0.1	1.26	1.55	136143	78351	2.36
T8. Farmers practice (intercrop Arhar without row ratio)	1596	325	1932	-10.3	-18.3	1.07	1.46	121687	64086	2.11
T9.Recommended intercropping(Cotton + Arhar = 8:2)	1819	336.7	2166	0.6	0.3	1.17	1.43	136459	78691	2.36
SEd	56.44	-	55.11			0.03	0.04	3546.76	3469.47	0.06
CD (5%)	**119.65**	-	116.83			0.06	0.08	7518.8	7354.96	0.13

Black cotton soil, 1.5 -2.0 m, Clay loam, pH: 6.1, O.C(%) : 0.63 , Available nutrients: N: 128, P_2O_5 : 38.5, K_2O : 252, Recommended nutrients :120:60:60 kg/ha, Spacing:90 x 60 cm , Rainfed:1247 mm

Dharwad

The significantly highest seed cotton yield (2466 kg/ha) , seed cotton equivalent yield (3184 kg/ha) , gross return (Rs 222,880 /ha), net return (Rs 155,816/ha), benefit cost ratio (3.32) recorded with T_7 Paired row planting of Bt cotton with one row (C) (Coriander) +one row (A) (Green gram). The same system registered higher Relative production efficiency (32.1%) , Relative Economic efficiency (66.0%), Land equivalent ratio (1.47)and Diversification index (1.60) (Table 56).

Table 56 Seed Cotton yield (kg ha^{-1}), intercrop yield, Seed cotton equivalent yield (kg ha^{-1}) and economics as influenced by multitier cropping system at Dharwad

Treatments	Seed cotton Yield (kg/ha)	Intercrop yield (kg/ha)	Seed cotton equivalent yield (kg/ha)	Gross return (Rs/ha)	Net Return (Rs/ha)	BCR	Relative production efficiency (RPE)	Relative Economic efficiency	Land equivalent ratio	Diversification index
T1. Paired row Sole Bt cotton (60-120-60x 60cm)	2161		2161	151270	94026	2.64	0	0	1	1
T2. Paired row planting of Bt cotton with two rows of intercrop (A) (Green gram)	2180	--	2710	189723	125677	2.96	20.1	34.3	1.26	1.46
T3. Paired row planting of Bt cotton with two rows of intercrop (B) (Beans)	2178	530	2499	174907	108397	2.62	12.3	15	1.16	1.29
T4. Paired row planting of Bt cotton with two rows of intercrop (C) (Coriander)	2071	14969	2650	185500	121890	2.91	18	30.7	1.23	1.53
T5. Paired row planting of Bt cotton with one row (A) (Green gram) +one row (B) (Beans)	2447	2701	2964	207480	140192	3.08	26.9	49.7	1.38	1.43
T6 Paired row planting of Bt cotton with one row (B) (Beans) +one row (C) (Coriander)	2403	352+ 7677	2842	198917	131807	2.96	23.8	41	1.32	1.37
T7 Paired row planting of Bt cotton with one row (C) (Coriander) +one row (A) (Green gram)	2466	5826+ 1466	3184	222880	155816	3.32	32.1	66	1.47	1.6
T8. Farmers practice (without intercrop with 90x60 cm spacing	2231	1312+ 437	2231	156147	98025	2.68	0	0	1	1
T9. Recommended intercropping (Cotton + Green gram at 90x60 cm)	2459	--	3032	212263	148355	3.32	28.7	58	1.4	1.44
T10: Recommended intercropping (Cotton + Beans at 90x60 cm)	2415	574	2705	189327	121865	2.81	20.1	30	1.25	1.24
SE(d)	136	-	134	9381	8868	0.12	4.5	9.8	0.07	0.05
C.D.	286	14969	284	19862	18775	0.26	9.5	20.8	0.14	0.1

Genotype : **Ajeet 155 BGII,** Medium deep black, pH: 7.2 , OC(%): 0.51, Recommended Nutrient levels:100: 50: 50 kg NPK/ha and 50 % of RDF to the intercrops as per populations Environment: Rainfed , Rainfall received: 1077 mm in 74 rainy days

Srivilliputhur

The multi-tier cropping system revealed that growth characters, yield attributes and seed cotton yield were not influenced by the different intercrop combinations in multitier cropping. The results revealed that the intercrops selected were compatible with cotton. The highest cotton equivalent yield of 3382 kg/ha was arrived with (T5 - Paired row planting of Bt cotton with one row onion + one row cluster bean) and followed by (T8 - Paired row planting of Bt cotton with1row onion+1 row cluster bean+1 row coriander, 2985 kg/har) and (T3 - Paired row planting of Bt cotton with two rows of cluster bean , 2866 kg/ha).Observation on the weed dry weight at 60 days after sowing revealed that sole Bt cotton (T_1 – Sole Bt Cotton (No weeding) registered the highest dry weight of 212.7 g/m^2.

The higher land equivalent ratio of 1.11 was derived with paired row planting of Bt cotton to two rows of onion (T_2 –Paired row planting of Bt cotton with two rows of onion). This was followed by T8. Pared row planting of Bt cotton + 1 row of cotton + 1 row of cluster bean + 1 row coriander. The highest relative production efficiency of 89% was recorded with paired row planting of Bt cotton + 1 row of onion + 1 row of cluster bean. This was followed by (T8 - Paired row planting of Bt cotton with1row onion+1 row cluster bean+1 row coriander).. The highest Net returns of Rs.1,25,105 / ha was derived with (T_5 –Paired row planting of Bt cotton with one row onion + one row cluster bean) followed by (T_2 –Paired row planting of Bt cotton with two rows of onion). Paired with (T_3 –Paired row planting of Bt cotton with two rows of cluster bean) registered the highest BCR of 2.39 followed by (T_4 –Paired row planting of Bt cotton with two rows of coriander).

Table 57. Seed Cotton yield (kg ha^{-1}), intercrop yield, Seed cotton equivalent yield (kg ha^{-1}) and economics as influenced by multitier cropping system at Srivilliputhur

Treatments	Seed cotton Yield (kg/ha)	Intercrop yield (kg/ha)	Seed Cotton equivalent yield (kg/ha)	Relative production efficiency (RPE) (%)	Relative Economic efficiency (%)	Land equivalent ratio	Gross return	Net Return (Rs/ha)	BCR
T_1 – Sole Bt Cotton (No weeding)	1683	--	1783	0	0	1.00	169818	93653	2.22
T_2 –Paired row planting of Bt cotton with two rows of onion	1862	Onion – 1527	2625	47	22.9	1.11	208747	112447	2.16
T_3 –Paired row planting of Bt cotton with two rows of cluster bean	1768	Cluster bean - 3025	2866	60	25.2	1.05	212735	123985	2.39
T_4 –Paired row planting of Bt cotton with two rows of coriander	1774	Coriander –764	2492	39	11.4	1.05	189178	109808	2.38
T_5 –Paired row planting of Bt cotton with one row onion + one row cluster bean	1705	Onion – 695	3382	89	38.8	1.01	235825	125105	2.13
T_6 –Paired row planting of Bt cotton with one row cluster bean + one row coriander	1685	Cluster bean – 1618	2944	65	18.4	1.00	201149	114674	2.32
T_7 – Paired row planting of Bt cotton with one row onion + one row coriander	1710	Onion – 750	2691	50	22.9	1.02	208872	117822	2.29
T_8 – Paired row planting of Bt cotton with1row onion+1 row cluster bean+1 row coriander	1793	Onion – 657	2985	67	32.6	1.06	225305	122925	2.21
T_9 –Farmers' practice (1 row Bt cotton + 1 row black gram)	1715	Black Gram – 115	1828	3	-2.8	1.02	165215	89465	2.18
T_{10} – Recommended intercropping (1 row Bt cotton + 1 row green gram)	1747	Green Gram - 128	1895	6	-1.1	1.04	168025	92275	2.22
SEd	109								
CD (5%)	NS								

Cotton Genotypes :Jadoo Bt,Clay loam, pH:8.26, Soil fertility status (kg/ha): N: 196 (Low)P_2O_5 :40 (High)K_2O : 446 (High), O.C.(%):7.2,Recommended nutrient level: 120 : 60 : 60 Kg NPK /ha,Recommended spacing: 20 x 60 cm, Environment: Irrigated

Raichur

The multi-tier cropping system revealed that Significantly higher seed cotton yield (2813 kg/ha) was recorded in Sole Bt cotton which was on par with Bt cotton + Black Gram+ Soybean (2683 kg/ha), Bt Cotton+ Sesamum+ Blackgram (2678 gk/ha) and Groundnut (2638 kg/ha) (recommended inter crop). All the intercropping systems were found on par with each other. Higher yield was mainly attributed to higher number of sympodia/plant, higher number of bolls per sq.

Significantly lower weed number (5.3/m2) was recorded in Bt cotton + Soybean + Sesamum + Black Gram inter cropping system followed by Bt cotton + Black Gram and Bt cotton + Green gram inter intercropping system (5.4/m2).Significantly higher Gross Returns (Rs. 213813/-), Net Returns (Rs. 140117/-) and B: C (2.90) were recorded in T2.Paired row planting of Bt cotton with two rows of intercrop, Soybean (A) and followed by sole Bt cotton

Higher Relative Production Efficiency (2.92) and Relative Economic Efficiency (2.92) were recorded in Bt cotton + groundnut intercropping system. Significantly higher LER (1.31) was recorded with Bt + sesamum + blackgram intercropping system . The relatively higher Weed Smothering Efficiency (51.40%) was recorded in Bt cotton + Green gram and Bt cotton + groundnut (50.90%) intercropping systems.

Table 58 Seed Cotton yield (kg ha^{-1}), intercrop yield, Seed cotton equivalent yield(kg ha^{-1}) and economics as influenced by multitier cropping system at Raichur

Treatments	Seed cotton Yield (kg/ha)	Intercrop yield (kg/ha)	Seed cotton equivalent yield (kg/ha)	Relative Production Efficiency (RPE)	Relative Economic Efficiency (REE)	Land Equivalent Ratio (LER)	Diversification index	Gross Returns	Net Returns (Rs/ha)	BCR
T1. Sole Bt cotton	2813	--	2813	0	0	1	1	213813	140117	2.9
T2.Paired row planting of Bt cotton with two rows of intercrop, Soybean (A)	2663	309	2866	1.78	1.78	1.18	1.23	217821	142225	2.88
T3.Paired row planting of Bt cotton with two rows of intercrop, Sesamum (B)	2565	204	2739	-3.83	-3.83	1.13	1.16	208153	132457	2.75
T4.Paired row planting of Bt cotton with two rows of intercrop, Black gram (C)	2662	222	2795	-1.58	-4.74	1.17	1.5	212412	136711	2.81
T5.Paired row planting of Bt cotton with one row of Soybean (A) + one row of Sesamum (B)	2646	163+144	2876	1.84	1.84	1.23	1.24	218601	139505	2.76
T6 Paired row planting of Bt cotton with one row of Sesamum (B) +one row of Black gram (C)	2678	138+156	2898	1.72	1.72	1.31	1.23	220276	141075	2.78
T7 Paired row planting of Bt cotton with one row of Black gram (C) +one row of Soybean (A)	2683	148+179	2898	2.14	2.14	1.28	1.34	220266	141165	2.78
T8 Recommended intercropping (Groundnut as intercrop)	2638	396	2925	2.92	2.92	1.17	1.47	222293	142972	2.8
T9. Farmers practice (Green gram as inter crop)	2455	225	2603	-7.92	-7.92	1.13	1.88	197813	120629	2.56
T10. Paired row planting of Bt cotton with one row of Soybean (A) + one row of Sesamum (B) + one row of Black gram (C)	2281	176+125 +90	2537	-11.18	-11.18	1.23	1.52	192849	112153	2.39
SEd	168	--	167	6.2	6.2	0.06	0.06	12738	12738	0.16
CD (5%)	500	--	498	NS	NS	0.18	0.18	37846	37846	0.48

Genotype: **Jaadoo (Bt cotton),**Medium black soil and fine, pH :8.05, Soil fertility status: N: 256 kg/ha, P_2O_5 : 34 kg/ha, K_2O: 284 kg/ha, O.C.(%) : 0.52 , Recomended nutrient level: 180:90:90 kg, NPK/ha, Environment : Irrigated

Coimbatore

The experiment was conducted under irrigated ecosystem in the department of cotton farm , TNAU, CBE . Seed cotton yield was not significantly influenced by intercropping system. The highest seed cotton equivalent yield (4246 kg/ha), net return (Rs 160643/ ha) and BCR (3.06) was recorded with T_2.Paired row planting of cotton with two rows of cluster bean . Higher LER (1.95) was recorded with T_4Paired row planting of Bt cotton with two rows of coriander (Table 59)

Table 59. Seed Cotton yield (kg ha^{-1}), Seed cotton equivalent yield (kg ha^{-1}) and economics as influenced by multitier cropping system at Coimbatore

Treatments	Seed cotton Yield (kg ha^{-1})	Seed cotton equivalent yield (kg ha^{-1})	Land equivalent ratio	Weed smothering efficiency (%)	Gross return (Rs. ha^{-1})	Net Return (Rs. ha^{-1})	BCR
T_1. Sole Bt cotton	2117	2072	1.00	-	113785	37291	1.49
T_2.Paired row planting of Bt cotton with two rows of Cluster bean	2148	4246	1.70	72.78	238600	160643	3.06
T_3.Paired row planting of Bt cotton with two rows of Beetroot	1750	3356	1.06	76.89	184525	105889	2.35
T_4.Paired row planting of Bt cotton with two rows of Coriander	2030	2758	1.95	74.30	151325	73640	1.95
T_5.Paired row planting of Bt cotton with one rows of Cluster bean and Beetroot	1696	4175	1.39	75.52	221750	143469	2.83
T_6Paired row planting of Bt cotton with one rows of Beetroot and one row Coriander	1852	3210	1.55	54.02	176500	98884	2.27
T_7Paired row planting of Bt cotton with one rows of Coriander and Cluster bean	1744	3589	1.83	71.0	195125	116788	2.49
T_8.Farmers practice	1934	2812	1.48	72.1	161350	83759	2.08
T_9.Recommended intercropping(Black gram)	1804	2645	1.48	73.5	145600	68009	1.88
SEd	193						
CD (5%)	NS						

Soil: Brown, pH:8.35, Soil fertility status:N : 224 kg ha^{-1}, P_2O_5:28 kg ha^{-1}, K_2O : 730 kg ha^{-1}, OC(%) : 0.54, Environment:Irrigated

Chamrajnagar

The data of multitier intercropping system trial revealed that significant reduction of seed cotton yield by multitier intercropping systems as compared to sole Bt cotton(T_1, 1749 kg ha^{-1}). Among the intercropping systems paired row of cotton intercropped with two rows of black gram recorded significantly higher seed cotton (T_3,1510 kg ha^{-1}), followed by paired row of cotton with two rows of green gram (T_2,1463 kg ha^{-1}) and both were found to be on par with each other (Table 60).

Seed cotton equivalent yield was significantly higher in cotton +cluster bean intercropping system (T_9,2369 kg ha^{-1}), followed by cotton + groundnut (T_{10}, 2060 kg ha^{-1}), paired row of cotton + black gram (T_3, 2091 kg ha^{-1}) and paired row of cotton+ green gram (T_2, 2043 kg ha^{-1}). Cotton + cluster bean intercropping system (T_9) recorded significantly higher gross return (**Rs.**.201356 ha^{-1}) and net returns (**Rs.**103531 ha^{-1}), followed by cotton +black gram intercropping system (T_3, **Rs.**. 177708 ha^{-1} and **Rs.**.99795 ha^{-1}, respectively). However, the benefit-cost ratio was maximum in cotton+ green gram (T_2, 2.3) followed by cotton + black gram intercropping system (T_3, 2.28) .The lowest was recorded in sole cotton (T_1, 2.02). Intercropping system significantly enhanced the production system efficiencies. The relative production efficiency (RPE) ranged between 4.4 to 38.7, relative economic efficiency (REE) of 7.1 to 42.1, land equivalent ratio (LER) of 1.16 to 1.26 and diversity index (DI) of 1.01 to 1.25.

Table 60. Seed Cotton yield (kg ha^{-1}), intercrop yield, Seed cotton equivalent yield (kg ha^{-1}) and economics as influenced by multitier cropping system at Chamrajnagar

Treatments	Seed cotton Yield (kg/ha)	Intercrop yield	Seed cotton equivalent yield	Relative production efficiency (RPE)	Relative Economic efficiency	Land equivalent ratio	Gross return	Net Return (Rs/ha)	BCR
T1. Sole Bt cotton	1749	-	1749	0	0	1	148681	74877	2.02
T2. Paired row planting of Bt cotton with two rows of green gram	1463	384	2043	14.1	20.4	1.21	173619	97957	2.3
T3. Paired row planting of Bt cotton with two rowsof black gram	1510	415	2091	18.5	27	1.25	177708	99795	2.28
T4. Paired row planting of Bt cotton with two rows of sesame	1352	216	1968	5.1	7.6	1.01	167266	93933	2.28
T5. Paired row planting of Bt cotton with one row of each green gram and black gram	1436	204+212	1914	8.7	12.2	1.2	162732	85994	2.12
T6 Paired row planting of Bt cotton with one row of each black gram and sesame	1406	197+114	1878	6	8.6	1.19	159589	84217	2.12
T7 Paired row planting of Bt cotton with one row of each green gram and sesame	1326	189+122	1872	5.1	7.2	1.16	159093	86245	2.18
T8 Paired row planting of Bt cotton with one row of each green gram, black gram and Sesame	1265	117+129+ 114	1845	4.4	7.1	1.17	156816	81593	2.09
T9. Farmers practice (cotton + cluster bean)	1349	3512	2369	38.7	42.1	1.25	201356	103531	2.06
T10.Recommended intercropping (cotton+ groundnut)	1404	661	2060	20	28.6	1.24	175108	91033	2.08
SEd	120.1	-	43.8	-	-	-	-	-	-
CD (5%)	252.7	-	92.18	-	-	-	-	-	-

Soil type: Red clay loamy, pH:8.2, EC(dSm^{-1}):0.346, OC (%):0.40, Environment: Rainfed, Soil fertility status :N (kg/ha):185.4, P2O5:45.5 kg/ha,K2O:745.8 kg/ha
Rainfall (mm):1030.2 mm

LAM

The results found that sole Bt cotton (T1) recorded the maximum seed cotton yield (2398 kg/ha) and comparable with paired row of Bt cotton with two rows of foxtailmillet (T4) (2174 kg/ha) and paired row of Bt cotton with one row of foxtailmillet + one row of green gram (T7) (2151kg/ha) but significantly superior over T9, T5, T8, T6, T2 and T3. Weed density at 20 DAS at 45DAS are evident that significantly higher density and weed dry matter was found in T8 Farmer's Practice (120x60 cm) .The lowest weed population and weed dry matter was noticed with T4 and T9, which might be due to suppression of weeds by the intercrops (foxtailmillet and green gram) during critical period of the crop growth. Higher weed smothering efficiency at 20 DAS (29.69 %) and at 45 DAS (52.31%) were recorded by paired row of Bt cotton with 2 rows of foxtailmillet (T4) followed by paired row of Bt cotton with 3 rows of greengram (T9).The maximum seed cotton equivalent yield (2502 kg/ha) and maximum net returns (Rs.89, 624/- ha) was noticed with T6- PR Cotton +1Row of RG+1Row of FM , and BC ratio was obtained with T4- PR Cotton +2 Rows of Foxtailmillet (1.93) followed by T6 (1.91), whereas the highest RPE (4.3) and REE (50.8) was noticed with Paired row of Bt Cotton + 1row of redgram +1 row of foxtailmillet (T6) (Table 61).

Table 61 : Seed Cotton Equivalent yield (kg ha^{-1}), weed smothering efficiency and Relative Productive efficiency and economics as influenced by different intercrops in cotton at LAM

Treatments	Seed Cotton Yield (kg/ha)	Seed Cotton Equivalent Yield (kg/ha)	WSE (%) at 45 DAS	Total Gross returns (Rs/ha)	Net returns (Rs/ha)	BC R	RPE (%)	REE (%)
T1-Sole Bt cotton (105x60cm)	2398	2398	9.28	179850	59420	1.49		
T2-PR(Paired Row) Cotton +2Rows of GG (Greengram)	1949	1949	39.34	146175	47995	1.49	-18.7	-19.2
T3- PR Cotton +2Rows of RG (Redgram)	1860	2442	25.32	183151	82221	1.81	1.8	38.4
T4- PR Cotton +2 Rows of foxtailmillet	2174	2314	52.31	173595	83705	1.93	-3.5	40.9
T5- PR Cotton +1 Row of GG+1 Row of RG	1995	2447	31.28	185773	87493	1.89	2.0	47.2
T6- PR Cotton +1Row of RG+1Row of foxtailmillet	1966	2502	30.37	187624	89624	1.91	4.3	50.8
T7- PR Cotton +1 Row foxtailmillet +1Row GG	2151	2224	25.67	166800	68800	1.70	-7.3	15.8
T8-Farmer's Practice (120x60 cm)	1972	1972	0.00	147875	25945	1.21	-17.8	-56.3
T9- PR of Cotton + intercropping of 3 Rows of GG	2031	2031	51.08	152350	54070	1.55	-15.3	-9.0
SEd	156.7		-					
CD (5%)	332		-					

Clay soils, pH:8.01, EC(dSm^{-1}):0.26, N : 209 kg /ha, P_2O_5 : 34.6 kg/ha, K_2O : 784 kg/ha, Recommended nutrients: 120:60:60 kg NPK ha^{-1}, Environment: Rainfed, Total rainfall received : 951.1 mm

Perambalur

The results of multitier intercropping system trial revealed that significant reduction of seed cotton yield by multitier intercropping systems as compared to sole Bt cotton(T_1, 2342 kg ha^{-1}). Paired row planting of Bt cotton with two rows of intercrop (Radish) (T2) registered the significantly highest seed cotton equivalent yield (2939 kg/ha) , gross return (Rs253170/ha), net return (Rs 182720/ha) and benefit cost ratio(3.6).The same system (T2) was calculated higher relative production efficiency (33.8 %) and relative economic efficiency (41.1%). However, farmers practice observed the highest weed smothering efficiency (21.4 %).

Table 62: Seed Cotton Equivalent yield (kg ha^{-1}), weed smothering efficiency and Relative Productive efficiency as influenced by different intercrops in cotton at Perambalur

Treatments	Seed cotton Yield (kg/ha)	Intercrop yield (kg/ha)	Seed cotton equivalent yield (kg/ha)	Relative production efficiency (RPE)	Relative Economic efficiency	Land equivalent ratio	Weed smothering efficiency	Gross return	Net Return (Rs./ha)	BCR
T1. Sole Bt cotton	2342	-	2342	6.6	9.2	1	-0.8	210780	149530	3.4
T2.Paired row planting of Bt cotton with two rows of intercrop (Radish)	2183	1890	2939	33.8	41.1	0.93	-36.5	253170	182720	3.6
T3.Paired row planting of Bt cotton with two rows of intercrop (Cowpea)	2150	625	2400	9.3	8.9	0.91	-17	212250	144750	3.1
T4.Paired row planting of Bt cotton with two rows of intercrop (Coriander)	2148	1260	2778	26.5	32.2	0.91	-56.1	241720	173270	3.5
T5.Paired row planting of Bt cotton with one rows (Radish) +one row (Cowpea)	2126	906 + 262	2593	18.1	18.5	0.9	-27	226380	154630	3.2
T6Paired row planting of Bt cotton with one rows (Cowpea) +one row (Coriander)	2148	305 + 645	2592	18.1	19.7	0.91	-45.5	228270	158520	3.3
T7Paired row planting of Bt cotton with one rows (Coriander) +one row (Radish)	1962	741 + 859	2676	21.9	23.1	0.83	-16.3	231990	159340	3.2
T8.Farmers practice	2196	-	2196	0	0	-	21.4	197640	136390	3.2
T9.Recommended intercropping	2018	1260	2648	26.5	9.2	0.86	4.4	232020	163570	3.4
SEd	105									
CD (5%)	252									

Black cotton, Deep, Clay loam soil, , pH :7.6, Soil EC (dSm^{-1}):0.38, OC (%):4.4, Soil fertility status (kg/ha) N: 162, P_2O_5 : 14.2, K_2O : 261, Recommended Nutrient levels: 100:50:60 kg NPK / ha, Environment: rainfed , Rainfall (mm) received: 630 mm

Table 63: Seed cotton yield (kg ha^{-1}), Gross monetary returns (Rs.ha^{-1}), Net monetary returns (Rs. ha^{-1}) and B:C ratio as influenced by application of bio stimulant at Faridkot

Treatments	Seed cotton yield (kg ha^{-1})			Gross monetary returns (Rs. ha-1)			Net monetary returns (Rs. ha-1)			B:C ratio		
	V1.Bt hybrid (RCH 926)	V2. Bt/Non Bt Variety (F-228)	Mean	V1.Bt hybrid (RCH 926)	V2. Bt/Non Bt Variety (F-228)	Mean	V1.Bt hybrid (RCH 926)	V2. Bt/Non Bt Variety (F-228)	Mean	V1.Bt hybrid (RCH 926)	V2. Bt/Non Bt Variety (F-2228)	Mean
B1.Bio stimulant@4mg/ litre at 30 , 45 and 60 DAS	2628	1946	2287	144532	107015	125773	95374	67064	81219	1.93	1.67	1.8
B2. Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS	2359	2020	2189	129731	111084	120408	82726	70542	76634	1.76	1.73	1.74
B3. DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS	2501	1974	2238	137578	108569	123074	90917	69877	80397	1.95	1.8	1.88
B4.Control (water spray- 30, 45, 60 & 75 DAS)	2686	2092	2389	147751	115053	131402	100510	76318	88414	2.11	1.97	2.04
Mean	2544	2008		139898	110430		92382	70950		1.94	1.79	
	SEd	CD (5%)		SEd	CD (5%)		SEd	CD (5%)		SEd	CD (5%)	
G	101	470		5589	25890		4775	22119		0.06	NS	
B	150	NS		8250	NS		7050	NS		0.1	NS	
GxB	212	NS		11668	NS		9970	NS		0.15	NS	

Soil parameters: pH: 8.7, EC(dsm^{-1}):0.23 , OC (%) :0.39, Available P_2O_5: 11 kg/ha , Available K_2O: 600 kg/ha, Recommended spacing: 67.5 X 75 cm, 75 kg N and 30 kg P_2O_5 for variety/ha;105 kg N and 30 kg P_2O_5 for Bt hybrid/ha, Cotton species/type: *Gossypium hirsutum* ; Environment: irrigated; Total rainfall during cropping period: 497.1 mm

Hisar

The results of bio stimulant trial conducted at Hisar under irrigated condition revealed that seed cotton yield was not significantly varied between genotypes G1.RCH 776 BGII and G2.H1098i. Amongst bio stimulant treatments, seed cotton yield was significantly the highest (2552 kg ha^{-1}) with bio stimulant spray@4mg/litre at 45, 60 and 75 DAS (B2) which was found significantly superior over B3 (DMSO @100 µL/litre spray at 30, 45, 60 & 75 DAS) and B_4 i.e. water spray at 30,45,60 and at 75 DAS. However, which was found at par with B1 **(**bio stimulant spray@4mg/litre at 30, 45 and 60 DAS). The interaction effect was non-significant. Amongst bio stimulant treatments, higher gross monetary return (**Rs.**2,16,873 ha^{-1}), was calculated with bio stimulant spray @ 4 mg/litre at 45, 60 and 75 DAS (B2) which was followed by B1 **(**bio stimulant spray@4mg/litre at 30,45 and 60 DAS). The highest net return (**Rs.** 64,234ha^{-1}) was calculated with B1.Bio stimulant spray@4mg/litre at 30,45 and 60 DAS . Similar trend was also observed in case of B:C ratio (Table 64)

Table:64 Seed cotton yield (kg ha^{-1}), Gross monetary returns (Rs. ha^{-1}), Net monetary returns (Rs. ha^{-1}) and B:C ratio as influenced by application of bio stimulant at Hisar

Treatments	Seed cotton yield (kg ha^{-1})			Gross return (Rs. ha^{-1})			Net return (Rs. ha^{-1})			B:c ratio		
	G1.RCH 776 BGII	G2.H1098i	Mean	G1.RCH 776 BGII	G2.H1098i	Mean	G1.RCH 776 BGII	G2.H1098i	Mean	G1.RCH 776 BGII	G2.H1098i	Mean
B1.Bio stimulant@4mg/litre at 30 , 45 and 60 DAS	2126	2963	2545	180727	251852	216289	37898	90570	64234	1.26	1.56	1.41
B2. Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS	1921	3182	2552	163237	270508	216873	21902	97962	59932	1.15	1.57	1.36
B3. DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS	1591	2648	2119	135254	225034	180144	2575	67318	34946	1.01	1.42	1.22
B4.Control (water spray- 30, 45, 60 & 75 DAS)	1605	2592	2099	136420	220370	178395	15441	76413	45927	1.13	1.52	1.32
Mean	1811	2846		153910	241941		19455	83066	0	1.14	1.51	
ANOVA	SE d	CD (5%)		SE d	CD (5%)					SE d	CD (5%)	
Gen.	158.9	344.1		9547.2	20675.0					0.04	0.08	
Bs	112.3	243.3		13501.7	29238.9					0.05	0.11	
Gen.X BS	224.69	NS		19094.33	NS					0.07	NS	

Sandy loam, pH : 7.89 OC(%) :0.44, EC(dSm^{-1}) : 0.52, Soil fertility status N: 172 Kg/ha, P_2O_5 : 16 Kg/ha and K_2O : 262 Kg/ha, Environment: Irrigated, Rainfall (mm) received596 mm

Akola

The results of bio stimulant trial conducted at Akola under rainfed condition revealed that seed cotton yield was significantly the highest in genotype PDKV-JKAL-116 Bt (BG-II) (2396 kg ha^{-1}) as compared to by AKH-9-5 (*Suvarna Shubhra*) (1752 kg ha^{-1}). The genotype PDKV-JKAL-116 Bt (BG-II) registered 26.87 per cent yield increase over genotype AKH-9-5 (*Suvarna Shubhra*).The SCY was significantly highest (2346 kg ha^{-1}) in treatment of B1. biostimulent spray@4mg/litre at 30,45 and 60 DAS which was found significantly superior over B3 (DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS) and B_4i.e.water spray at 30,45,60 and at 75 DAS (Table 65). However, B_1 (biostimulent spray@4mg/litre at 30, 45 and 60 DAS) was found at par with B_2 **(**biostimulent spray@4mg/litre at 45,60 and 75 DAS). Treatment B_1(bio-stimulent spray @ 4 mg/litre at 30,45 and 60 DAS) registered 26.38% yield increase as compared to control i.e.water spray at30,45,60 and 75 DAS.The interaction of other growth, yield attributes and seed cotton yield showed non-significant differences.

Significantly higher gross monetary return (GMR) (Rs.145687 ha^{-1}) was registered in PDKV-JKAL-116 Bt followed by AKH-9-5. Amongst biostimulant spray higher GMR (Rs.142659 ha^{-1}) was also recorded in treatment of B1.bio-stimulent spray@ 4 mg/litre at 30,45 and 60 DAS and lowest GMR (Rs.105002 ha^{-1}) in case of control i.e. water spray. Similar trend was also observed in case of net monetary return. B:C ratio was found significantly superior in PDKV-JKAL-116 Bt (2.72) genotype than AKH-9-5(2.21). Among the use of bio-stimulent maximum B:C ratio (2.75) was registered in B_1 (@ 4 mg/litre at 30,45 and 60 DAS) and lowest B:C ratio in treatment of water spray i.e. B_4. (2.17).

Table 65: Seed cotton yield (kg ha-1), Gross monetary returns (Rs. ha-1), Net monetary returns (Rs. ha-1) and B:C ratio as influenced by application of bio stimulant at Akola

Treatments	Seed cotton yield (kg ha^{-1})			Gross monetary returns (Rs. ha-1)			Net monetary returns (Rs. ha-1)			B:C ratio		
	G1-PDKV JKAL-116(BG-II)	G2-AKH 9-5 (Suvarna Shubhra)	Mean	G1-PDKV JKAL-116(BG-II)	G2-AKH 9-5 (Suvarna Shubhra)	Mean	G1-PDKV JKAL-116(BG-II)	G2-AKH 9-5 (Suvarna Shubhra)	Mean	G1-PDKV JKAL-116(BG-II)	G2-AKH 9-5 (Suvarna Shubhra)	Mean
B1.Bio stimulant@4mg/litre at 30 , 45 and 60 DAS	2735	1958	2346	166268	119051	142659	111758	70751	91255	3.05	2.46	2.75
B2. Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS	2502	1826	2164	152122	111021	131571	97369	61874	79622	2.78	2.26	2.52
B3. DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS	2308	1810	2059	140326	110048	125187	86417	60676	73547	2.6	2.22	2.41
B4.Control (water spray- 30, 45, 60 & 75 DAS)	2040	1414	1727	124032	85971	105002	73175	40421	56798	2.44	1.89	2.17
Mean	2396	1752		145687	106523		92180	58431		2.72	2.21	
ANOVA	SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)	
Gen.	79.91	171.38		4858	10420		4429	9498		0.07	0.16	
Bs	113.01	242.37		6870	14736		6263	13433		0.1	0.22	
Gen.X BS	159.81	NS		9716	NS		8857	NS		0.14	NS	

Recommended spacing: 90X30 cm, Recommended Fertilizer dose : 60:30:30 Kg NPK/ha, Environment : Rainfed, Cotton Species : *Bt* Cotton and *Hirsutum variety*, Total Rainfall during Cropping period : 1161.0 mm in 51 rainy days, Soil parameters :pH :7.90, EC (dSm^{-1}): 0.12, O.C.(%) : 3.90, Available N : 232 kgha^{-1}, P_2O_5 : 16.8 kgha^{-1}, K_2O : 377 kgha^{-1}

Bhawanipatna

The results revealed that different growth and yield parameters and seed cotton yield were significantly affected by different treatments. There was no significant difference in plant height among two genotypes. However, it was significantly affected by different levels of the bio stimulant. Maximum plant height of 105.67 cm was recorded in B2 (Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS) and lowest in B4(water spray). Number of monopodia/plant was maximum in G2(1.74) and B3(1.84) whereas No. of sympodia/plant was maximum in G1(13.81) and B2(15.51). The significantly higher boll weight, number of bolls/m^2 and plot seed cotton yield was recorded with G1- Keshari (Bt hybrid) (1689 kg/ha) than G2- BS 279(Non Bt variety) Amongst bio stimulant spray , the significantly highest was recorded with B2(1850 kg/ha) followed by B1(1706 kg/ha) (Table 66).Application of bio stimulant@ 4mg/litre at 45, 60 & 75 DAS registered the significantly highest gross return(Rs. 116557/ha), net return(Rs. 62921/ha) and benefit cost ratio(2.17)

Table 66: Seed cotton yield (kg ha-1), Gross monetary returns (Rs. ha-1), Net monetary returns (Rs. ha-1) and B:C ratio as influenced by application of bio stimulant at Bhawanipatna

	Seed cotton yield (kg ha-1)			Gross monetary returns (Rs. ha-1)			Net monetary returns (Rs. ha-1)			B:C ratio		
Treatments	G1- Keshari (Bt hybrid)	G2- BS 279(Non Bt variety)	Mean	G1- Keshari (Bt hybrid)	G2- BS 279(Non Bt variety)	Mean	G1- Keshari (Bt hybrid)	G2- BS 279(Non Bt variety)	Mean	G1- Keshari (Bt hybrid)	G2- BS 279(Non Bt variety)	Mean
B1.Bio stimulant@4mg/litre at 30 , 45 and 60 DAS	5664	4571	1706	356840	287973	107468	194820	126953	53629	6.61	5.37	2.0
B2. Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS	5783	5320	1850	364329	335138	116577	203809	173718	62921	6.81	6.23	2.2
B3. DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS	4553	4267	1470	286840	268821	92610	133820	116001	41637	5.62	5.28	1.8
B4.Control (water spray- 30, 45, 60 & 75 DAS)	4267	4171	1406	268821	262773	88599	119501	112953	38742	5.4	5.26	1.8
Mean	1689	1527		106402	96225		54329	44135		2.04	1.84	
ANOVA	SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)	
Gen.	42.36	90.86		2668.86	5724.14		2624.53	5629.05		0.05	0.11	
BS	59.91	128.49		3774.34	8095.16		3711.64	7960.68		0.07	0.15	
Gen.X BS	84.73	181.72		5337.72	11448.28		5249.06	11258.11		0.1	0.22	

Soil pH:6.1, OC(%): O.62, Available N: 120 kg/ha , P_2O_5 : 37.5 kg/ha , K_2O: 248 kg/ha, recommended spacing: 90 cm x60 cm, recommended nutrients 120:60:60 kg/ha, Cotton species/type: G1- Bt hybrid(Keshari) G2- Non- Bt Variety (BS 279), environment: rainfed and total rainfall -1247 mm during cropping period.

Raichur

The experiment was conducted with two genotypes (Jaadoo and BGDS 1063) and four growth regulators sprays. Significantly higher seed cotton yield of 2624 kg/ha was obtained with Jaadoo compared to BGDS 1063 (2334 kg/ha). The higher seed cotton was obtained due to higher number of monopodia/plant, number of bolls per plant and boll weight. Among different growth regulators sprays, B2.Bio stimulant spray at 45, 60 & 75 DAS recorded significantly higher seed cotton yield (2771 kg/ha) (Table 67). Significantly higher net returns (Rs.140156/ha) was obtained with Jaadoo compared to BGDS 1063 (Rs 124126/ha). Among different growth regulators sprays, B2.Bio stimulant spray at 45, 60 & 75 DAS recorded significantly higher net returns (Rs.155558/ha) and B C Ratio (2.94) compared to other sprays. B C ratio found non-significant with respect to genotypes. Interaction found non-significant.

Table 67: Seed cotton yield (kg ha^{-1}), Gross monetary returns (Rs. ha^{-1}), Net monetary returns (Rs. ha^{-1}) and B:C ratio as influenced by application of bio stimulant at Raichur

Treatments	Seed cotton yield (kg ha^{-1})			Gross return (Rs. ha^{-1})			Net return (Rs. ha^{-1})			B:c ratio		
	G1.Jadoo	G2.BGDS1063	Mean	G1.Jadoo	G2.BGDS1063	Mean	G1.Jadoo	G2.BGDS1063	Mean	G1.Jadoo	G2.BGDS1063	Mean
B1.Bio stimulant@4mg/litre at 30 , 45 and 60 DAS	2626	2321	2474	223182	197313	210248	140742	123514	132128	2.71	2.67	2.69
B2. Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS	2922	2620	2771	248398	222700	235549	164086	147029	155557	2.95	2.94	2.94
B3. DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS	2691	2366	2528	228707	201110	214908	143906	124951	134429	2.7	2.64	2.67
B4.Control (water spray- 30, 45, 60 & 75 DAS)	2257	2027	2142	191845	172323	182084	111890	101009	106450	2.4	2.42	2.41
Mean	2624	2334		223032	198361		140156	124126		2.69	2.67	
ANOVA	Genotypes	Bio-stimulants	Interaction	Genotypes	Bio-stimulants	Interaction	Genotypes	Bio-stimulants	Interaction	Genotypes	Bio-stimulants	Interaction
SE (d)	14	150	212	1173	12724	17995	1173	12724	17995	0.01	0.16	0.23
CD (5%)	64	330	NS	5435	28032	NS	5435	28032	NS	NS	0.36	NS

Table 68. Seed cotton yield (kg ha^{-1}), as influenced by application of bio stimulant at Coimbatore

Treatments	Seed cotton yield (kg ha^{-1})		
	G1. RCH 659 BG II	G2.CICR *Bt* 23	**Mean**
B1.Bio stimulant@4mg/litre at 30 , 45 and 60 DAS	1853	1239	1546
B2. Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS	2195	1559	1877
B3. DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS	2064	1465	1765
B4.Control (water spray- 30, 45, 60 & 75 DAS)	1841	1226	1534
Mean	1988	1372	1680
ANOVA	Gen.	BS	Gen.X BS
SE (d)	103.87	146.894	207.739
CD (5%)	216	NS	NS

Soil: Brown, pH:8.35, Soil fertility status:N : 224 kg ha^{-1}, P_2O_5: 28 kg ha^{-1}, K_2O : 730 kg ha^{-1}, OC(%): 0.54,Environment: iirrigated

Black soil, shallow and fine textured, pH: 8.0, Soil fertility status: N: 215 kg/ha, P_2O_5 : 30 kg/ha, K_2O: 264 kg/ha, O.C.(%) : 0.50, Environment: irrigated Spacing followed: 90 x 60 cm(for *Bt* hybrid), 90 x 30 cm(for *hirsutum* variety), Nutrients dose followed: For *Bt* cotton hybrid:180:90:90 kg NPK/ha,For *hirsutum* variety:80:40:40 kg NPK/ha

Coimbatore

The experiment was conducted with two genotypes (G1. RCH 659 BG II, G2.CICR *Bt* 23) and four growth regulators sprays. Significantly higher seed cotton yield of 1988 kg ha^{-1} was obtained with G1. RCH 659 BG II as compared to G2.CO 17 (1372 kg ha^{-1}) (Table 68). The higher seed cotton was obtained due to higher number of monopodia/plant, number of bolls per plant and boll weight. Among different growth regulators sprays, Bio stimulant spray at 45, 60 and 75 DAS (B2) recorded significantly higher seed cotton yield (1877 kg ha^{-1}) compared to other sprays. Interaction effect was found non-significant

Srivilliputhur

The results showed that significant variation in between genotypes and higher seed cotton yield of 1865 kg/ha was registered with the Bt hybrid Jadoo and it was comparable with the yield of SVPR 6 (1871 kg / ha). The highest number of 61.6 bolls / m2 was recorded with the application of (B2 - Bio stimulant@ 4 mg/litre at 45, 60 and 75 DAS + DMSO 0.5 ml in 5 litre of water) and it was comparable with the application of (B1- Bio stimulant @ 4 mg/litre at 30, 45 and 60 DAS + DMSO 0.5 ml in 5 litre of water) and (B3 - DMSO 100 Ul/ litre @ at 30, 45, 60 and 75 DAS). Foliar application of (B2 - Bio stimulant@ 4 mg/litre at 45, 60 and 75 DAS + DMSO 0.5 ml in 5 litre of water) registered the highest seed cotton yield of 1935 kg/ha and it was on par with the application o f(B1 - Bio stimulant @ 4 mg/litre at 30, 45 and 60 DAS + DMSO 0.5 ml in 5 litre of water) and (B3 - DMSO 100 Ul/ litre @ at 30, 45, 60 and 75 DAS). Control registered the lowest number of sympodia / plant, bolls / m2 and seed cotton yield. Interaction between genotypes and application of bio stimulant was not significantly for all the growth, yield attributes and seed cotton yield. . All the economic indicators like total income, net income and BC ratio were higher with bio stimulant application @ 4 mg/litre at 45, 60 and 75 DAS + DMSO 0.5 ml in 5 litre of water followed by that of bio stimulant application @ 4 mg/litre at 30, 45 and 60 DAS + DMSO 0.5 ml in 5 litre of water

LAM

The results of the experiment revealed that both the genotypes differed significantly with respect to all growth and yield characters (plant height, number of bolls /m^2, boll weight and yield) except number of monopodia/plant. Bt hybrid (Jaadoo) recorded significantly higher growth parameters, *viz*., plant height (172.8 cm) (Table-1) and yield attributes, sympodia per plant (25.9), boll weight (4.8 g) and seed cotton yield (2341 kg/ha) compared to hirsutum straight variety (NDLH-1938) which recorded plant height (149.0 cm) and yield attributes, sympodia per plant (24.7), boll weight (4.1 g) and seed cotton yield (2142 kg/ha).Among the treatments of biostimulant spraying (B1 to B4), spraying of biostimulant @4 mg/L at 30,45 and 60 DAS (B1) resulted in higher growth and yield parameters, i.e. sympodia/plant (27.5), boll weight (4.6g), and significantly superior to B3 and B4. Highest seed cotton yield was noticed with B1 (2454 kg/ha) (Table 70) which was significantly superior over B3 and B4, but comparable with B2 (2330 kg/ha). The lowest seed cotton yield was recorded by water spray (B4) at 30, 45 and 60 DAS (2029 kg/ha). The interaction was found non significant with both the genotypes and biostimulant application. Among the treatments, spraying of biostimulant @4 mg/L at 30, 45 and 60 DAS (B1) recorded higher gross returns (Rs. 184,029/- ha) followed by B2 (Rs. 174,775/-), B3 (Rs. 161,629/ha) and B4 (Rs. 152,162/ ha) . The highest net returns (Rs. 59,026/- ha) and BCR (1.47) was noticed in B1 and the lowest net returns (Rs. 29,645/ ha) and BCR (1.24) was recorded with B4. Bt hybrid (Jaadoo) recorded significantly higher BCR (1.38) over Hirsutum straight variety (NDLH-1938) (1.24) .

Table 69: Seed cotton yield (kg ha^{-1}), Gross monetary returns (Rs. ha^{-1}), Net monetary returns (Rs. ha^{-1}) and B:C ratio as influenced by application of bio stimulant at Srivilliputhur

Treatments	Seed Cotton Yield (kg/ha)	Cost of cultivation (Rs/ ha)	Gross Income (Rs/ ha)	Net Income (Rs/ ha)	BCR
Genotypes					
Bt hybrid -Jadh	1865	86023	121225	35417	1.41
Variety - SVPR 6	1671	74596	108615	26560	1.45
CD (P=0.05)	256				
Bio Stimulant					
B1.Bio stimulant @ 4 mg/litre at 30, 45 and 60 DAS + DMSO 0.5 ml in 5 litre of water	1809	83879	117585	37502	1.40
B2.Bio stimulant@ 4 mg/litre at 45, 60 and 75 DAS + DMSO 0.5 ml in 5 litre of water	1935	76664	125775	39651	1.64
B3.DMSO 100 Ul/ litre @ at 30, 45, 60 and 75 DAS	1744	77943	113360	30987	1.46
B4.Control (water spray at 30, 45, 60 and 75 DAS)	1582	73340	102830	22156	1.40
CD (P=0.05)	222				
Interaction	NS				

Table 70: Seed cotton yield (kg ha^{-1}), Gross monetary returns (Rs. ha^{-1}), Net monetary returns (Rs. ha^{-1}) and B:C ratio as influenced by application of bio stimulant at LAM

Treatments	Seed cotton yield (kg ha^{-1})			Gross return (Rs. ha^{-1})			Net return (Rs. ha^{-1})			B:c ratio		
	G1.Jadoo	G2.NDLH 1938	Mean	G1.Jadoo	G2.NDLH 1938	Mean	G1.Jadoo	G2.NDLH 1938	Mean	G1.Jadoo	G2.NDLH 1938	Mean
B1.Bio stimulant@4mg/litre at 30 , 45 and 60 DAS	2588	2320	2454	194086	173972	184029	67771	50282	59026	1.53	1.40	1.47
B2. Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS	2479	2182	2330	185925	163625	174775	57738	38063	47900	1.45	1.30	1.37
B3. DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS	2226	2084	2155	166975	156284	161629	38300	30234	34267	1.30	1.24	1.27
B4.Control (water spray-30, 45, 60 & 75 DAS)	2071	1986	2029	155350	148975	152162	31520	27770	29645	1.25	1.23	1.24
Mean	2341	2142		175584	160714		48832	36587		1.38	1.24	
ANOVA	SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)	
Gen.	62.4	135		4678	10132		4678	10132		0.04	0.08	
Bs	88.2	191		6616	14329		6616	14329		0.05	0.11	
Gen.X BS	124.7	NS		9357	NS					0.07	NS	

Clay soils, pH: 8.1, Soil fertility status: N : 211 kg/ha(Low), P: 32.4 kg/ha, K : 789 kg/ha, Recommended spacing : 105x60 cm for Bt hybrid (Jaadoo), 90x60 cm for NDLH-1938 variety, Environment :rainfed, Rainfall (mm) received during cropping periods:951.1 mm

Agronomy XII: Drought and water logging management

Agronomy XII A: Effect of land configuration and plant growth regulator on drought management in cotton

Akola

The results on land configuration revealed that plant height, number of symopodia, number of bolls per square meter, length of sympodial branches was significantly influenced by land configuration treatments except monopodial branches and bolls weight. The significantly highest plant height (108.94 cm), number of sympodia (23.00), sympodial length (28.31 cm) and number of bolls per square meter (112.89) were observed in land configuration treatment of broad bed furrow (A1) and was found significantly superior over planting on ridges and furrow (A2) and over control i.e. farmers practice without any land configuration treatment.

However, ridges and furrow land configuration method were found significantly superior over farmer's practice. The SCY was significantly highest (2130 kg ha^{-1}) with land configuration treatment of broad bed furrow which was significantly superior over ridges and furrow treatment (1917 kg $ha^{-1)}$ and over control. (1763 kg ha^{-1}). The maximum yield in broad bed furrow might be due to moisture conservation which helped in later stages of cotton growth and development and also it drains out the excess moisture from the furrow in the situation of excess and continuous rainfall this year.

There was significant response to spraying of chemicals during drought situation. The spraying of glycine betanine@100 ppm as a single spray (D1), Salicylic acid@100 ppm as a single spray (D2) at 70% water depletion stage in cotton were tested. The drought management practice i.e. spraying of chemicals recorded significant differences in plant height, number of symopodia, number of bolls per square meter, length of sympodial branches and seed cotton yield. Monopodial branches and boll weight did not affect significantly due to spraying of chemicals.

The SCY was significantly highest (2020 kg ha^{-1}) with drought management practice of Salicylic acid spraying @ 100 ppm as a single spray on cotton in drought situation. However, there were non-significant differences in D1 (Glycine Betanine @100 ppm sparying) and D2 (Salicylic acid@100 ppm as a single spray) which were found at par with each other. The lowest yield of 1836 kg ha^{-1} was recorded In farmers practice (D3) (Table 71).

All the interaction effect of Land configuration X Drought management practices with regards to all growth parameters were found non-significant except number of bolls per square meter was found significantly superior over other treatments. Combination of broad bed furrow and salicylic acid spraying was found superior over other combination of ridges and furrow and other chemicals.

Soil parameters :pH: 7.90, EC (dSm^{-1}): 0.13, O.C.(%) : 3.95, Available N : 242 $kgha^{-1}$, P_2O_5 : 16.6 $kgha^{-1}$, K_2O : 382 $kgha^{-1}$, Recommended spacing: 60X30 cm, Recommended Fertilizer dose :60:30:30 Kg NPK/ha , Environment : Rainfed, Cotton Species :*Hirsutum Varieties of* Cotton, Total Rainfall during Cropping period : 1161 mm in 51 rainy days

Table 71 . Seed cotton yield (kg ha^{-1}) as influenced by land Configuration and drought management practices at Akola

Treatments	A1:Broad Bed Furrow	A2:Ridges & Furrow	A3:Control-Farmers Practice	Mean (Drought)	Anova	SE d	CD (5%)
D1:Glycine Betaine@100 ppm single spray	2124	1928	1814	**1955**	Land Configuration (A)	38	147
D2:Salicylic acid @ 100 ppm single spray	2266	1968	1827	**2020**	Drought management(D)	34	106
D3: Control	2002	1857	1648	**1836**	A x D	59.40	NS
Mean (Land Configuration)	**2130**	**1917**	**1763**				

Bhawanipatna

The results found that the growth characters and yield of cotton was significantly affected by land configuration methods and drought management chemicals. Among the land configuration methods, ridge and furrow method(A_2) recorded significantly maximum plant height (93.81cm), No. of sympodial branches/plant (12.11), No of bolls/m^2(37.29), average boll weight(4.06 g), single plant yield(152.3 g) and seed cotton yield(2021 kg/ha) and minimum numbers of monopodial branches/plant(1.64). Flat bed planting (Farmers practice) recorded minimum growth and yield parameters.

Among the drought management chemicals, application of D1.Glycine Betaine @ 100 ppm as single spray after depletion of 75 per cent soil moisture gave the best results with respect to growth and yield parameters of cotton. It recorded significantly maximum plant height (98.3 cm), No. of sympodial branches/plant (12.19), No of bolls/m^2(37.6), average boll weight(4.10 g), single plant yield(154.5 g) and seed cotton yield(2076 kg/ha) (Table 72) and minimum numbers of monopodial branches/plant(1.60). Spraying of water in place of drought management chemicals recorded least growth and yield parameters of cotton.

Table 72. Seed cotton yield (kg ha^{-1}) as influenced by land configuration and drought management chemicals at Bhawanipatna

Treatments	A_1: Broad bed & Furrow	A_2: Ridge & Furrow	A_3: Control (Farmers Practice): Flat Bed Sowing	Mean	ANOVA	SEd	CD (5%)
D_1: Glycine Betaine @ 100 ppm single spray after depletion of 75 per cent soil moisture	6039.4	7186.8	5458.5	2076	Land. Confi.	**110.3**	**306.3**
D_2: Salicylic acid @ 100 ppm single spray after depletion of 75 per cent soil moisture	5853.6	6609.5	4871.6	1926	Drought. mgmt	**101.3**	**220.7**
D_3: control	4543.7	4398.2	3867.7	1423	LC X Dr.mgmt	**175.4**	**382.3**
Mean	1826	2021	1577				

Black cotton soil, 1.5 -2.0 m, Clay loam, pH: 6.1, O.C(%) : 0.63 , Soil fertility status: N : 128 kg/ha, P_2O_5 : 38.5 kg/ha, K_2O : 252 kg/ha Recommended nutrients: 120:60:60 kg/ha, Recommended spacing: 90 x 60 cm, Environment: Rainfed, Total rainfall received during cropping periods: 1247 mm

Khandwa

The results of the experiments showed that the land configuration of ridge and furrow is suitable for drought management. This gave higher growth parameters as well as yield attributing characteristics and also significantly higher seed cotton yield (2144 kg/ha) (Table 73). This was followed land configuration broad bed and furrow (1873 kg/ha). Both proved better in comparison the flat bed sowing in terms of productivity of the cotton (1587 kg/ha) (Table 73). Amongst foliar application of osmoprotectant, after depletion of 75 per cent soil moisture found that single spray of Salicylic acid @ 100 ppm (1976 kg/ha)was recorded better in terms of the growth and productivity followed by the application of Glycine Betaine @ 100 ppm (1909 kg/ha) as compared to the control (1719 kg/ha). Nutrient uptake was also recorded higher under ridge furrow sowing of cotton with application of Salicylic acid @ 100 ppm after depletion of 75 per cent soil moisture.

Table 73. Seed cotton yield (kg ha^{-1}) as influenced by land configuration and drought management chemicals at Khandwa

Treatments	A_1: Broad bed & Furrow	A_2: Ridge & Furrow	A_3: Control (Farmers Practice): Flat Bed Sowing	Mean	ANOVA	SEd	CD (5%)
D_1: Glycine Betaine @ 100 ppm single spray after depletion of 75 per cent soil moisture	1920	2140	1667	1909	Land. Confi.	60	167
D_2: Salicylic acid @ 100 ppm single spray after depletion of 75 per cent soil moisture	1979	2261	1688	1976	Drought . mgmt	16	45
D_3: control	1721	2030	1405	1719	LC X Dr. mgmt	99	229
Mean	1873	2144	1587				

Soil parameters pH : 7.78, Ec (dSm^{-1}) : 0.504, Organic Carbon (%) : 0.62, Available N, P_2O_5 & K_2O (kg/ha) : 210.7 (N), 14.9 (P_2O_5)& 385 K_2O, Recommended spacing : 90 X 60 cm, Recommended dose of nutrients – NPK @ 100:60:40 kg/ ha, Cotton species/type: Hirsutum (Hybrid) RCH-659, Environment : Rainfed and total rainfall (mm) during cropping periods : 1044 mm. Uneven distribution of rainfall was observed. Drought spells were occurs during growth and flowering period.

Nanded

The soil moisture content was not affected due to land configuration treatments up to 120 DAS whereas ridges and furrow recorded significantly higher moisture content than flat bed at 150 DAS. The effect of land configuration treatments on plant height and monopodia plant^{-1} was non-significant. Broad bed and furrow treatment was found to increase number of sympodia plant^{-1} and number of plants per net plot at harvest over control and was on par with Ridges and furrow treatment. The yield attributes and seed cotton yield ha^{-1} were statistically on par in all the land configuration treatments. Broad bed and furrow (A1) recorded higher numerical values of seed cotton yield (3469 kg ha^{-1}), bolls m^{-2} (77.44) and boll weight (4.83 g) followed by ridges and furrow treatment (Table 74). Similarly, all the land configuration treatments were equally profitable in terms of GMR, NMR and BCR.

Soil moisture content was not changed significantly due to foliar application of osmoprotectants. The foliar application treatments didn't have any significant effect on plant growth characters, yield contributing characters and seed cotton yield ha^{-1}. Glycine Betaine @ 100 ppm single spray recorded numerically greater values of seed cotton yield (3428 kg ha^{-1}). Similarly,

drought management treatments had non-significant effect on monetary returns. Salicyclic acid @ 100 ppm recorded greater numerical values of NMR and BCR.

Table 74. Seed cotton yield (kg ha^{-1}) as influenced by land configuration and drought management treatments at Nanded

Treatments	A_1: Broad bed & Furrow	A_2: Ridge & Furrow	A_3: Control (Farmers Practice): Flat Bed Sowing	Mean	ANOVA	SEd	CD (5%)
D_1: Glycine Betaine @ 100 ppm single spray after depletion of 75 per cent soil moisture	3504	3489	3292	**3428**	Land. Confi.	150.46	N.S.
D_2: Salicylic acid @ 100 ppm single spray after depletion of 75 per cent soil moisture	3483	3459	3279	**3407**	Drought. mgmt	98.49	N.S.
D_3: control	3420	3404	3206	**3343**	LC X Dr.mgmt	170.58	N.S.
Mean	**3469**	**3451**	**3259**				

Soil parameters : pH **:** 8.08, EC: 0.26 dSm^{-1}, Org. C(%): 0.48, available N : 148.30 kg ha^{-1}, P_2O_5 : 12.14 kg ha^{-1}, K_2O : 435.82 kg ha^{-1}, Recommended spacing : 120 x 45 cm, recommended nutrients : 120:60:60 NPK kg ha^{-1}, Cotton species/type : hirsutum *Bt* hybrid, environment : rainfed and total rainfall : 1294 mm

Dharwad

The drought management studies made to protect the Bt Cotton under drought situation at Dharwad.The results revealed that growth parameters Viz. plant height, no of monopodials per plant sympodial numbers and yield attributes Viz, No of Bolls per plant, no of bolls per Sq m and single boll weightwere unaffected by different land configuration treatments.Interactions of land configurations and drought management treatments were also not significant.Different land configuration practices did not affect the seed cotton yield per hectare. Whereas spraying of Glycine betaine (D_1) produced significantly higher seed cotton yield (2816 kg/ha) (Table 75). Increased seed cotton yield can be attributed to production of higher seed cotton yield per plant.

Land configuration levels were unaffected during this season owing to above normal rainfall observed from July to end of October. Whereas from November onwards there was no rainfall observed during boll development stage. Hence spraying of Glycine Betaine might have helped to increase the yield. Interactions were not significant

Table 75: Effect of Land shaping and Drought management on seed cotton yield (kg ha^{-1}) at Dharwad

Land shaping	L1:Broad Bed Furrow	L2: Ridges and Furrow	L3: control	Mean
D_1: Glycine Betaine @ 100 ppm single spray after depletion of 75 per cent soil moisture	2884	2878	2685	2816
D_2: Salicylic acid @ 100 ppm single spray after depletion of 75 per cent soil moisture	2660	2683	2579	2641
D_3: control	2580	2511	2553	2548
Mean	2708	2691	2606	
Anova	Land config	Drought mgt	LxD	DxL
S. Ed	42	40	69	71
CD	NS	88	NS	NS

Medium deep black, pH: 7.2 , OC (%): 0.45, Soil fertility status: N: 230 kg/ha, P_2O_5 : 27.0 kg/ha, K_2O : 425 kg/ha, Recommended Nutrients: 100:50:50 kg NPK/ha, Environment: rainfed, Rainfall (mm) received during cropping periods : 1070 mm, No of rainy days: 74

Perambalur

The results on drought management experiment revealed that the land configuration, L_1-Broad bed & Furrow recorded significantly higher number of sympodia per plant, number of bolls per square meter, average boll weight (g), single plant yield(g/plant) and higher seed cotton yield (2412 kg/ha) which was on par with L_2-Ridge& Furrow (2097kg/ha) (Table 76).With respect to plant growth regulators, D_1- Glycine Betaine @ 100 ppm single spray after depletion of 75 per cent soil moisture significantly recorded higher number of sympodia per plant, number of bolls per square meter, single plant yield (g/plant) and higher seed cotton yield (2217 kg/ha) which was on par with D_2-Salicylic acid @ 100 ppm single spray after depletion of 75 per cent soil moisture (2149kg/ha).Hence, broad bed and furrow along with spraying of glycine betaine @ 100 ppm once after depletion of 75% soil moisture may be recommended for higher growth and yield on drought conditions in cotton.

Table 76: Effect of Land shaping and Drought management on boll weight (g) and seed cotton yield (kg ha^{-1}) at Perambalur

Treatments	Average boll weight (g)				Seed cotton yield (kg ha-1)			
	L1: Broad bed & Furrow	L2: Ridge & Furrow	L3: Control (Farmers Practice): Flat Bed Sowing	Mean	L1: Broad bed & Furrow	L2: Ridge & Furrow	L3: Control (Farmers Practice): Flat Bed Sowing	Mean
D1: Glycine Betaine @ 100 ppm single spray after depletion of 75 per cent soil moisture	5.9	5.2	5.2	5.2	2581	2244	1827	2217
D2: Salicylic acid @ 100 ppm single spray after depletion of 75 per cent soil moisture	5.7	4.8	4.8	5	2440	2191	1816	2149
D3: control	5.2	4.5	4.3	4.7	2216	1856	1760	1944
Mean	5.6	4.9	4.5		2412	2097	1801	
ANOVA	SEd	CD (5%)				SEd	CD (5%)	
Land. Confi.	0.2	0.8				147	408	
Drought. mgmt	0.2	NS				92	201	
LC X Dr.mgmt	0.43	NS				196	NS	

Cotton Genotypes : RCH 659, Black cotton, Deep, Clay loam soil, pH :7.6, Soil EC (dSm-1):0.42, OC(%): 0.4, Soil fertility status: 158:13.2:281 Kg NPK/ha, Environment: Rainfed, Rainfall (mm) received during cropping periods: 630 mm

Agronomy XII B. Effect of land configuration and plant growth regulator on water logging management in cotton

Junagadh

The results of water logging management experiment revealed that different land configuration and foliar application of osmoprotectant and nutrient application treatments were significantly influenced the seed cotton yield. Significantly higher seed cotton yield 2129 kg/ha was found with treatment of ridges & furrow. From the different water logging management treatments of sub plot, application of Nitrogen @ 20kg/ha + Potassium @20kg/ha was recorded significantly higher seed cotton yield 1913 kg/ha. Which was statistically at par with salicylic acid @0.5mM single spray application (1809 kg/ha) (Table 77) . Plant height (120) and No. of bolls per square meter (56.38) were also observed significantly higher in ridges & furrow treatment. Nitrogen and potassium uptake was increases with application of Nitrogen @ 20kg/ha + Potassium @20kg/ha.

Table 77. Seed cotton yield (kg ha^{-1}) as influenced by land configuration and plant growth regulator under water logging at Junagadh

Treatments	A_1: Broad bed & Furrow	A_2: Ridge & Furrow	A_3: Control (Farmers Practice): Flat Bed Sowing	Mean	Anova	SEd	CD (5%)
W1. Nitrogen @20kg/ha + Potassium @20kg/ha	1797	2218	1724	1913	Land. Confi.	74	291
W2.Salicylic acid @0.5mM single spray	1741	2259	1429	1809	Water logging	59	182
W3. Control	1644	1910	1305	1619	LC X WL. mgmt	102	NS
Mean	1727	2129	1486				

Soil parameters of pH:7.67, Soil Ec (dSm^{-1}): 0.58, OC(%): 0.90, av. N :325 kg/ha, P_2O_5 :46.33 kg/ha : K_2O 341 kg/ha, recommended spacing :120 X 45 cm, Cotton species/type: G.Cot.Hy.-24 BG-II, environment: irrigated and total rainfall : 1319 mm during cropping periods.

Surat

The experiment was conducted in Split Plot Design with three Land Configuration levels *viz*; Broad Bed Furrow **(L1)**, Ridges & Furrow **(L2)** and Farmers Practice -Flat bed **(L3)** were laid out in main plot and three water logging management practices *viz*; Nitrogen @ 20 kg/ha + Potassium @ 20kg/ha **(W1)**, Salicylic acid spray @ 0.5mM single spray **(W2)** and Control **(W3)** were laid out in sub plots. Bt cotton hybrid G. Cot. Hy- 8 (BG II) was selected for the study.The significant results were observed with land configuration. The sub plot treatments and interaction effect were found non significant

The growth characters includes plant height No of monopodia/plant , no. of sympodia/plant. No. of bolls per sqm area were significantly influenced by land configuration treatments of Ridges & Furrow **(L2)** which were on par with Broad Bed Furrow **(L1)**. However, boll weight was not significantly influenced by land configuration.Seed cotton yield (kg/ha) was significantly influenced only with different land configuration treatments. Land configuration treatment L2 recorded significantly higher seed cotton yield (2358 kg/ha) as compared to treatment L3 (1666 kg/ha) but it was statistically at par with treatment L1 (2156 kg/ha) (Table 78).

Table 78. Seed cotton yield (kg ha^{-1}) as influenced by land configuration and plant growth regulator at Surat

Treatments	L_1: Broad Bed Furrow	L_2: Ridges & Furrow	L_3: Control Flat bed)	Mean	ANOVA	SE d	CD (5%)
W1 : Nitrogen @ 20kg/ha + Potassium @ 20kg/ha	2271	2368	1842	2160	L	121	477
W2 : Salicylic acid @0.5mM single spray	2217	2510	2195	2110	W	91	NS
W3 : Control	1979	2195	1553	1909	L X W	158	NS
Mean (Land configuration)	2156	2358	1666				

Soil:P^{H}:7.52, EC(dsm^{-1}):0.51, OC(%):0.48, Available N: 296kg/ha, Available P: 31.10kg/ha, Available K: 512kg/ha, Recommended spacing: 120 x 45cm, Recommended nutrients: 240:40:00 NPK kg/ha, Cotton species/type: Gossypium hirsutum Bt cotton hybrid, Environment: Irrigated, Total rainfall:1493mm

Raichur

The results of water logging experiments conducted at Raichur revealed that Plant height, number of monopodia, number of sympodia, No. of bolls/ SQM and Single plant yield (g/plant) and Seed cotton yield (kg ha^{-1}) were significantly as influenced by land configuration and sub plot water logging management treatments. The land configuration of A_1: Broad bed & Furrow registered significantly higher growth characters , yield attributes , seed cotton yield (2634 kg/ha) and nutrient uptake. Application of nutrients after draining of excess water in water logging plots , W1. Nitrogen @20kg/ha + Potassium @20kg/ha observed higher performance of growth characters , yield attributes , seed cotton yield (2718 kg/ha)and nutrient uptake (Table 79). The interaction effect was found non significant

Table 79. Seed cotton yield (kg ha^{-1}) as influenced by Land Configuration and Water logging management at Raichur

Treatments	L_1: Broad bed & Furrow	L_2: Ridge & Furrow	L_3: Control (Farmers Practice): Flat Bed Sowing	Mean	ANOVA	SEd	CD (5%)
W1. Nitrogen @20kg/ha + Potassium @20kg/ha	2881	2629	2644	**2718**	Land. Confi.	70	199
W2. Salicylic acid @0.5mM single spray	2652	2449	2455	**2519**	Water logging	141	310
W3. Control	2370	2179	2064	**2204**	LC X WL. mgmt	243	NS
Mean	**2634**	**2419**	**2388**				

Cotton Genotypes: Rasi Magna, Black soil, Shallow soils, Fine texture soil, pH : 8.1, Soil EC (dSm-1): 0.31, Organic Carbon (%):0.51,Soil fertility status: N : 258kg/ha, P_2O_5 : 32 kg/ha, K_2O: 268 kg/ha, Nutrients applied: 80:90:90 kg NPK/ha, Spacing: 90 X 60 cm, Environment: Irrigated, Rainfall (mm) received during cropping periods: 851.2 mm

Coimbatore

The results of water logging experiments conducted at Coimbatore revealed that Plant height, number of monopodia, number of sympodia, No. of bolls/ SQM and Single plant yield (g/plant) and Seed cotton yield (kg ha^{-1}) were significantly as influenced by land configuration and sub plot water logging management treatments. The land configuration of A_1: Broad bed & Furrow registered significantly higher growth characters , yield attributes , seed cotton yield (1989 kg/ha) and nutrient uptake. Application of nutrients after draining of excess water in water logging plots , W1. Nitrogen @20kg/ha + Potassium @20kg/ha observed higher performance of growth characters , yield attributes , seed cotton yield (1993 kg/ha)and nutrient uptake (Table 79 A). The interaction effect was found non significant (Table 79 A)

Table 79 A. Seed cotton yield (kg ha^{-1}) as influenced by Land Configuration and Water logging management treatments at Coimbatore

Treatments	A_1: Broad bed & Furrow	A_2: Ridge & Furrow	A_3: Control (Farmers Practice): Flat Bed Sowing	Mean	ANOVA	SEd	CD (5%)
W1. Nitrogen @20kg/ha + Potassium @20kg/ha	2290	1910	1778	**1993**	Land. Confi.	37.61	76.48
W2.Salicylic acid @0.5mM single spray	1910	1881	1720	**1837**	Water logging	90.12	183.03
W3. Control	1768	1745	1659	**1724**	LC X WL. mgmt	84.22	NS
Mean	**1989**	**1845**	**1719**				

PHYSIOLOGY AND BIOCHEMISTRY

PHY 1	PGR for optimum morpho- frame and enhanced yield
PHY2	Preparing for climate change - Growth and development of *arboreum* cotton in response to growth regulators
PHY 3	Effect of growth retardant on physiological parameters and productivity of compact genotypes
PHY 4	Use of Defoliants to facilitate mechanical picking
BIO CHEM1	Screening of cotton genotypes for abiotic stress tolerance, estimation of seed oil, gossypol and protein and analysis of biochemical constituents of organic trial
BIO CHEM2	Analysis of biochemical constituents of organic cotton experiment (Agronomy IV), morpho frame (Phy:1), climate change (Phy :2) growth retardants (Phy:3) and defoliants (Phy:4)

PHY 1PGR for optimum morpho frame and enhanced yield

Preamble: Plant growth and development are regulated by natural plant hormones, these processes may be influenced either by altering the plant hormone level or by changing the capacity of the plant response to natural hormones. Bt cotton, the plant morphoframe doesn't develop fully due to early switch over to reproductive phase under resource constraints condition. Modification of morphoframe by agrochemicals could greatly help in dispensing away these limitations

Hisar

The results of PGR for optimum morpho frame of cotton revealed that RCH 650 recorded significantly higher plant height at 90 DAS as compared to CICR Bt 6. Plant height at harvest was recorded significantly lower in the treatments with PGR application as compare to control. Number of monopodia, sympodia and boll weight were not affected by PGR application. Seed cotton yield of RCH 650 was significantly higher (2518 kg/ha). Application of B2.Mepiquat chloride @ 100ppm at 90 DAS (2206 kg/ha) and B3.Ethrel @45 ppm at 40DAS + Mepiquat chloride @ 100ppm at 90 DAS (2097 kg/ha)resulted significantly higher seed cotton yield as compare to other treatments (Table 80).

Table 80. Growth parameters, yield attributes and seed cotton yield as influenced by PGR applications at Hisar

Treatments	Plant height (cm)			Boll weight (g)			Seed cotton yield (kg ha-1)		
	V1.Bt hybrid	V2. Non Bt Variety	Mean	V1.Bt hybrid	V2. Non Bt Variety	Mea n	V1.Bt hybrid	V2. Bt/Non Bt Variety	Mea n
B1. Ethrel @ 45 ppm at 40 DAS	138	128	133	3.41	2.58	2.99	2165	957	1561
B2. Mepiquat chloride @100 ppm at 90 DAS	141	137	139	3.7	2.45	3.07	3066	1346	2206
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm	127	143	135	3.83	2.49	3.16	2857	1337	2097
B4. Control (Water spray)	170	155	163	3.47	2.59	3.03	1983	970	1471
Mean	144	141		3.6	2.53		2518	1152	
ANOVA	SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)	
Gen.	5.89	NS		0.1	0.22		192.0	415.8	
GR	8.33	18.03		0.15	NS		271.5	588.0	
Gen.XGR	11.77	NS		0.21	NS		384.0	NS	

Soil: pH : 7.89, OC (%):0.44, EC(dsm^{-1}) : 0.52 , Soil fertility status:N: 172 Kg/ha, P_2O_5: 16 Kg/ha, K_2O : 262 Kg/ha, Recommended Nutrients: 175:60:60:25, N:P:K:$ZnSo_4$ kg/ha & 90:30:0:25 kg/ha N:P:K:Zn for hybrid and variety respectively, Environment: Irrigated, Recommended spacing:67.5x60cm, 67.5x30 cm, Total Rainfall (mm) received during cropping periods596 mm

Sirsa

The results of PGR for optimum morpho frame of cotton found that between genotypes significantly higher plant height was recorded with hirsutum variety (142.3 cm), irrespective of the growth regulator applied. Yield attributes and seed cotton yield was significantly higher with Bt hybrid as compared tohirsutum variety, irrespective of the growth regulator applied.Among the growth regulators applied, significantly lower values of plant height were observed with B3 treatment [i.e., application of Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS] (96.4 cm) but the same treatment recorded the highest number ofbolls per plant(48.9).(Table 81)

The yield attributes and seed cotton yield was significantly higher with B3 treatment [i.e., application of Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS](3132 kg/ha) over B1 [i.e., Ethrel @ 45 ppm at 40 DAS] (2761 kg/ha); B2 [i.e., Mepiquat chloride @100 ppm at 90 DAS](2856 kg/ha) as well as over B4 [i.e., Control (Water spray)] (2606 kg/ha), irrespective of the cotton genotype. All the interactions were non significant.

Table 81. Growth parameters, yield attributes and seed cotton yield as influenced by PGR applications at Sirsa

Treatments	Plant height (cm)			boll weight (g)			Bolls per plant			Seed cotton yield (kg ha-1)		
	V1.Bt hybrid (RCH 776 BGII)	V2. Variety(CSH-3075)	Mean	V1.Bt hybrid (RCH 776 BGII)	V2. Variety(CSH-3075)	Mean	V1.Bt hybrid (RCH 776 BGII)	V2. Variety(CSH-3075)	Mean	V1.Bt hybrid (RCH 776 BGII)	V2. Variety (CSH-3075)	Mean
B1. Ethrel @ 45 ppm at 40 DAS	112.8	153	132.9	3.46	2.15	2.8	49.7	34.2	41.9	3166	2356	2761
B2. Mepiquat chloride @100 ppm at 90 DAS	92.7	127.9	110.3	3.69	2.32	3.0	52.0	34.8	43.4	3267	2444	2856
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm	81.5	111.3	96.4	4.19	2.58	3.4	60.1	37.9	48.9	3594	2669	3132
B4. Control (Water spray)	131.2	176.9	154.1	3.21	2.02	2.6	48.9	31.9	40.4	3065	2147	2606
Mean	104.6	142.3		3.64	2.67		52.7	34.7		3273	2404	
ANOVA	SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)	
Gen.	9.45	27.45		0.085	0.392		1.09	5.05		120.4	557.6	
GR	4.28	9.42		0.161	0.354		2.11	4.66		44.4	97.8	
Gen. X GR	6.05	NS		0.227	NS		2.99	NS		62.8	NS	

Soil parameters: pH: 8.2; EC(dsm^{-1}):0.25 m; OC (%) : 0.30; Available P_2O_5: 13.1 kg ha^{-1}; Available K_2O: 214.8 kg ha^{-1}, Recommended nutrients: For Bt hybrid: 150 kg N ha^{-1}; 30 kg P_2O_5 ha^{-1} and 25 kg K_2O ha^{-1}, For Hirsutum variety: 75 kg N ha^{-1}; 30 kg P_2O_5 ha^{-1} and 12.5 kg K_2O ha^{-1}, Environment: irrigated; Total rainfall during cropping period: 439.7 mm

Surat

The results of PGR for optimum morpho frame of cotton at Surat found that boll weight and no. sympodia were non-significantly influenced by the treatments. The data revealed that Seed Cotton Yield (Kg/ha), Gross monetary returns (Rs ha-1), and Net monetary returns (Rs ha-1) were significant due to treatments. The treatment B1. Ethrel @ 45 ppm at 40 DAS showed significant higher yield per plant which was at par with B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS . The genotypes V1.G.Cot Hy 12 BG II registered significantly higher seed

cotton yield (2406 kg/ha). The interaction results revealed that seed cotton yield was significantly higher for genotype G.CotHy 12 BG II when treated with Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS (2552 kg/ha) (Table 82).The similar trend was observed with Gross monetary return and net monetary return

Table 82. Growth parameters, seed cotton yield and economics as influenced by PGR applications at Surat

Treatments	Plant height (cm)			Seed cotton yield (kg ha-1)			Gross monetary returns (Rs ha-1)			Net monetary returns (Rs ha-1		
	V1.G.Cot Hy 12 BG II	V2. GN Cot 32	Mean	V1.G.Cot Hy 12 BG II	V2. GN Cot 32	Mean	V1.G.Cot Hy 12 BG II	V2. GN Cot 32	Mean	V1.G.Cot Hy 12 BG II	V2. GN Cot 32	Mean
B1. Ethrel @ 45 ppm at 40 DAS	148.0	143.1	145.6	2527	2078	2302	202122	166254	184188	136615	103886	120250
B2. Mepiquat chloride @100 ppm at 90 DAS	132.2	112.9	122.6	2505	1883	2194	200429	150600	175515	135050	89581	112316
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS	126.6	117.6	122.1	2552	1984	2268	204154	158752	181453	138447	97018	117733
B4. Control (Water spray)	145.4	139.9	142.7	2040	1824	1932	163169	145945	154557	101340	85623	93481
Mean	138.1	128.4		2406	1942	2174	192468	155388	173928	127863	94027	110945
ANOVA	SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)	
Gen.	5.47	N.S.		59	127.7		4717	10215		4304	9321	
GR	7.74	16.76		83.4	180.6		6671	14446		6087	13182	
Gen.XGR	10.94	N.S.		117.9	NS		9434	NS		8609	NS	

Soil : pH:7.12, EC(dsm^{-1}):0.65, Avail.N:423.22 kg/ha, Avail P:19.33kg/ha, Avail K: 599.52kg/ha, Total rainfall:1493mm, Rainy days:80

Dharwad

The experiment was conducted to study the effect on plant growth regulators on growth and development and productivity in both Bt and Non Bt cotton. The plant growth regulators like Ethrel and Mepiquat chloride at varied concentration was used along with control. The mean seed cotton yield was significantly higher in (Aeet-199) Bt cotton (2277 kg ha^{-1}) compared to non Bt (Sahana) cotton (1846 kg ha^{-1}). The interaction results revealed that Bt ybrid with B3 Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS recorded significantly higher seed cotton yield (2439 kg ha^{-1}) followed by treatment B1. Ethrel @ 45 ppm at 40 DAS which recorded 2317 kg ha^{-1} seed cotton yield in Bt cotton. However, in Sahana variety treatment B2. Mepiquat chloride @100 ppm at 90 DAS recorded significantly higher seed cotton yield 1968 kg ha^{-1} which was on with treatment B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS (1931 kg ha^{-1}). The plant height decreased by 15.85% under B3 Treatment compared to control. The number of Sympodia branches per plant was higher in B3 treatment (27 branches) compared to control in Bt cotton (24). Under non Bt the number of Sympodia branches per plant was 24% higher under B3 treatment compared to control. The concludes that the both Bt and Non Bt genotypes had better physiological performance with respect to all traits when treated with Ethrel @ 45 ppm at 40 DAS +Mepiquat chloride @100 ppm at 90 DAS. The treatment B3 Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS recorded significantly higher gross monetary returns (Rs. 152959 ha^{-1}) , Net monetary returns (Rs. 85959 ha^{-1}) and Benefit Cost ratio (2.28) (Table 83)

Table 83. Growth parameters, seed cotton yield and economics as influenced by PGR applications at Dharwad

Treatments	Plant height (cm)			Seed cotton yield (kg ha-1)			Gross monetary returns (Rs. ha-1)			Net monetary returns (Rs. ha-1)			Benefit Cost ratio		
	V1.Bt hybrid	V2. Non Bt Variety	Mean	V1.Bt hybrid	V2. Bt/Non Bt Variety	Mean	V1.Bt hybrid	V2. Bt/Non Bt Variety	Mean	V1.Bt hybrid	V2. Bt/Non Bt Variety	Mean	V1.Bt hybrid	V2. Bt/Non Bt Variety	Mean
B1. Ethrel @ 45 ppm at 40 DAS	150	135	142	2317	1795	2056	162221	125670	143945	97221	65670	81445	2.5	2.09	2.3
B2. Mepiquat chloride @100 ppm	135	128	132	2240	1968	2104	156800	137742	147271	88800	76742	82771	2.31	2.26	2.28
B3. Ethrel @ 45 ppm at 40 DAS +	138	121	130	2439	1931	2185	170735	135182	152959	100735	71182	85959	2.44	2.11	2.28
B4. Control (Water spray)	164	144	154	2111	1691	1901	147802	118370	133086	86469	62370	74420	2.4	2.12	2.2
Mean	147	132		2277	1846		159390	129241		93306	68991		2.5	2.09	
ANOVA	SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)		SE d	CD (5%)	
Gen.	2.42	10.18		36	111		2567	7789		2609	7915		0.042	0.128	
GR	3.42	14.39		51.86	157		3631	11015		3690	NS		0.06	NS	
Gen.XGR	1.61	6.78		73.35	227		5135	NS		5219	NS		0.084	NS	

Soil: pH : 7.89 , OC(%) :0.44,EC(dSm^{-1}) : 0.52, Soil fertility status: N: 172 Kg/ha, P_2O_5: 16 Kg/ha, K_2O : 262 Kg/ha, Recommended Nutrient levels :RDF 175:60:60:25, N:P:K:$ZnSo_4$kg/ha , 90:30:0:25 kg/ha N:P:K:Zn for hybrid and variety respectively , Environment : Irrigated, Recommended spacing: 67.5x60cm, 67.5x30 cm, Total Rainfall (mm) received during cropping periods :596 mm

LAM

The results of PGR for optimum morpho frame of cotton at LAM farm found that Seed Cotton Yield (Kg/ha), Gross monetary returns (Rs ha-1), and Net monetary returns (Rs ha-1) were significant due to treatments. The treatment B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DASregistered significantly higher seed cotton yield (3028 kg/ha. The genotypes G1. Jaadoo BGII registered significantly higher seed cotton yield (3136 kg/ha) (Table 83 A). The treatment B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DASwas observed with higher Gross monetary return (Rs 2,10,992/ha) and net monetary return(Rs 79,147/ha) also

Table 83A. Growth parameters, seed cotton yield and economics as influenced by PGR applications at LAM

Treatments	Plant height (cm)			Seed cotton yield (kg ha-1)			Gross monetary returns (Rs ha-1)			Net monetary returns (Rs ha-1		
	G1. Jaadoo BGII	G2. NDLH 1938	Mean	G1. Jaadoo BGII	G2. NDLH 1938	Mean	G1. Jaadoo BGII	G2. NDLH 1938	Mean	G1. Jaadoo BGII	G2. NDLH 1938	Mean
B1. Ethrel @ 45 ppm at 40 DAS	156.0	145.2	150.6	2821	2149	2485	196564	149748	173156	64877	20824	42851
B2. Mepiquat chloride @100 ppm at 90 DAS	157.0	142.6	149.8	3634	2080	2857	253241	144922	199082	120915	15359	68137
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS	152.3	146.2	149.3	3517	2539	3028	245089	176895	210992	111862	46432	79147
B4. Control (Water spray)	177.8	157.6	167.7	2574	2075	2324	179353	144578	161965	48566	16554	32560
Mean	160.8	147.9	154.3	3136	2210		218562	154036		86555	24792	
ANOVA	SE d	CD (5%)		SE d	CD (5%)							
Gen.	4.1	8.8		154.0	330.3							
GR	5.8	12.4		217.8	467.1							
Gen.XGR	8.2	NS		308.0	NS							

PHY 2. Preparing for Climate Change: Effect of environment on crop phenology development & yield

Preamble: Desi cotton is known for tolerance of abiotic stress. However, the land races are known for photo and thermo sensitive characters. Delay sowing observed excessive vegetative growth with less or no flowering. However erratic onset of monsoon is not uncommon by climate change. Hence the experiment is proposed to induce flowering by spraying PG in desi cotton under delay sowing situation

Surat

The experimental results revealed that seed cotton yield (kg/ha) was significantly affected due to Dates of Sowing and Growth regulator . The significantly higher seed cotton yield was observed in normal sowing (D1, 992 kg/ha) which was followed by D2 (D1+20 days, 842 kg/ha) and D3 (D2+20 days, 693 kg/ha). The treatment G4:Ethrel@8.5µM at 45 DAS +Detopping on 20th node showed significant higher yield (889 kg/ha) as compare to control (793 kg/ha) (Table 84). Days required for squaring, flowering and boll opening as influenced by growth regulators and times of sowing .The result showed that effect of time of sowing was significant for days required to all phonological stages. Days required for 50% squaring and 1st flowering were non-significant due to growth regulators however to bear 50% flowering and boll bursting were significant by growth regulators and detopping. Overall control required higher number of days to 50% flowering and boll opening as compare to other treatments.

The number of flower at 50% flowering, 30 days after 50% flowering and No of flower at 60 days after 50% flowering were significantly deviated due to time of sowing and growth regulators. Significantly higher no of flowers was observed in D1 sowing at50% flowering and60 days after 50% flowering while it was significantly higher in D2 at 30 days after 50% flowering. The interaction of growth regulator and time of sowing for number of flower at different stages showed significant deviation which indicate that date of sowing may also influence the effect growth regulator .

Table 84. Seed cotton yield (kgha^{-1}) and No of flowers at 30 days after50% flowering as influenced by growth regulators and times of sowing at Surat

Treatments		Seed cotton yield (kg/ha)				No of flowers at 30dayafter50% flowering			
		D1. Normal sowing	D2. D1+20 days delay	D3. D2+20 days delay	Mean	D1. Normal sowing	D2. D1+20 days delay	D3. D2+20 days delay	Mean
G_1	Control	983	733	663	793	45.0	66.3	53.0	54.8
G_2	Detopping on 20th node	977	903	687	856	52.3	68.7	58.3	59.8
G_3	Gibberellic acid @ 100 ppm at 45 &60 DAS+ Detopping on 20th node	941	810	639	797	50.0	75.0	62.7	62.6
G_4	Ethrel@8.5µM at 45 DAS +Detopping on 20th node	1097	802	770	889	45.3	76.3	64.0	61.9
G_5	Homobrassinolide @ 0.2 ppm at 45 & 60 DAS +Detopping on 20th node	960	872	709	847	40.0	73.7	59.3	57.7
Mean		992	824	693			46.5	72.0	59.5
ANOVA		GR	D	GR X D			GR	D	GRXD
SE d		30.7	13.5	53.1			1.25	1.12	2.16
CD (5%)		63.7	38.4	NS			2.59	3.18	4.91

Soil : pH:7.05, EC(dsm^{-1}):0.68, Avail.N:453.11 kg/ha, Avail P:20.98 kg/ha, Avail K:539.11 kg/ha, Total rainfall:1493mm, Rainy days:80

Dharwad

The experiment was conducted to study the growth and development of arboreum cotton in response to growth regulators and changing climate. The results depicted that, the seed cotton yield decreased with delayed dates of sowing. The mean cotton yield was recorded higher in D1 (1300 kg ha^{-1}) which was on par with D2 (1280 kg ha^{-1}). The seed cotton yield decreased by 23.69% under D3 compared to D1. Under delayed sowing (D3) the treatment G6 Ethrel@8.5µM + detopping on 20th internode recorded significantly higher cotton yield (1184 kg ha^{-1}) followed by G7-planofix@0.25ml/l @40 & 60 DAS (1349 kg ha^{-1}) (Table 85). The monopodia branches decreased by 33.33 % under delayed sowing compared to normal. The sympodia branches per plant also showed similar trend. Among the treatments G7-planofix@0.25ml/l @40 & 60 DAS and G5 Ethrel@8.5µM recorded higher boll weight 5.6 g each under 2nd date of sowing. Under delayed sowing D3 the treatment G7-planofix@0.25ml/l @40 & 60 DAS recorded significantly higher No. of Bolls per plant 14.53 bolls per plant which was on par with treatment G6 Ethrel@8.5µM + on 20th internode (14.13) and G5 Ethrel@8.5µM (14.20). The number of flowers at 30 days after 50% flowering has greaterly influenced by dates of sowing and growth regulators. Treatment G6 Ethrel@8.5µM + Detopping on 20th internode recorded significantly higher number of flowers at 30 days after flowering (32 per plant) followed by G7-planofix@0.25ml/l @40 & 60 DAS (31.67 per plant) and G5 Ethrel@8.5µM (29.67 per plant under 1st date of sowing. The experiment concluded that the application of growth regulator Ethrel@8.5µM + detopping on 20th internode has a greater influence on seed cotton yield and other yield contributing traits.

Table 85. Seed cotton yield (kg/ha) and No of flowers at 30 days after 50% flowering as influenced by growth regulators and times of sowing atDharwad

Treatments	Seed cotton yield (kg/ha)				No. of flowers at 30 days after 50% flowering			
	D1. Normal sowing	D2. D1+20 days delay	D3. D2+20 days delay	Mean	D1. Normal sowing	D2. D1+20 days delay	D3. D2+20 days delay	Mean
G1 control	1389	1322	1039	**1250**	25.00	22.33	16.67	**21.33**
G2 Detopping on 20th internode	1450	1371	1048	**1290**	24.33	21.00	19.00	**21.44**
G3 Gibberellic acid @ 100 ppm	860	1062	751	**891**	26.00	24.00	20.33	**23.44**
G4 Gibberellic acid @ 100 ppm + Detopping on 20th internode	841	954	700	**832**	26.33	26.67	22.33	**25.11**
G5 Ethrel@8.5µM	1456	1393	1156	**1335**	29.67	29.00	23.67	**27.44**
G6 Ethrel@8.5µM + Detopping on 20th internode	1508	1471	1184	**1387**	32.00	31.33	23.33	**28.89**
G7-planofix@0.25ml/l @40 & 60 DAS	1597	1385	1066	**1349**	31.67	30.00	23.33	**28.33**
Mean	**1300**	**1280**	**992**		**27.86**	**26.33**	**21.24**	
ANOVA	**GR**	**D**	**GR x D**		**GR**	**D**	**GR x D**	
SE d	14.05	13.57	23.50		0.50	0.51	0.88	
CD (5%)	19.87	19.18	33.23		0.71	0.72	1.24	

Medium deep black soil, pH: 7.5, soil fertility : N : 256 kg/ka, P_2O_5 : 34 kg/ha, K_2O: 515 kg/ha, recommended spacing: 60 x 30 cm, environment : Rainfed

LAM

The experiment was conducted to study the growth and development of arboreum cotton in response to growth regulators and changing climate. The results revealed that the seed cotton yield

decreased significantly with delayed dates of sowing. The mean cotton yield was recorded higher in D1 (1242 kg ha^{-1}). Boll weight (g) was significantly influenced by dates of sowing. The first date of sowing registered significantly higher boll weight (2.31g) . Application of PGR did not influence significantly boll weight and seed cotton yield . The significant interaction effect on seed cotton yield recorded with D1. Normal sowing with G3.Gibberellic acid @ 100 ppm at 45 &60 DAS+ Detopping on 20th node (1487 kg/ha)

Table 85 A. Boll weight (g) and Seed cotton yield (kg/ha) as influenced by growth regulators and times of sowing at LAM

Treatments	Boll weight (g)				Seed cotton yield (kg/ha)			
	D1. Normal sowing	D2. D1+20 d. delay	D3. D2+20 d. delay	Mean	D1. Normal sowing	D2. D1+20 d. delay	D3. D2+20 d. delay	Mean
G1.Control	2.27	2.27	1.51	2.02	917	532	233	561
G2.Detopping on 20th node	2.23	2.17	1.57	1.99	1224	545	242	671
G3.Gibberellic acid @ 100 ppm at 45 &60 DAS+ Detopping on 20th node	2.27	1.80	1.36	1.81	1487	494	229	737
G4.Ethrel@8.5µM at 45 DAS +Detopping on 20th node	2.50	2.36	1.53	**2.13**	1256	487	208	650
G5.Homobrassinolide@0.2 ppm at 45 & 60 DAS +Detopping on 20th node	2.29	2.16	1.49	1.98	1327	417	203	649
Mean	2.31	2.15	1.49		1242	495	223	
ANOVA	GR	D	GRXD		GR	D	GR x D	
SE d	0.13	0.10	0.22		69.5	53.8	120.3	
CD (5%)	NS	0.20	NS		NS	110.8	247.7	

PHY 3.Effect of growth retardant on physiological parameters and productivity of compact genotypes

Dharwad

The experiment was conducted to study the effect of growth retardant on physiological parameters and productivity of compact genotype (DDHC-1651). Mepiquat chloride was used as a growth retardant at varied concentrations, multiple sprays at square initiation late after. Along with the treatments detopping was also done with one control treatment. All treatments for the seed cotton yield were found to be highest compare to control (1510 kg/ha). Among the treatments significantly higher seed cotton yield was recorded in T_7Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray(1896 kg/ha); which was followed by T_6.Mepiquat chloride@45ppm at square initiation and 15 days after first spray +Detopping (1813 kg/ha) (Table 86). The plant height was significantly higher in control (137 cm) and lowest was recorded in treatment T6 (97 cm) and T8 (97 cm). The number of sympodial branches was significantly higher in control (24) followed by treatment T7 (23 per plant). All treatments compare to control showed decrease in the number of nodes per plant T1(21.67). The highest number of nodes per plant was recorded in the treatment T_2 (21.33) and the lowest number of nodes per plant was

recorded in the treatment T_5 (16.00).It was recorded that the treatment T_6 (47.97) and T_3 (47.77) has the highest value of SPAD compare to control (42.23).

Table 86. Growth characters, physiological parameters as influenced by growth retardant application at Dharwad

Treatments	Plant Height @ Harvest (cm)	No. of Monopodia branches	No. of Sympodia branches	No of Bolls Plant^{-1}	No of Nodes Plant^{-1}	Seed Cotton Yield (kg ha^{-1})	SPAD
T_1.Control	137	1.8	24	23.33	21.67	1510	42.23
T_2.Detopping	104	1.8	18	24.33	21.33	1604	44.63
T_3.Mepiquat chloride@45ppm at square initiation	112	2.2	20	26.33	19.00	1777	47.77
T_4.Mepiquat chloride@45ppm at square initiation +Detopping	102	1.7	19	25.00	18.00	1794	46.87
T_5.Mepiquat chloride@45ppm at square initiation and 15 days after first spray	113	2.2	22	29.00	16.00	1712	44.80
T_6.Mepiquat chloride@45ppm at square initiation and 15 days after first spray +Detopping	97	2.2	17	32.67	16.33	1813	47.97
T_7.Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray (need based)	116	1.6	23	33.33	19.00	1896	47.63
T_8.Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray (need based)+Detopping	97	1.8	17	31.00	16.67	1746	47.50
Mean	**110**	**1.9**	**20**	**28.13**	**18.50**	**1732**	**46.18**
S.Em. ±	1.67	0.20	0.61	0.74	0.78	37.68	0.41
CD @5%	5.07	0.60	1.84	2.25	2.36	114.29	1.24

Medium deep black soil, pH: 7.5, N : 256 kg/ha, P_2O_5 : 34 kg/ha, K_2O : 515 kg/ha, OC (%): 0.54, Recommended spacing :90 x 30 cm, Environment: Rainfed

Hisar

The **e**xperiment was conducted to study the effect of growth retardant on physiological parameters and productivity of compact genotype under irrigated condition at Hisar. The results revealed that number of monopodia, and seed index were not affected by spray of growth retardant. Spray of Mepiquat chloride@45ppm at square initiation +Detopping (T4, 3443 kg/ha) and Mepiquat chloride@45ppm at square initiation and 15 days after first spray +Detopping (T6, 3466 kg/ha) resulted significantly higher boll weight, number of bolls per square metre and seed cotton yield as compared to other treatments (Table 87)

Sandy loam, pH : 7.89 OC(%) :0.44, EC(dSm^{-1}) : 0.52, N : 172 Kg/ha, P_2O_5 : 16 Kg/ha, K_2O : 262 Kg/ha, Recommended nutrients: 175:60:60:25 kg/ha, Environment: Irrigated, recommended spacing: 67.5x60 cm, total rainfall received: 596 mm

Table 87. Growth, Seed cotton yield and yield attributes as influenced by growth retardant applications at Hisar

Treatments	Plant height at harvest cm	No of sympodial branches at harvest	Boll wt. gm	No of bolls per sq. mt	Seed cotton yield kg/ha
T_1. Control	165	13	3.23	78	2895
T_2. Detopping	159	11	3.26	80	2988
T_3. Mepiquat chloride@45ppm at square initiation	162	12	3.30	80	2991
T_4. Mepiquat chloride@45ppm at square initiation +Detopping	135	16	3.95	98	3443
T_5. Mepiquat chloride@45ppm at square initiation and 15 days after first spray	151	11	3.09	77	2990
T_6. Mepiquat chloride@45ppm at square initiation and 15 days after first spray +Detopping	129	17	3.74	111	3466
T_7. Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray (need based)	143	12	3.37	77	2744
Mean	111	11	3.35	79	2606
CD at 5%	18.89	2.92	0.49	21.74	473.44

Surat

The experiment was conducted to study the effect of growth retardant on physiological parameters and productivity of compact genotype (RCH 608 BG- II) under irrigated condition . Plant height was found non-significant before spraying of treatment while at harvest, it was significantly highest in T1 (Control, 130.2 cm) as compare to detopping treatments; however mepiquat chloride treatments showed non-significant decrease in plant height as compared to control . Effect of mapiquat chloride with detopping treatment was significantly reduced plant height in T6 (90.8 cm) and T8 (88.7 cm) as compare to T2 (111.5 cm). No. of sympodia was found significantly highest in T1 (22.7) treatment which was at par with T3 (22.6) and T5(21.9) while rest of the treatments was significant lower number of sympodia as compare to control. The boll per sq meter was significantly higher in treatment T4 (138) followed by T2 (135) and T5 (131.1) (Table 88). The effect of mepiquat chloride and detopping was non-significant on boll weight however it was seen that there was numerically higher boll weight in treatment with detopping. The seed cotton yield was significantly higher in treatment T2 (2341 kg/ha) which was at par with T4(2309 kg/ha) and T8(2015 kg/ha). Seed index and Lint index were non-significant among treatments while GOT was significantly highest in T4 treatment.

Table 88. Growth characters, physiological parameters as influenced by growth retardant application at Surat

Treatments	Plant height (cm)	No of Sympodia at harvest	Boll per sq meter	Boll weight (g)	Seed cotton yield (kg/ha)
T_1.Control	130.2	22.7	131.0	3.93	1869
T_2.Detopping	111.5	20.0	135.0	4.11	2341
T_3.Mepiquat chloride@45ppm at square initiation	128.7	22.6	130.0	3.95	1944
T_4.Mepiquat chloride@45ppm at square initiation +Detopping	97.7	16.0	138.0	4.15	2309
T_5.Mepiquat chloride@45ppm at square initiation and 15 days after first spray	125.0	21.9	131.1	3.85	1964
T_6.Mepiquat chloride@45ppm at square initiation and 15 days after first spray +Detopping	90.8	17.0	96.4	4.44	1983
T_7.Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray (need based)	118.0	18.7	121.7	4.34	1898
T_8.Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray (need based)+Detopping	88.7	15.1	125.7	4.20	2015
SEd	6.07	4.30	7.71	0.14	108.9
CD (5%)	18.41	2.82	23.38	NS	330.2

Soil : pH:7.38, EC($dsm^{-1)}$:0.66, Avail.N:409.17 kg/ha, Avail P:20.81 kg/ha, Avail K:523.35 kg/ha, Total rainfall:1493mm, Rainy days:80

LAM

The experiment was conducted to study the effect of growth retardant on physiological parameters and productivity of compact genotype (Navaneeth Bt) under rainfed condition . Plant height was found non-significant before spraying of treatment while at harvest, it was significantly highest in T1 (Control, 171.2 cm) . Effect of Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray (need based)+Detopping treatment was significantly reduced plant height in T8 (135.5 cm). No. of sympodia was found significantly highest in T1 (22.6) treatment . The boll per sq meter was significantly higher in treatment T_7.Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray (need based) (170.7) (Table 88 A). The effect of mepiquat chloride and detopping was non-significant on boll weight however it was seen that there was numerically higher boll weight in treatment with detopping. The seed cotton yield was significantly higher in treatment T_7.Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray (need based) (2450 kg/ha).

Table 88A. Growth characters, physiological parameters as influenced by growth retardant application at LAM

Treatments	Plant height (cm)	No of Sympodia at harvest	Boll per sq meter	Boll weight (g)	Seed cotton yield (kg/ha)
T_1.Control	171.2	22.6	119.8	6.6	1593
T_2.Detopping	146.9	19.2	131.2	7.0	1854
T_3.Mepiquat chloride@45ppm at square initiation	161.7	21.7	127.3	6.4	1629
T_4.Mepiquat chloride@45ppm at square initiation +Detopping	134.8	17.9	159.9	7.3	2326
T_5.Mepiquat chloride@45ppm at square initiation and 15 days after first spray	151.9	20.8	160.5	6.7	2151
T_6.Mepiquat chloride@45ppm at square initiation and 15 days after first spray +Detopping	132.7	18.1	159.2	7.1	2254
T_7.Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray (need based)	156.0	20.1	170.7	7.2	2450
T_8.Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray (need based)+Detopping	135.5	17.6	156.7	6.7	2095
SEd	5.2	1.1	10.6	0.5	236
CD (5%)	10.8	2.17	21.88	NS	488

PHY 4 Use of Defoliants to facilitate mechanical picking

Dharwad

The experiment was conducted to study the effect of defoliants chemicals to facilitate the mechanical picking in cotton. Among the treatments T4-Thidiazuron@500ppm recorded significantly higher seed cotton yield (2237 kg ha^{-1}) followed by T6- Ethrel @ 2000 ppm + Dimethopin@1200ppm (2235 kg ha^{-1}), T3- KCL@10% (2227 kg ha^{-1}) compared to control (1958 kg ha^{-1}) (Table 89). In our findings, it noticed that all different treatments recorded highest value per cent defoliation compare to control (17%). The highest value was notice in the treatments T_7 KCL@10% + Dimethopin @ 1200ppm (93%), follows by treatment T_6 Ethrel @ 2000 ppm +Dimethopin@1200ppm (88%) and the lowest value was recorded in the treatment T_{12} .Sodium chlorate@0.9% (22%). Number of bolls per plant was significantly higher in T4. Thidiazuron@500ppm which was 33.33% higher compared to control (T1). The number of sympodial branches per plant was significantly higher in treatment T_4 (28) and T_{10} (28) compared to control (25). The overall experiment concluded that, Treatment combination of KCL@10% + Dimethopin@1200ppm was comparatively better as defoliant compared to control and other treatments which showed 93% of defoliation suitable for mechanical picking.

Table 89. Per cent defoliation, Seed cotton yield (kg ha^{-1}) and economics as influenced by Defoliants at Dharwad

Treatment	Seed Cotton Yield (kg ha^{-1})	Gross return (Rs. ha-1)	Net Return (Rs. ha-1)	B:C Ratio	Per cent Defoliation
T1- Control	1958	137091	76965	2.28	17
T2- Ethrel @ 2000 ppm	2121	148484	84722	2.33	88
T3- KCL@10%	2227	155901	90277	2.38	78
T4-Thidiazuron@500ppm	2237	156578	86046	2.22	87
T5-Dimethopin@1200ppm	2157	151004	76778	2.03	87
T6- T2 + T5	2235	156420	84776	2.18	88
T7- T3+T5	2176	152329	77034	2.02	93
T8- T4+T5	1823	127584	57185	1.81	72
T9- T2+ Diuron @200 ppm	1825	127757	53451	1.72	62
T10- T3+ Diuron @200 ppm	2145	150126	76411	2.04	82
T11-T4+Diuron@200ppm	1965	137523	65782	1.92	45
T12-Sodium chlorate@0.9%	2073	145084	81351	2.28	22
T13- CICR Defoliant	2137	149578	88394	2.44	82
Mean	**2083**	**145805**	**76859**	**2.13**	**69**
S.Em. ±	64	4513	4608	0.07	1.78
CD @5%	188	13174	13451	0.20	5.21
CV	5.36	5.36	10.38	5.59	4.45

Medium deep black soil, pH: 7.0-7.5, Soil fertility status: N : 256kg/ka, P_2O_5 : 34kg/ha, K_2O : 515kg/ha, OC(%): 0.54, Recommended spacing : 60 x 30cm, Environment : Rainfed

Junagadh

The experiment was conducted to identify defoliants and treatments were given after 65% boll opening. The data showed that growth characters, yield attributes and seed cotton yield were not influenced significantly by different defoliants in Bt cotton. Numerically higher seed cotton yield was recorded with application of sodium chlorate @ 0.9 % (4033 kg/ha). The highest gross return (330733 **Rs.**/ha) and was obtained in treatment with application of sodium chlorate @ 0.9 %. While net return maximum recorded (2575797 **Rs.**/ha) with treatment No. T_{10} (ethrel @2000 ppm + Paraquat @375 ml (two times)/ha) (Table 90) . Seed index, lint index and ginning outturn were non-significantly affected by different defoliants treatments in Bt cotton. The defoliation percentage affected by different defoliants in Bt cotton. Boll opening, leaves defoliation at 5 days and 10 days after sprays were significantly deviated due to different defoliant treatments. Boll opening was found highest (70.35 %) in treatment No. T_{10} i.e. ethrel @ 2000 ppm + paraquat @ 375 ml (two times)/ha, which was statistically at par with treatment No. T_3, T_4, T_6, T_{12} and $T_{13.}$ Defoliation was significantly higher in all treatment as compare to control at 5 day and 10 days after spray. Treatment T_5- Sodium chlorate @0.9 % showed significant higher defoliation (89.87 % at 10 DAS) which was statistically at par with treatment No. T_3, T_6, $T_{8,}$ T_{10}, T_{11} and T_{13} at 10 days after sprays.

Table 90. Boll opening percentage, Per cent defoliation and Seed cotton yield (kgha^{-1}) as influenced by Defoliants at Junagadh

Treatments	Boll opening percentage	Per cent defoliation at 5 day after spraying	Per cent defoliation at 10 day after spraying	Earliness Index	Seed cotton yield (kg/ha)	Cost of cultivation (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)
T_1.Control	67.00	15.50	20.73	0.48	3427	55462	280987	225525
T_2.Ethrel @2000 ppm	67.49	**76.26**	80.00	0.74	3433	64702	281506	216804
T_3.KCl @10%	**68.75**	**79.30**	**87.67**	0.73	3820	136466	313240	176774
T_4. Thidiazuron @500 ppm	**67.77**	**76.32**	79.92	0.69	3925	416335	321863	-94472
T_5.Sodium chlorate @0.9 %	65.63	**77.56**	**89.87**	0.77	4033	78671	**330733**	**252063**
T_6.CICR Defoliant	**68.64**	**70.33**	**82.33**	0.73	3523	60708	288913	-
T_7. T_2+Diuron@200 ppm	66.60	**76.60**	78.47	0.66	3525	64203	289050	224847
T_8.T_3+Diuron @200 PPM	65.67	**71.67**	**82.67**	0.69	3962	140706	324909	184203
T_9. T_4+Diuron @200 PPM	67.66	**77.83**	80.80	0.67	3437	420124	281807	-138317
T_{10}.T_2+Paraquat @375 ml (two times)/ha	**70.35**	**73.33**	**83.53**	0.75	3927	64408	321987	**257579**
T_{11}.T_2+Glyphosate @1500 ml/ha	66.96	61.47	**82.33**	0.71	3630	63845	297660	233815
T_{12}. T_2+T_4	**69.08**	**78.00**	77.00	0.74	3853	426243	315946	-110297
T_{13}.T_2+T_5	**68.37**	**76.83**	**85.00**	0.69	3706	87521	303892	216371
SEd	0.90	3.31	2.78	0.03	184	-	-	-
CD (5%)	2.62	9.65	8	0.08	NS	-	-	-

Soil pH:8.03, Ec(dsm$^{-1)}$: 0.35, OC(%):0.90, av. N :279 kg/ha, P_2O_5 : 81.05 kg/ha & K_2O :395 kg/ha, spacing : 120 x 45 cm, nutrients :240:50:150 NPK kg/ha Cotton species :G.Cot. Hy-24 BG-II, environment: Irrigated and total rainfall :1319 mm during cropping periods

Surat

The experiment was conducted with objective to identify defoliant for cotton and treatments were imposed after 65% boll opening. The results revealed that plant height was significantly higher in T2 and T5 treatments while lowest in T13 treatment. All the treatments were at par with the control for number of bolls. Boll weight and Seed cotton yield (kg/ha) were non-significant. Seed index, Lint index and GOT were non-significantly affected by treatments.Boll opening, Defoliation at 5days and 10 days after sprays were significantly deviated due to treatments. Boll opening was found highest in T5-Sodium chlorate @0.9 % (94.67%) followed by T12- Ethrel @2000 ppm+Thidiazuron @500 ppm (94.10%). Defoliation was significantly higher in all treatment as compare to control at 5 day and 10 days after spray. Treatment T4- Thidiazuron @500 ppm (96.2% at 10DAS) showed significant higher defoliation followed by T6- CICR defoliant (94.2%) and T9- T4+Diuron @200 ppmat 10 days after sprays (92.07%) (Table 91).

Table 91. Boll opening percentage, Per cent defoliation at 10 DAS and Seed cotton yield (kgha^{-1}) as influenced by Defoliants at Surat

Treatments	Boll opening percentage	Per cent defoliation at 5 DAS	Per cent defoliation at 10 DAS	Seed cotton yield (kg/ha)
T_1.Control	82.73	13.71	17.48	2663
T_2.Ethrel @2000 ppm	86.81	78.83	82.82	2531
T_3.KCl @10%	91.55	87.30	91.57	2811
T_4. Thidiazuron @500 ppm	92.97	75.31	96.22	2678
T_5. Sodium chlorate @0.9 %	94.67	64.39	87.23	2802
T_6. CICR Defoliant	86.31	74.32	94.20	2596
T_7. T2+Diuron@200 ppm	85.20	71.84	85.01	2586
T_8.T3+Diuron @200 ppm	89.19	80.28	83.21	2849
T_9.T4+Diuron @200 ppm	83.35	91.66	92.07	2637
T_{10}.T2+Paraquat @ 375ml (two times)/ha	91.04	50.46	86.76	2918
T_{11}. T2+Glyphosate @1500 ml/ha	86.27	43.79	81.88	2617
T_{12}. T2+T4	94.10	82.32	84.79	2662
T_{13}. T2+T5	87.00	80.14	86.21	2466
SEd	2.21	4.34	1.67	296.1
CD (5%)	4.5	9.01	3.46	NS

Note: pH:7.40, EC(dsm^{-1}):0.62, Avail.N:485.14 kg/ha, Avail P:23.14 kg/ha, Avail K:520.30 kg/ha, Total rainfall:1493mm, Rainy days:80

LAM

The experiment was conducted with objective to identify defoliant for cotton. The results revealed that growth characters, yield attributes and seed cotton yield were not significantly influenced by the treatments. Boll opening and Defoliation at 10 days after sprays were significantly deviated due to treatments. Boll opening was found highest in T11. Ethrel @2000 ppm +Glyphosate @1500 ml/ha (84.3 %) . Application of T5. Sodium chlorate @0.9 % registered the highest defoliation at 10 DAS (89.13 %) (Table 91A).

Table 91 A. Boll opening percentage, Per cent defoliation at 10 DAS and Seed cotton yield (kgha^{-1}) as influenced by Defoliants at LAM

Treatments	Boll opening percentage	Per cent defoliation at 10 DAS	Seed cotton yield (kg/ha)
T1. Control	7.6	5	2223
T2. Ethrel @2000 ppm	79.2	72.53	2157
T3. KCl @10%	38.4	30	2349
T4. Thidiazuron @500 ppm	79.8	78.93	2484
T5. Sodium chlorate @0.9 %	79.87	89.13	2221
T6. CICR Defoliant	46.07	38.8	2196
T7. T2+Diuron@200 ppm	78.87	82.4	2272
T8. T3+Diuron @200 PPM	75.87	73.47	2305
T9. T4+Diuron @200 PPM	83.93	79.93	2494
T10. T2+Paraquat @375 ml (two times)/ha	77.07	87.13	2357
T11. T2+Glyphosate @1500 ml/ha	84.33	88.8	2366
T12. T2+T4	79.33	76.93	2196
T13. T2+T5	83.93	79.67	2371
SEd	0.84	1.25	234
CD (5%)	1.7	2.54	NS

BIO CHEM1. Screening of Cotton genotypes for abiotic stress tolerance and estimation of for seed oil

BIO CHEM1a. Screening of Cotton genotypes for drought tolerance and estimation of for seed oil, gossypol and protein (Hisar)

Hisar

The analysis was done from rainfed and irrigated conditions to identify drought tolerance. The specific leaf weight (SLW) increased in most of genotypes, whereas, the plant height, relative water content (RWC) and total chlorophyll content was found to decrease in rainfed condition as compared to irrigated condition . The genotypes H 1521, H 1528, H 1557 and H 1491 showed maximum increase in specific leaf weight under rainfed condition as compared to irrigated control.The proline and protein content increased in most of genotypes in rainfed condition as compared to irrigated condition . The highest and lowest proline content was observed in H 1480 and H 1521 genotype under rainfed condition, respectively. The genotypes H 1480, H 1530, H 1529, H1581 and H 1564 showed maximum increase in proline content under rainfed condition as compared to irrigated control. Data for soluble protein presented in Table 92 showed increase under rainfed condition in most of the genotypes but was decreased in H 1528, H 1557, H 1569, H 1566, H 1533, H 1547 and H 1553 genotypes. The photosynthetic rate was highest in H 1547 genotype followed by H 1530 and H 1539 under rainfed condition. The genotype H 1530 showed highest seed cotton yield under irrigated and rainfed conditions . Cotton seed yield under irrigated condition differ significantly from rainfed condition, however, least decrease in seed cotton yield was observed in H 1530 followed by H 1529, H 1539, H 1547 and H 1553 genotypes .The seed biochemical quality parameters were also influenced by the drought stress in cotton as shown in Table 92. The

crude oil, crude protein and gossypol content decreased significantly under drought condition in all the genotypes (Table 93).The genotypes, H 1530, H 1529, H 1539, H 1480 and H 1564 performed best because of high degree indices for CSI, SLW and proline content and very less reduction in RWC and seed cotton yield under rainfed condition.

Table 92 Physiological and biochemical parameters as influenced by water stress tolerance genotypes at Hisar

Genotypes (B)	RWC (%)		SLW (mg/cm^2)		Protein (mg/g FW)		Proline content (µmoles/g) of tissue		Seed cotton yield (kg/ha)	
	IR (A)	RF (A)	IR (A)	RF (A)	IR (A)	RF (A)	IR (A)	RF(A)	IR (A)	RF(A)
H 1480	76.78	73.72	4.48	4.79	1.80	2.21	1.43	1.81	1,973	1,669
H 1564	73.13	67.40	4.62	5.02	1.83	2.07	1.33	1.62	1,876	1,610
H 1491	69.06	61.70	5.49	6.36	1.47	1.58	1.05	1.17	1,303	1,025
H 1581	78.18	73.16	4.10	4.15	1.90	2.10	1.31	1.62	1,830	1,586
H 1566	72.56	66.76	4.78	5.00	1.82	1.67	1.26	1.50	1,672	1,403
H 1521	69.97	60.77	5.79	7.15	1.38	1.69	0.89	0.94	1,240	1,027
H 1539	71.26	63.53	5.06	5.59	2.09	2.14	1.17	1.38	1,783	1,659
H 1569	68.45	62.64	5.17	5.60	2.26	1.85	1.17	1.37	1,537	1,240
H 1528	68.55	58.22	5.60	6.69	2.14	1.61	1.07	1.14	1,332	1,017
H 1529	77.98	76.88	4.33	4.45	1.90	2.41	1.37	1.71	1,942	1,837
H 1530	75.33	72.53	4.21	4.42	1.83	2.36	1.40	1.76	2,000	1,912
H 1533	70.26	64.62	4.99	5.32	1.97	1.81	1.22	1.44	1,469	1,216
H 1531	70.75	60.63	5.49	6.25	1.46	1.75	1.03	1.11	1,475	1,142
H 1547	72.65	63.73	5.33	6.05	1.73	1.61	1.11	1.25	1,612	1,483
H 1553	74.44	69.84	4.60	4.75	2.16	2.15	1.28	1.56	1,923	1,755
H 1557	70.42	63.72	5.59	6.56	1.96	1.57	1.05	1.17	1,397	1,185
H 1098i	70.95	62.63	5.21	5.87	1.63	1.88	1.14	1.31	1,503	1,309
Mean	72.40	66.03	4.99	5.53	1.84	1.91	1.19	1.40	1,639	1,416
	C.D. (5%)	**SE (d)**	**C.D. (5%)**	**SE (d)**	**C.D. (5%)**	**SE (d)**	**C.D. (5%)**	**SE (d)**	**C.D. (5%)**	**SE(d)**
A	**0.19**	**0.10**	**0.04**	**0.02**	**0.02**	**0.01**	**0.02**	**0.01**	**25.3**	**12.4**
B	**0.55**	**0.28**	**0.11**	**0.06**	**0.07**	**0.03**	**0.05**	**0.03**	**73.8**	**36.1**
A X B	**0.78**	**0.39**	**0.16**	**0.08**	**0.09**	**0.05**	**0.07**	**0.04**	**104.3**	**51.1**

Table 93 Evaluation of cotton genotypes for seed oil, gossypol and protein at Hisar

Genotypes (B)	Crude Oil (%)		Crude Protein (%)		Total Gossypol (%)	
	IR (A)	RF(A)	IR (A)	RF(A)	IR (A)	RF(A)
H 1480	19.10	18.33	24.27	23.46	0.74	0.68
H 1564	18.60	18.00	23.55	22.22	0.57	0.48
H 1491	17.98	16.45	17.55	14.68	0.47	0.37
H 1581	18.80	17.90	25.74	24.62	0.65	0.57
H 1566	18.35	17.13	23.94	22.26	0.61	0.48
H 1521	16.83	15.23	19.72	15.69	0.51	0.42
H 1539	19.68	19.30	26.62	25.99	0.67	0.61
H 1569	17.50	16.13	20.00	18.15	0.45	0.34
H 1528	17.18	15.15	18.39	15.26	0.43	0.36
H 1529	19.25	18.58	24.21	24.01	0.66	0.60
H 1530	20.05	19.55	27.37	26.56	0.56	0.54
H 1533	17.83	16.58	22.35	20.48	0.67	0.54
H 1531	17.40	15.60	20.55	18.01	0.51	0.43
H 1547	19.03	18.28	25.62	25.23	0.53	0.48
H 1553	18.90	17.80	24.06	22.44	0.47	0.40
H 1557	16.60	15.10	21.43	18.17	0.43	0.33
H 1098i	18.23	17.25	22.21	19.68	0.39	0.33
Mean	18.31	17.20	22.80	20.99	0.55	0.47
	C.D. (5%)	**SE(d)**	**C.D. (5%)**	**SE(d)**	**C.D. (5%)**	**SE(d)**
A	**0.13**	**0.06**	**0.10**	**0.05**	**0.00**	**0.00**
B	**0.37**	**0.19**	**0.28**	**0.14**	**0.01**	**0.01**
A X B	**0.52**	**0.26**	**0.40**	**0.20**	**0.02**	**0.01**

Surat

The screening of genotypes for drought tolerance found that Seed cotton yield was higher with genotypes GJHV-566 under rainfed and irrigated conditions followed by GSHV-260 and GISV-360 , however reduction in the yield due to rainfed condition was lower in Suraj which was followed by GSHV-269 (Table 94). Relative water content (RWC), SLW (Specific Leaf weight) and SLA (Specific Leaf Area) were significantly differed amongst genotypes in rainfed.The GSHV-260 showed significant higher RWC (%) followed by GJHV-566 and LRA-5166 under rainfed condition.

Germination (%),Shoot length and root shoot ratio were significantly varies among genotypes while Root length and seed vigor were not significantly differed under rainfed condition. Photosynthesis rate, Conductance, Transpiration rate and SPAD value were significantly deviated among genotypes in both conditions. As well as Total chlorophyll content and proline content were significant due to genotypes under rainfed.Reducing sugar was found significant in rainfed and irrigated condition but it was higher in rainfed condition compared to irrigated (Table 95). Chlorophyll stability and protein content were significantly differed among all genotypes in rainfed and irrigated conditions. Chlorophyll stability index was found significantly highest in GJSH-566under rainfed condition.

The screening of genotypes for drought tolerance found that genotypes GJHV-566 showed significantly higher yield under rainfed and irrigated conditions followed by G.Cot-16, GJHV-522. Chlorophyll stability index was found significantly highest in NDLH-2035-5 and GISV-323 under rainfed condition.

Table 94. Physiological parameters of genotypes as influenced by moisture stress condition at Surat

Genotypes	Seed cotton yield (kg/ha)		RWC (%)		SLW (mg/cm^2)		SLA (cm^2/mg)		Root/shoot ratio	
	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated
GSHV-260	1649	1808	88.19	92.40	2.32	2.21	0.43	0.45	0.109	0.058
GISV-360	1803	2314	79.41	92.00	2.02	2.35	0.50	0.43	0.091	0.108
NDLA-3116-3	1031	1209	72.46	90.89	1.86	2.01	0.54	0.50	0.216	0.217
GJHV-566	2283	2409	82.67	94.16	2.27	2.11	0.44	0.48	0.118	0.080
Suraj	1414	1480	77.19	88.37	1.70	1.75	0.59	0.58	0.141	0.074
LRA-5166	749	864	81.91	91.08	1.97	1.90	0.51	0.53	0.067	0.077
G.Cot-16	1201	1576	75.05	91.99	2.17	1.92	0.46	0.52	0.102	0.082
GSHV-269	1578	1667	76.84	88.99	1.76	1.81	0.57	0.55	0.099	0.123
SE(d)	136	115	1.27	2.38	0.14	0.117	0.034	0.030	0.026	0.025
C.D. (5%)	295	250	2.76	N.S.	0.30	0.249	0.073	0.064	0.056	0.055

Note: pH: 7.11, EC(dsm^{-1}):0.65, Avail.N:430kg/ha, Avail P:22.20kg/ha, Avail K:507.25kg/ha, Total rainfall:1493 mm, Rainy days:80, Spacing:120x45cm

Table 95. Physiological parameters of genotypes as influenced by moisture stress condition at Surat

Genotypes	Reducing Sugar (mg/g of tissue)		Chlorophyll stability (%)		Protein (mg/g of tissue)	
	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated
GSHV-260	34.39	24.45	71.28	81.44	11.51	9.68
GISV-360	33.81	25.76	68.79	83.63	11.93	8.61
NDLA-3116-3	31.53	28.50	65.31	82.67	12.07	8.65
GJHV-566	29.81	24.20	72.82	88.00	12.55	8.51
Suraj	29.92	26.02	71.07	80.11	11.51	9.44
LRA-5166	34.37	25.89	72.01	80.55	10.81	9.48
G.Cot-16	31.46	26.65	71.17	81.01	11.47	9.57
GSHV-269	34.50	26.90	71.30	80.28	11.02	9.17
SE d	0.66	0.45	1.14	0.92	0.23	0.20
CD (5%)	1.42	0.96	2.45	1.98	0.52	0.43

Note: pH: 7.11, EC(dsm^{-1}):0.65, Avail.N:430kg/ha, Avail P:22.20kg/ha, Avail K:507.25kg/ha, Total rainfall:1493 mm, Rainy days:80, Spacing:120x45cm

Dharwad

The drought screening study included eighteen cotton genotypes including local and zonal checks were sown at ARS, Dharwad Farm, Dharwad, during 2022. Among hirsutum varieties, DDHC-1901 (2068 kg/ha) was high yielding. Among *arboreum* varieties, NDLA 3104 was high yielding (716 kg/ha) and among barbadense varieties, DB1901 was high yielding (691 kg/ha) and were comparable with that of checks (Table 96). The genotypes CPD-1902, DDHC 1901, NDLA 3104, and DB1901 exhibited high RWC (71%), CSI (> 70%), root/shoot ratio (0.3) and proline content (> 3 **µmol.g^{-1} of tissue**). Therefore based on the physiological and biochemical parameters it was evident that the genotypes CPD-1902, DDHC 1901, NDLA 3104, and DB1901were found to be drought tolerant.

Quality assessment: Seed oil, protein and gossypol content in cotton seeds were varying significantly. Mean oil content was found to be 21.66% (Table 97). Mean protein content was found to be 26.78%. Mean gossypol content in seed was found to be about 5.23 mg/g. Oil content and protein content in seeds was maximum in CPD1901, CCHC-19-1, CCHC-19-2 and DDHC-1902 (>22 and >27% respectively).

Table 96. Leaf relative water content (RWC), Root/shoot ratio , Chlorophyll content (mg/g fr. wt.) influenced by soil moisture stress in cotton genotypes at Dharwad

	RWC (%)			Root/shoot ratio			Chlorophyll content (mg/g fr. wt.)		
Genotypes	**Rainfed**	**Irrigated**	**Mean**	**Rainfed**	**Irrigated**	**Mean**	**Rainfed**	**Irrigated**	**Mean**
ARBH813 (LC)	72.07 (8.49)	93.84 (9.69)	82.96 (9.09)	0.23	0.31	0.27	3.50	6.35	4.93
CPD 1902	64.52 (8.03)	78.14 (8.84)	71.33 (8.44)	0.34	0.27	0.30	3.06	6.37	4.71
CCH 19-2	72.56 (8.52)	65.84 (8.11)	69.20 (8.32)	0.33	0.30	0.32	3.30	7.30	5.30
CCHC – 19-1	65.73 (8.11)	77.42 (8.80)	71.58 (8.45)	0.28	0.33	0.31	2.29	3.40	2.84
CCHC – 19-2	65.52 (8.09)	61.26 (7.83)	63.39 (7.96)	0.28	0.23	0.26	3.60	4.74	4.17
NDLH 2056-4	66.71 (8.17)	72.06 (8.49)	69.38 (8.33)	0.27	0.27	0.27	3.57	7.52	5.54
Sahana (ZC)	72.44 (8.51)	70.34 (8.39)	71.39 (8.45)	0.35	0.26	0.31	3.77	6.85	5.31
DDHC 1901	63.37 (7.96)	63.12 (7.94)	63.24 (7.95)	0.37	0.36	0.37	4.42	5.30	4.86
DDCC 1902	46.92 (6.85)	59.24 (7.70)	53.08 (7.27)	0.29	0.24	0.27	6.58	8.76	7.67
DLSa 17 (LC/ZC)	72.70 (8.53)	61.35 (7.83)	67.02 (8.18)	0.28	0.26	0.27	4.02	5.55	4.78
NDLA 3104	49.23 (7.02)	65.43 (8.09)	57.33 (7.55)	0.23	0.21	0.22	3.50	4.72	4.11
DB 1901	63.63 (7.98)	64.19 (8.01)	63.91 (7.99)	0.48	0.36	0.42	3.79	5.07	4.43
Suvin (LC/ZC)	52.58 (7.25)	70.09 (8.37)	61.34 (7.81)	0.37	0.33	0.35	3.43	6.09	4.76
Mean	63.69 (7.98)	69.41 (8.33)	66.55 (8.16)	0.32	0.29	0.30	3.76	6.00	4.88
	MP	**Genotype(SP)**	**Interaction**	MP	Genotype(SP)	Interaction	**MP**	**Genotype (SP)**	**Interaction**
SEm	0.118	0.158	0.245	0.019	0.031	0.046	0.017	0.106	0.145
CD (5%)	NS	0.464	1.568	NS	0.091	NS	0.305	.310	0.454

Values in parenthesis are arc sine transformed.

Table 97. Evaluation of seed oil, gossypol and protein content in cotton genotypes as influenced by moisture stress at Dharwad

S. No.	Genotypes	Oil content (%)			Protein content (%)			Total gossypol (mg/g tissue)		
		Rainfed	Irrigated	Mean	Rainfed	Irrigated	Mean	Rainfed	Irrigated	Mean
1	ARBH813 (LC)	18.25 (25.27)	19.25 (26.00)	18.75 (25.63)	24.19 (29.39)	26.96 (31.27)	25.57 (30.33)	5.14	5.47	5.31
2	CPD 1902	22.75 (28.47)	22.90 (28.58)	22.83 (28.52)	27.07 (31.30)	27.30 (31.48)	27.19 (31.39)	5.70	4.79	5.25
3	CCH 19-2	21.75 (27.78)	21.25 (27.43)	21.50 (27.60)	30.28 (33.37)	33.97 (35.63)	32.12 (34.50)	4.70	4.12	4.41
4	CCHC – 19-1	22.25 (28.12)	22.50 (28.31)	22.38 (28.21)	23.19 (28.64)	30.70 (33.61)	26.94 (31.12)	4.55	5.19	4.87
5	CCHC – 19-2	24.25 (29.48)	24.39 (29.58)	24.32 (29.53)	27.93 (31.85)	29.70 (33.01)	28.81 (32.43)	6.09	4.66	5.37
6	NDLH 2056-4	19.25 (26.00)	24.75 (29.82)	22.00 (27.91)	19.52 (25.95)	26.15 (30.74)	22.83 (28.34)	5.94	5.62	5.78
7	Sahana (ZC)	24.75 (29.82)	24.91 (29.93)	24.83 (29.87)	24.52 (29.67)	30.37 (33.43)	27.44 (31.55)	5.17	5.51	5.34
8	DDHC 1901	22.25 (28.12)	23.25 (28.81)	22.75 (28.47)	21.52 (27.61)	29.93 (33.13)	25.72 (30.37)	5.19	6.54	5.87
9	DDCC 1902	23.25 (28.81)	23.79 (29.18)	23.52 (28.99)	22.78 (28.41)	29.22 (32.70)	26.00 (30.56)	5.76	4.20	4.98
10	DLSa 17 (LC/ZC)	17.75 (24.89)	18.25 (25.28)	18.00 (25.08)	24.00 (29.23)	31.81 (33.95)	27.91 (31.59)	3.89	4.27	4.08
11	NDLA 3104	20.25 (26.72)	20.62 (26.99)	20.43 (26.86)	22.19 (27.98)	27.56 (31.65)	24.87 (29.81)	5.15	4.62	4.89
12	DB 1901	18.75 (25.64)	19.85 (26.43)	19.30 (26.04)	26.70 (31.00)	32.22 (34.55)	29.46 (32.78)	7.02	5.72	6.37
13	Suvin (LC/ZC)	20.25 (26.72)	21.75 (27.79)	21.00 (27.25)	21.48 (27.59)	25.00 (29.98)	23.24 (28.78)	5.75	5.26	5.50
	Mean	21.21 (27.37)	22.11 (28.01)	21.66 (27.69)	24.26 (29.38)	29.30 (32.70)	26.78 (31.04)	5.39	5.08	5.23
		MP	Genotype (SP)	Interaction	MP	Genotype(SP)	Interaction	MP	Genotype(SP)	Interaction
	SEm	0.543	0.310	0.687	0.437	1.712	2.367	0.197	0.333	0.494
	CD (5%)	NS	0.910	8.461	NS	NS	NS	NS	0.978	NS

BIO CHEM1B: Screening of Cotton genotypes for salinity stress tolerance and estimation of for seed oil, gossypol and protein

Hisar

The data presented revealed that average boll weight, and seed cotton yield under salt stress condition were differ significantly among the genotypes. The boll weight was found highest in genotype H 1529. The maximum seed cotton yield was observed in the genotype H 1530 followed by H 1539, H 1547, H 1529 and H 1553. The genotypes H 1529 had highest potassium to sodium ratio

followed by H 1564, H 1491, H 1553 and H 1547 (Table 98). The gossypol content was highest in genotype H 1557 while it was lowest in genotype H 1581. The highest crude oil was observed in the H 1529 and 1564 and highest protein content was observed in the H 1529 genotypes. Among all the genotypes screened for salt tolerance H 1530 and H 1529 genotype performed best.

Table 98. Evaluation of cotton genotypes for seed crude oil, crude protein and gossypol content at Hisar

Genotypes	Crude Oil (%)	Crude Protein (%)	Total Gossypol (%)	Boll wt (g)	Seed Cotton Yield (kg/ha)	K^+/Na^+
H 1480	14.88	24.58	0.153	1.98	1,189	2.03
H 1564	15.60	26.68	0.152	2.40	1,143	2.51
H 1491	15.58	26.65	0.176	2.27	869	2.49
H 1581	14.33	21.53	0.145	1.75	1,143	1.47
H 1566	14.53	22.68	0.150	1.88	1,029	1.61
H 1521	14.98	24.75	0.154	2.02	823	2.15
H 1539	15.10	25.30	0.153	2.12	1,280	2.29
H 1569	14.60	23.00	0.152	1.89	869	1.85
H 1528	14.73	23.08	0.178	1.90	960	1.87
H 1529	15.73	27.83	0.171	2.45	1,235	2.59
H 1530	15.00	24.90	0.161	2.05	1,326	2.15
H 1533	14.33	22.28	0.148	1.85	1,006	1.55
H 1531	15.08	25.15	0.170	2.09	869	2.26
H 1547	15.13	25.70	0.173	2.16	1,235	2.32
H 1553	15.18	26.28	0.173	2.20	1,189	2.39
H 1557	14.88	24.10	0.195	1.97	960	2.02
H 1098i	14.73	23.55	0.153	1.95	869	2.01
C.D.	0.55	0.85	0.01	0.10	136	0.16
SE(d)	0.27	0.42	0.00	0.05	67	0.08

Surat

The results an evaluation of cotton genotypes of pre released cultures for seed oil, fatty acid profile, gossypol and protein showed significant variations amongst the genotypes in rainfed and irrigated condition. .Higher oil content was observed in G.Cot-16 (17.61%) in rainfed condition while in irrigated condition, highest oil content was found in LRA5166 (17.50%) (Table 99). Gossypol content ranges from 0.61 to 0.68% in different genotypes in both conditions. Significant lower gossypol content was found inNDLA-3116-3 (0.60 %) which was followed by GSHV-269 (0.62%) and GISV-360 (0.63%) in rainfed condition. Highest protein content was observed in GSHV-260(18.12%) in rainfed condition.

Table 99. Evaluation of cotton genotypes for seed oil, gossypol and protein (Rainfed) at Surat

Genotypes	Oil content (%)		Protein content (%)		Total Gossypol (%)	
	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated
GSHV-260	17.60	17.32	18.12	16.25	0.68	0.64
GISV-360	17.55	17.29	17.51	16.87	0.63	0.63
NDLA-3116-3	16.68	16.61	16.46	15.76	0.60	0.61
GJHV-566	17.73	17.37	17.57	16.29	0.65	0.66
Suraj	17.44	17.30	17.76	16.97	0.63	0.64
LRA-5166	17.47	17.50	17.76	15.55	0.64	0.62
G.Cot-16	17.61	17.40	17.50	16.20	0.65	0.63
GSHV-269	17.34	17.21	17.66	16.68	0.62	0.63
SE d	0.28	17.32	0.28	16.25	0.017	0.64
CD (5%)	N.S.	0.22	0.61	0.45	0.035	0.010

Note: pH:7.11, EC(dsm^{-1}):0.65, Avail.N:430kg/ha, Avail P:22.20kg/ha, Avail K:507.25kg/ha, Total rainfall:1493 mm, Rainy days:80, Spacing:120x45cm

HISAR

The seeds of test entries of Br 4a trial were evaluated for crude protein, oil and total gossypol content . The highest oil content (13.35 %) was observed in KCH 9377 BG II . The highest crude protein content (15.98%) was observed in ACH-911-2 BGII . The highest total gossypol content (0.26 %) was observed in ACH-911-2 BGII . The entry HYCH – 1278 had lowest total gossypol (0.13%) (Table 100).

Table 100. Evaluation of cotton genotypes for seed oil, gossypol and protein at Hisar

Genotypes	Crude Oil (%)	Crude Protein (%)	Total Gossypol (%)
KCH 9377 BG II	13.35	15.28	0.16
ACH-911-2 BGII	13.15	15.98	0.26
US 712 BGII	13.45	15.00	0.17
C 9317 BG II	13.15	15.14	0.18
HYCH - 1278	13.07	14.58	0.13
C.D.	**0.17**	**0.70**	**0.03**
SE(d)	**0.06**	**0.25**	**0.01**

The seeds of test entries of Br 24a trial were evaluated for crude protein, oil and total gossypol content . The highest oil content (13.30 %) was observed in DACH 47N47 BG II . The highest crude protein content (17.24%) was observed in DACH 45N45 BG II . The highest total gossypol content (0.24 %) was observed in BIO 6635 BGII . The entry C 9316 BG II had lowest total gossypol (0.16%) (Table 101).

Table 101. Evaluation of cotton genotypes for seed oil, gossypol and protein at Hisar

Genotypes	Crude Oil (%)	Crude Protein (%)	Total Gossypol (%)
C 9316 BG II	12.60	16.96	0.16
Zonal BGII Check – 2	12.20	16.54	0.18
KCH 9388 BG II	11.90	15.84	0.20
ACH-944-2 BGII	12.40	16.26	0.20
DACH 45N45 BG II	12.30	17.24	0.18
ARCH 1010 BG II	13.15	14.72	0.21
DC5418 BGII	12.70	15.98	0.21
DACH 47N47 BG II	13.30	16.12	0.21
BIO 6635 BGII	13.05	16.82	0.24
C.D.	**0.35**	**0.94**	**0.03**
SE(d)	**0.15**	**0.41**	**0.01**

The seeds of test entries of Br 25a trial were evaluated for crude protein, oil and total gossypol content . The highest oil content (13.75 %) was observed in SP7692 BGII . The highest crude protein content (15.94%) was observed in **Zonal BGII Check – 2** The highest total gossypol content (0.22 %) was observed in RCH 997 BG II . The entry US 709 BGII had lowest total gossypol (0.17%) (Table 102).

Table 102. Evaluation of cotton genotypes for seed oil, gossypol and protein at Hisar

Genotypes	Crude Oil (%)	Crude Protein (%)	Total Gossypol (%)
ACH-927-2 BGII	13.70	16.26	0.19
US 709 BGII	13.30	17.66	0.17
Zonal BGII Check – 1	13.15	15.00	0.20
SP7692 BGII	13.75	17.80	0.20
RCH 997 BG II	13.30	14.44	0.22
US 705 BG II	13.70	17.24	0.21
ACH-559-2 BGII	-	-	-
Zonal BGII Check – 2	13.50	17.94	0.21
C.D.	**0.33**	**1.20**	**0.02**
SE(d)	**0.13**	**0.48**	**0.01**

Bio Chem II. Analysis of biochemical constituents of organic cotton experiment (Agronomy IV), morpho frame (Phy:1), climate change (Phy :2) growth retardants (Phy:3) and defoliants (Phy:4)

Bio Chem.II. Analysis of biochemical constitutes of organic vs inorganic plots (Agronomy IV)

Surat

The data recorded during *kharif* 2022 for various biochemical parameters in organic and inorganic plots at 90 DAS were presented in Table 103. Protein, reducing sugar, phenol, tannin, flavanoid and gossypol content were significantly varied by the treatments. Protein, reducing sugar, phenol, tannin, flavanoid and gossypol content was found in range of 11.54 to 17.43 mg/g, 16.66 to 26.53 mg/g,3.66 to 7.49 mg/g, 18.65 to 32.83 %, 3.04 to 7.43 mg/g and 0.38 to 0.81% respectively.The Protein content and sugar content were significantly higher in treatment T8:Seed treatment and soil application of rec. biofertilizers and foliar application of PPFM+ Neem cake 250kg ha^{-1} . The treatment T1.Absolute control showed significant higher phenol content (Table 103). However secondary metabolites, tannin was significant higher in T3: RD of Nutrient through organic based on P equivalent basis . Flavanol was significantly higher in T6: Raising of sun hemp between rows incorporated before flowering while gossypol content was significantly higher in T6: Raising of sun hemp between rows incorporated before flowering which was followed by T8:Seed treatment and soil application of rec. biofertilizers and foliar application of PPFM+ Neem cake 250kg ha^{-1}

Table 103. Primary and secondary metabolites as influenced under organic and inorganic treatments at Surat

Treatments	Protein (mg/g of FW tissue)	Reducing sugar (mg/g of FW tissue)	Phenol (mg/g of FW tissue)	Tannin (g/100g of dry tissue)	Flavanol (mg/g of FW tissue)	Gossypol (%)
T1:Absolute control (No organic and inorganic)	13.81	21.24	7.49	27.34	4.35	0.57
T2:Control (RDN through inorganic) (RDN 180:0);)-Urea	14.47	19.33	5.36	31.94	4.65	0.49
T3: RD of Nutrient through organic based on P equivalent basis(00-40-00)	16.78	21.75	5.22	32.83	6.57	0.51
T4:Seed treatment and soil application of rec. bio fertilizer and foliar application of PPFM	12.59	19.80	6.78	30.37	5.65	0.46
T5:Neem cake 250kg ha^{-1}	16.12	20.98	5.46	22.79	4.30	0.55
T6: Raising of sun hemp between rows incorporated before flowering	11.80	23.60	4.97	18.65	7.43	0.81
T7:Intercropping with green gram sowing	12.17	20.16	6.89	21.06	5.23	0.57
T8:Seed treatment and soil application of rec. biofertilizers and foliar application of PPFM+ Neem cake 250kg ha^{-1}	17.43	26.53	3.66	30.94	3.69	0.71
T9: Seed treatment and soil application of rec. biofertilizers and foliar application of PPFM+ Raising of sun hemp between rows incorporated before flowering	11.68	23.40	4.24	26.32	6.08	0.38
T10: Seed treatment and soil application of rec. biofertilizers and foliar application of PPFM+ Neem cake 250kg ha^{-1} +Raising of sun hemp between rows incorporated before flowering	11.54	16.66	5.43	27.85	6.19	0.50
T11:Seed treatment and soil application of rec. biofertilizers and foliar application of PPFM+ Neem cake 250kg ha^{-1} + Intercropping with green gram sowing	13.10	17.12	6.26	19.93	3.04	0.43
S. Ed	0.44	1.31	0.47	1.79	0.22	0.019
CD (5%)	0.92	2.73	0.22	3.74	0.45	0.040

Note: pH:7.10, EC(dsm^{-1}):0.35, Avail.N:427.55 kg/ha, Avail P:22.11 kg/ha, Avail K:457.80kg/ha, Total rainfall:1493 mm, Rainy days:80

Bio Chem II Optimum morpho frame and enhanced yield (PHY II)

Hisar

The results biochemical constituents on by the effects of PGR sprays on morpho frame of cotton plant revealed that RCH 650 and CICR *Bt* 6 cotton were reported in table 104. The highest sugar content was recorded in RCH 650 after Ethrel spray @ 45 ppm at 40 DAS + Mepiquat chloride spray @100 ppm at 90 DAS (B3). However, lowest sugar content was recorded in CICR *Bt* 6 after Ethrel spray @ 45 ppm at 40 DAS (B1). RCH 650 showed higher sugar content in all treatments except control. The highest phenolic content was recorded in RCH 650 after Mepiquat chloride spray @100 ppm at 90 DAS (B2). RCH 650 showed higher phenolic content in all treatments except B3 treatment. The highest gossypol content was recorded in RCH 650 after Ethrel spray @ 45 ppm at 40 DAS (B1) and after Ethrel spray @ 45 ppm at 40 DAS + Mepiquat chloride spray @100 ppm at 90 DAS (B3).

Table 104. Effect of PGR on bio chemical constituents as influenced by genotypes and growth regulators at Hisar

Treatments	CICR *Bt* 6	RCH 650	Mean (PGR)	ANOVA	CD (5%)	SE d
Total soluble sugar						
B1. Ethrel @ 45 ppm at 40 DAS	1.157	1.453	1.305	**A**	0.061	0.030
B2. Mepiquat chloride @100 ppm at 90 DAS	1.625	1.830	1.728	**B**	0.086	0.042
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS	1.637	1.860	1.748	**AXB**	0.121	0.059
B4. Control (Water spray)	1.830	1.445	1.638			
Mean (Genotype)	1.562	1.647				
Total phenolic content						
B1. Ethrel @ 45 ppm at 40 DAS	0.321	0.350	0.336	**A**	0.014	0.007
B2. Mepiquat chloride @100 ppm at 90 DAS	0.316	0.369	0.343	**B**	0.020	0.010
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS	0.346	0.312	0.329	**AXB**	0.028	0.014
B4. Control (Water spray)	0.297	0.325	0.311			
Mean (Genotype)	0.320	0.339				
Gossypol content						
B1. Ethrel @ 45 ppm at 40 DAS	0.157	0.185	0.171	**A**	NS	0.004
B2. Mepiquat chloride @100 ppm at 90 DAS	0.173	0.168	0.170	**B**	0.010	0.005
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS	0.168	0.185	0.177	**AXB**	0.014	0.007
B4. Control (Water spray)	0.174	0.141	0.157			
Mean (Genotype)	0.168	0.170				

Surat

The results revealed that protein content was found significantly higher in treatment B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS (11.01 mg/g) while it was non significant due to genotypes (Table 105). The significantly highest tannin content was observed in G.Cot Hy 12 BG II treated with B3 followed by GN Cot 32 treated with B3 and G.Cot Hy 12 BG II treated with B1. Phenol content was non-significant due to genotypes however treatment B2 showed significant higher phenol content . Reducing sugar content was significantly differed between genotypes as well amongst treatments. The interaction for reducing sugar was significant showed that G.Cot Hy 12 BG II treated with B3 had significant higher reducing sugar which was followed by G.Cot Hy 12 BG II treated with B2 and GN Cot 32 treated with B1 . Gossypol content was significantly varied by genotype and treatments. Significant higher gossypol content was observed in plant treated with Ethrel @ 45 ppm at 40 DAS (Table 105). Among these metabolites, protein, tannin, reducing sugar and phenol was higher due to treatment B3- Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS.

Table 105. Effect of PGR on bio chemical constituents as influenced by genotypes and growth regulators at Surat

Treatments	V1.G.Cot Hy 12 BG II	V2. GN Cot 32	Mean	ANOVA	SE d	CD (5%)
Protein content (mg/g)						
B1. Ethrel @ 45 ppm at 40 DAS	9.1	9.65	9.38	Gen.	0.124	N.S.
B2. Mepiquat chloride @100 ppm at 90 DAS	10.32	10.12	10.22	GR	0.175	0.37
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS	11.05	10.97	11.01	Gen.XGR	0.247	N.S.
B4. Control (Water spray)	9.21	8.86	9.03			
Mean	9.92	9.9				
Tannin content (g/100g)						
B1. Ethrel @ 45 ppm at 40 DAS	19.52	19.11	19.31	Gen.	0.344	0.73
B2. Mepiquat chloride @100 ppm at 90 DAS	16.64	16.64	16.64	GR	0.486	1.04
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS	25.43	21.99	23.71	Gen.XGR	0.688	1.47
B4. Control (Water spray)	19.08	19.31	19.19			
Mean	20.17	19.26				
. Phenol content (mg/g)						
B1. Ethrel @ 45 ppm at 40 DAS	8.19	7.96	8.08	Gen.	0.19	N.S.
B2. Mepiquat chloride @100 ppm at 90 DAS	9.23	9.04	9.14	GR	0.269	0.57
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm	9.16	9.05	9.11	Gen.XGR	0.38	N.S.
B4. Control (Water spray)	8.24	7.65	7.95			
Mean	8.71	8.43				
Reducing sugar (mg/g)						
B1. Ethrel @ 45 ppm at 40 DAS	20.52	26.53	23.53	Gen.	0.72	1.53
B2. Mepiquat chloride @100 ppm at 90 DAS	26.94	23.91	25.43	GR	1.01	2.17
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm	29.16	22.47	25.81	Gen.XGR	1.44	3.07
B4. Control (Water spray)	25.3	21.19	23.24			
Mean	25.48	23.53				
Gossypol (%)						
B1. Ethrel @ 45 ppm at 40 DAS	0.73	0.65	0.69	Gen.	0.012	0.026
B2. Mepiquat chloride @100 ppm at 90 DAS	0.55	0.53	0.54	GR	0.017	0.037
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm	0.7	0.62	0.66	Gen.XGR	0.024	N.S.
B4. Control (Water spray)	0.69	0.65	0.67			
Mean	0.67	0.61				

Dharwad

The experiment was conducted to study the effect of plant growth regulators on growth and development and productivity in both Bt and Non Bt cotton. The plant growth regulators like Ethrel and Mepiquat chloride at varied concentration were used for the study. Primary and secondary metabolites were quantified in all the treatments after 2nd day of spray in comparison to control. The study indicated that the treatment mepiquat chloride alone and mepiquat chloride in combination with ethrel induced the high expression of primary and secondary metabolites in both the Bt and non-Bt cotton genotypes (Table 106).

Table 106. Primary metabolite content as influenced by genotypes and plant growth regulator at Dharwad

Growth regulator	Carbohydrates (mg/g fr. wt.)			Proteins (mg/g fr. wt.)		
	Ajeet 199 (G1)	Sahana (G2)	Mean	Ajeet 199 (G1)	Sahana (G2)	Mean
B1 (Ethrel @45 ppm)	132.31	139.64	135.97	90.25	47.51	68.88
B2 Mepiquat chloride @100ppm	118.23	143.82	131.03	91.11	49.58	70.35
B3 (B1 + B2)	145.07	142.00	143.54	96.38	96.38	96.38
B4 (Control)	105.99	133.02	119.50	82.05	94.45	88.25
Mean	125.40	139.62	132.51	89.95	71.98	80.96
	MP	**SP**	**Interaction**	**MP**	**SP**	**Interaction**
SEm	0.967	2.382	3.073	0.020	0.223	0.274
CD (5%)	6.332	7.421	10.619	0.133	0.694	0.857

Table 107. Tannins and polyphenol content as influenced by genotypes and plant growth regulator at Dharwad

Growth regulator	Tannins (mg/g fr. wt.)			Polyphenols (mg/g fr. wt.)		
	Ajeet 199 (G1)	Sahana (G2)	Mean	Ajeet 199 (G1)	Sahana (G2)	Mean
B1 (Ethrel @45 ppm)	21.17	34.34	27.76	2.96	2.92	2.94
B2 Mepiquat chloride @100ppm	25.40	46.13	35.76	5.04	3.33	4.18
B3 (B1 + B2)	31.58	44.82	38.20	5.21	4.69	4.95
B4 (Control)	19.03	28.93	23.98	2.29	2.66	2.47
Mean	24.30	38.56	31.43	3.87	3.40	3.64
	MP	**SP**	**Interaction**	**MP**	**SP**	**Interaction**
SEm	0.225	0.234	0.364	0.028	0.058	0.076
CD (5%)	1.471	0.728	1.610	0.130	0.127	0.193

Table 108. Flavonoid and gossypol content as influenced by genotypes and plant growth regulator at Dharwad

Growth regulator	Flavonoids (mg/g fr. wt.)			Gossypol (mg/g fr. wt.)		
	Ajeet 199 (G1)	Sahana (G2)	Mean	Ajeet 199 (G1)	Sahana (G2)	Mean
B1 (Ethrel @45 ppm)	22.41	25.46	23.93	1.61	1.05	1.33
B2 Mepiquat chloride @100ppm	30.14	30.14	23.93	1.38	1.87	1.63
B3 (B1 + B2)	43.31	32.73	38.02	1.53	1.39	1.46
B4 (Control)	19.28	23.50	21.39	0.91	0.88	0.90
Mean	28.78	28.78	28.78	1.36	1.30	1.33
	MP	**SP**	**Interaction**	**MP**	**SP**	**Interaction**
SEm	0.462	0.421	0.692	0.012	0.025	0.033
CD (5%)	NS	1.312	3.216	NS	0.078	0.118

Bio Che II Preparing for climate change - Growth and development of *arboreum* cotton in response to growth regulators (PHY II)

Surat

The results of bio chemical analysis showed that the interaction for all bio molecules except gossypol analysed are significant due to time of sowing and PGR treatments. Which was indicated that effect of growth regulators is varying with different time of sowing. Protein content and reducing sugar content were significantly higher in leaves of cotton sowed at normal condition (D1) and treated with G3 Gibberellic acid @ 100 ppm at 45 &60 DAS+ Detopping on 20th node. Tannin content was significantly higher in leaves of cotton sowed at D3 (D2+20 days delay) and treated with G3 Gibberellic acid @ 100 ppm at 45 &60 DAS+ Detopping on 20th node. (Table 109). Treatment G2 Detopping on 20th node on D3 sown cotton showed significant higher phenol content in leaves. Flavanol content was significantly higher G1. Control cotton grown under normal sowing date (D1) .The result indicated that overall protein, tannin, phenols and reducing sugar were higher in treatment G3 and G2 while flavanol was higher in treatment G1.

Table 109. Protein (mg/g), Tannin (g/100g) and Phenol content (mg/g) from leaf as influenced by growth regulators and times of sowing at Surat

Treatments		Protein (mg/g)				Tannin (g/100g)				Phenol content (mg/g)			
		D1. Normal sowing	D2. D1+20 days delay	D3. D2+20 days delay	Mean	D1. Normal sowing	D2. D1+20 days delay	D3. D2+20 days delay	Mean	D1. Normal sowing	D2. D1+20 days delay	D3. D2+20 days delay	Mean
G1	Control	9.10	10.12	9.66	9.63	19.52	16.64	20.42	18.86	8.19	9.04	8.74	8.66
G2	Detopping on 20th node	10.32	10.97	9.33	10.21	16.64	21.99	20.72	19.78	9.23	9.05	9.60	9.30
G3	Gibberellic acid @ 100 ppm at 45 &60 DAS+ Detopping on 20th node	11.05	8.86	9.50	9.80	22.61	19.31	23.52	21.81	9.16	7.65	9.44	8.75
G4	Ethrel@8.5µ M at 45 DAS +Detopping on 20th node	9.21	9.11	8.89	9.07	19.08	19.40	19.80	19.43	8.24	8.53	8.24	8.34
G5	Homobrassin olide@0.2 ppm at 45 & 60 DAS +Detopping on 20th node	9.65	9.58	9.35	9.53	19.11	18.83	19.57	19.17	7.96	8.52	8.34	8.27
Mean		9.87	9.73	9.35		19.39	19.23	20.81		8.56	8.56	8.87	
ANOVA		GR	D	GRXD		GR	D	GRXD		GR	D	GRXD	
SE d		0.102	0.131	0.227		0.244	0.315	0.545		0.127	0.165	0.285	
CD (5%)		0.20	0.26	0.46		0.50	0.64	1.18		0.26	0.33	0.58	

Table 110. Reducing sugar (mg/g), Flavanol (mg/g) and Gossypol content (%) from leaf as influenced by growth regulators and times of sowing at Surat

Treatments		Reducing sugar (mg/g)				Flavanol (mg/g)				Gossypol content (%)			
		D1. Normal sowing	D2. D1+20 days delay	D3. D2+20 days delay	Mean	D1. Normal sowing	D2. D1+20 days delay	D3. D2+20 days delay	Mean	D1. Normal sowing	D2. D1+20 days delay	D3. D2+20 days delay	Mean
G1	Control	20.52	23.91	21.20	21.88	8.54	8.30	8.37	8.41	0.73	0.65	0.72	0.70
G2	Detopping on 20th node	26.94	22.47	27.63	25.68	7.69	8.08	8.27	8.01	0.55	0.65	0.61	0.60
G3	Gibberellic acid @ 100 ppm at 45 &60 DAS+ Detopping on 20th node	29.16	21.19	29.02	26.45	8.08	7.77	8.20	8.01	0.70	0.65	0.72	0.69
G4	Ethrel@8.5µ M at 45 DAS +Detopping on 20th node	25.30	25.11	26.75	25.72	7.74	7.57	7.61	7.64	0.69	0.68	0.58	0.65
G5	Homobrassin olide@0.2 ppm at 45 & 60 DAS +Detopping on 20th node	26.53	28.00	27.58	27.37	7.76	7.55	7.75	7.69	0.65	0.65	0.66	0.66
Mean		25.69	24.13	26.44		7.96	7.85	8.04		0.67	0.66	0.66	
ANOVA		GR	D	GRXD		GR	D	GRXD		GR	D	GRXD	
SE d		0.510	0.659	1.14		0.055	0.071	0.123		0.026	0.033	0.057	
CD (5%)		1.04	1.35	2.34		0.11	0.14	0.25		N.S.	0.068	N.S.	

Note: pH:7.05, EC(dsm^{-1}):0.68, Avail.N:453.11 kg/ha, Avail P:20.98 kg/ha, Avail K:539.11 kg/ha, Total rainfall:1493.65mm, Rainy days:80

Dharwad

The experiment was conducted to study the growth and development of arboreum cotton in response to growth regulators and changing climate. Sowing was performed at three different dates with 20 day interval to represent different temperature regimes and their response to growth regulators such as GA, Ethrel and planofix at varied concentrations including detopping and control. The treatments G3, G4, G5, G6 and G7 induced accumulation of higher levels of primary and secondary metabolites in arboreum cotton.

Table 111. Primary metabolite content as influenced by date of sowing and growth regulator at Dharwad

S. No	Growth regulator	Carbohydrates (mg/g fr. wt.)				Proteins (mg/g fr. wt.)			
		D1	D2	D3	Mean	D1	D2	D3	Mean
G_1	Control	67.59	72.08	51.06	63.58	70.84	65.84	53.90	63.52
G_2	Detopping at 20th node	99.74	76.17	67.01	80.97	64.44	78.45	64.44	69.11
G_3	Gibberellic acid @ 100 ppm	127.33	191.12	114.05	144.17	78.84	85.19	65.79	76.61
G4	Gibberellic acid @ 100 ppm + Detopping on 20th internode	134.48	147.59	143.28	141.78	74.64	82.84	64.84	74.11
G5	Ethrel@8.5µM	124.22	165.43	179.83	156.49	82.97	97.34	86.34	88.88
G6	Ethrel@8.5µM + on 20th internode	189.57	182.07	134.48	168.71	87.44	97.29	90.45	91.72
G7	Planofix@0.25ml/l @ 40 & 60 DAS	171.38	184.31	175.26	176.98	94.57	98.79	96.34	96.57
	Mean	130.62	145.54	123.57	133.24	79.10	86.53	74.58	80.07
		G	**D**	**Interaction**		**G**	**D**	**Interaction**	
	SEm	0.536	1.719	2.808		0.582	0.363	96.565	
	CD (5%)	3.514	5.147	8.773		3.810	1.906	4.542	

Table 112. Tannins and polyphenol content as influenced by date of sowing and growth regulator at Dharwad

S. No.	Growth regulator	Tannins (mg/g fr. wt.)				Polyphenols (mg/g fr. wt.)			
		D1	D2	D3	Mean	D1	D2	D3	Mean
G_1	Control	14.48	15.40	24.78	18.22	3.70	2.92	2.30	2.97
G_2	Detopping at 20th node	19.88	24.86	26.66	23.80	4.19	3.10	3.95	3.75
G_3	Gibberellic acid @ 100 ppm	18.71	28.69	26.02	24.47	4.76	3.41	4.48	4.22
G4	Gibberellic acid @ 100 ppm + Detopping on 20th internode	22.71	28.72	29.27	26.90	4.22	3.03	3.79	3.68
G5	Ethrel@8.5µM	23.73	33.29	32.05	29.69	4.73	5.46	5.66	5.28
G6	Ethrel@8.5µM + on 20th internode	36.01	23.86	35.40	31.75	5.00	4.39	5.48	4.96
G7	Planofix@0.25ml/l @ 40 & 60 DAS	38.95	34.44	37.46	36.95	5.34	5.85	6.17	5.79
	Mean	24.92	27.03	30.23	27.40	4.56	4.02	4.55	4.38
		G	**D**	**Interaction**		**G**	**D**	**Interaction**	
	SEm	0.127	0.256	0.431		0.100	0.087	0.172	
	CD (5%)	0.835	0.768	1.423		NS	0.260	0.723	

Table 113. Flavonoids and gossypol content as influenced by date of sowing and growth regulator at Dharwad

S. No.	Growth regulator	Flavonoids (mg/g fr. wt.)				Gossypol (mg/g fr. wt.)			
		D1	D2	D3	Mean	D1	D2	D3	Mean
G_1	Control	13.50	12.40	18.27	14.72	0.90	0.82	0.78	0.83
G_2	Detopping at 20th node	14.31	18.58	32.23	21.70	0.74	0.96	0.87	0.85
G_3	Gibberellic acid @ 100 ppm	17.77	19.27	30.40	22.48	1.12	1.55	1.48	1.38
G4	Gibberellic acid @ 100 ppm + Detopping on 20th internode	16.44	30.12	31.62	26.06	1.26	1.49	1.38	1.38
G5	Ethrel@8.5µM	19.27	32.50	34.49	28.75	1.89	1.88	1.77	1.85
G6	Ethrel@8.5µM + on 20th internode	27.84	35.69	43.96	35.83	1.33	1.07	1.17	1.19
G7	Planofix@0.25ml/l @ 40 & 60 DAS	29.15	39.00	46.73	38.29	1.39	1.43	1.27	1.36
	Mean	19.75	26.79	33.96	26.83	1.23	1.31	1.24	1.26
		G	**D**	**Interaction**		**G**	**D**	**Interaction**	
	SEm	0.686	0.938	1.653		0.020	0.029	0.051	
	CD (5%)	4.497	2.808	5.963		NS	0.087	0.180	

Bio Chem II Effect of growth retardant on physiological parameters and productivity of compact genotype (PHY III)

Hisar

The results revealed that bio chemical constituents are varying by growth retardant application on RCH 650. The highest sugar content was observed in Mepiquat chloride spray @45ppm at square initiation and 15 days after first spray and 15 days after second spray (T7) followed by Mepiquat chloride spray @45ppm at square initiation and 15 days after first spray (T5). The lowest sugar, phenol and gossypol content was observed in control (T1) (Table 114). However, highest phenolic content and gossypol content were observed in Mepiquat chloride spray @45ppm at square initiation, 15 days after first spray and 15 days after second spray + Detopping (T8). It was observed that sugar, phenol and gossypol content was increased with increase in number of Mepiquat chloride spray at different intervals. However, it was recorded that after detopping, sugar content was declined and phenol and gossypol content was increased.

Table 114. Effect of growth retardant on Biochemical parameters of RCH 650 at Hisar

S.No.	Treatment	Sugar (%)	Phenol (%)	Gossypol (%)
T1	Control	1.211	0.231	0.116
T2	Detopping	1.220	0.260	0.135
T3	Mepiquat chloride@45ppm at square initation	1.273	0.274	0.137
T4	Mepiquat chloride@45ppm at square initation + Detopping	1.400	0.300	0.146
T5	Mepiquat chloride@45ppm at square initation and 15 days after first spray	1.474	0.278	0.148
T6	Mepiquat chloride@45ppm at square initation and 15 days after first spray + Detopping	1.322	0.341	0.153
T7	Mepiquat chloride@45ppm at square initation and 15 days after first spray and 15 days after second spray	1.509	0.350	0.157
T8	Mepiquat chloride@45ppm at square initation and 15 days after first spray and 15 days after second spray + Detopping	1.457	0.353	0.167
C.D.		**0.101**	**0.026**	**0.013**
SE(d)		**0.050**	**0.013**	**0.006**

Dharwad

The experiment was conducted to study the effect of growth retardant on physiological and biochemical parameters and productivity of compact genotype. Mepiquat chloride was used as a growth retardant at varied concentrations, multiple sprays at square initiation late after. Along with the PGR treatments and detopping were also performed and a control was maintained. Treatments T6.Mepiquat chloride@45ppm at square initiation and 15 days after first spray +Detopping, T7.Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray (need based), and T8.Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 fays after second spray (need based)+Detopping induced the accumulation of higher levels of primary and secondary metabolites in the compact genotype (Table 115).

Table 115. Effect of growth retardant on accumulation of primary metabolites in cotton (DDHC 1651) at Dharwad

Treatments	Carbohydrates (mg/g fr. wt.)	Proteins (mg/g fr. wt.)	Tannins (mg/g fr. wt.)	Polyphenols (mg/g fr. wt.)	Flavonoids (mg/g fr. wt.)	Gossypol (mg/g fr. wt.)
T1.Control	142.01	71.14	25.52	1.49	16.08	1.25
T2.Detopping	138.10	63.14	26.66	3.19	20.05	1.57
T3.Mepiquat chloride@45ppm at square initiation	127.43	63.78	33.34	3.04	32.77	2.23
T4.Mepiquat chloride@45ppm at square initiation +Detopping	134.39	76.74	39.44	3.04	36.32	2.23
T5.Mepiquat chloride@45ppm at square initiation and 15 days after first spray	95.07	89.62	32.84	3.82	31.97	1.90
T6.Mepiquat chloride@45ppm at square initiation and 15 days after first spray +Detopping	100.25	68.74	53.53	3.05	33.54	1.98
T7.Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray (need based)	119.18	91.54	49.97	4.25	41.11	2.57
T8.Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 fays after second spray (need based)+Detopping	119.76	80.58	52.35	4.30	41.39	2.48
Mean	122.02	75.66	39.21	3.27	31.65	2.03
SEM	**0.045**	**0.013**	**0.085**	**0.276**	**0.192**	**0.088**
CD (5%)	**0.136**	**0.038**	**0.261**	**0.884**	**0.587**	**0.270**

Surat

The data recorded during *kharif* 2022 for various biochemical parameters from canopy management in HDPS using compact Bt hybrid presented in table 116. The results found that protein, reducing sugar, phenol content, tannin, flavanol and gossypol content was found in range of 8.70 to 9.86 mg/g, 18.67 to 24.94 mg/g, 5.17 to 7.46 mg/g, 10.01 to 15.18 %, 3.91 to 5.32mg/g and 0.65 to 0.74 % respectively (Table 116). Protein content was significantly higher in T2 Detopping , while reducing sugar was significantly higher in treatments T5 Mepiquat chloride@45ppm at square initiation and 15 days after first spray and G6 Mepiquat chloride@45ppm at square initiation and 15 days after first spray + Detopping . The treatment T3 Mepiquat chloride@45ppm at square initiation showed higher phenol content .Tannin content was found highest in T6 Mepiquat chloride@45ppm at square initiation and 15 days after first spray + Detopping. Flavanoid was significantly higher in treatment T7 Mepiquat chloride@45ppm at square initiation and 15 days after first spray and 15 days after second spray while Gossypol content were significantly higher in treatment G1 T1.Control

Table 116. Primary and secondary metabolites as influenced under HDPS by PGR at Surat

Treatments	Protein (mg/g of FW tissue)	Reducing sugar (mg/g of FW tissue)	Phenol (mg/g of FW tissue)	Tannin (g/100g of dry tissue)	Flavanol (mg/g of FW tissue)	Gossypol (%)
T1.Control	9.55	22.32	5.83	10.49	4.25	0.74
T2.Detopping	9.86	20.77	7.07	10.58	4.32	0.72
T3.Mepiquat chloride@45ppm at square initation	9.49	18.67	7.46	10.04	3.91	0.70
T4.Mepiquat chloride@45ppm at square initation + Detopping	9.19	20.41	5.52	10.96	4.61	0.69
T5.Mepiquat chloride@45ppm at square initation and 15 days after first spray	8.70	24.94	5.17	11.50	5.20	0.68
T6.Mepiquat chloride@45ppm at square initation and 15 days after first spray + Detopping	8.79	24.94	5.87	15.18	4.62	0.67
T7.Mepiquat chloride@45ppm at square initation and 15 days after first spray and 15 days after second spray	9.02	19.95	5.59	10.85	5.32	0.65
T8.Mepiquat chloride@45ppm at square initation and 15 days after first spray and 15 days after second spray + Detopping	9.38	21.29	5.38	10.01	4.69	0.66
S. Ed	0.15	1.22	0.108	0.91	0.16	0.013
CD (5%)	0.43	2.61	0.23	1.96	0.35	0.028

Note: pH:7.38, EC(dsm^{-1}):0.66, Avail.N:40917 kg/ha, Avail P:20.81 kg/ha, Avail K:523

Bio Chem II. Use of Defoliants to facilitate mechanical picking (PHY IV)

Surat

The data was recorded during *kharif* 2022 for various biochemical parameters from leaves after 24 h of defoliant spray were presented in Table 117. Protein, reducing sugar, phenol , tannin, flavanol and Gossypol content was ranged from 11.49 to 12.62mg/g, 12.24 to 20.05mg/g, 4.77 to 7.02mg/g, 6.09 to 9.3 %, 3.12 to 4.17mg/g and 0.46 to 0.55 % respectively. Protein content was significantly higher by application of KCl @10%+Diuron @200 ppm while reducing sugar was significantly higher by Ethrel @2000 ppm+Thidiazuron @500 ppm. The phenol content was significantly higher in Control The tannin content was non-significant. Flavanol was significantly higher by application of Ethrel @2000 ppm+Glyphosate @1500 ml/ha while gossypol was significantly higher due to treatment by CICR Defoliant

Table 117. Primary and secondary metabolites as influenced under defoliant spray at Surat

Treatments	Treatments	Protein (mg/g of tissue)	Reducing sugar (mg/g of tissue)	Phenol (mg/g of tissue)	Tannin (g/100g of dry tissue)	Flavanol (mg/g of tissue)	Gossypol (%)
T1	Control	12.08	16.20	7.02	9.30	3.12	0.46
T2	Ethrel @2000 ppm	11.54	18.15	5.43	8.50	3.20	0.51
T3	KCl @10%	11.77	14.09	4.77	6.92	3.83	0.52
T4	Thidiazuron @500 ppm	12.48	12.24	5.37	9.09	3.63	0.50
T5	Sodium chlorate @0.9 %	12.24	19.64	5.24	8.50	3.65	0.53
T6	CICR Defoliant	11.91	16.30	4.98	8.20	3.70	0.55
T7	T2+Diuron@200 ppm	12.05	16.92	4.89	8.47	3.73	0.50
T8	T3+Diuron @200 ppm	12.62	18.20	5.40	7.73	3.76	0.49
T9	T4+Diuron @200 ppm	11.49	18.77	5.49	7.10	4.11	0.52
T10	T2+Paraquat @ 375ml (two times)/ha	11.63	18.92	5.63	6.57	4.07	0.47
T11	T2+Glyphosate @1500 ml/ha	12.06	13.37	5.57	6.09	4.17	0.48
T12	T2+T4	12.22	20.05	6.88	8.05	3.78	0.49
T13	T2+T5	11.60	18.05	6.03	8.05	4.06	0.47
S. Ed		0.24	0.75	0.15	1.22	0.17	0.022
CD (5%)		0.50	1.50	0.31	N.S.	0.35	0.045

Note: pH:7.40, EC(dSm^{-1}):0.62, Avail.N:485.14 kg/ha, Avail P:23.14kg/ha, Avail K:520.30kg/ha, Total rainfall:1493mm, Rainy days:80

Dharwad

The experiment was conducted to study the effect of defoliants to facilitate the mechanical picking in cotton. The experiment included 13 treatments of various chemicals including, KCL, Thidiazuron, Diuron and sodium chlorate at varied concentrations. Results indicated a differential expression of primary and secondary metabolites due to the growth retardant in the cotton hybrid.

Table 118. Primary metabolites in Bt hybrid, Ajeet-199, as influenced by defoliant spray at Dharwad

	Treatments	Carbohydrates (mg/g fr. wt.)	Proteins (mg/g fr. wt.)	Tannins (mg/g fr. wt.)	Polyphenols (mg/g fr. wt.)	Flavonoids (mg/g fr. wt.)	Gossypol (mg/g fr. wt.)
T1	Control	147.89	83.84	23.34	1.77	25.42	1.21
T2	Ethrel @2000 ppm	103.94	83.83	19.57	2.09	27.58	0.77
T3	KCl @10%	115.83	78.83	55.51	3.31	33.62	0.67
T4	Thidiazuron @500 ppm	144.32	89.43	39.29	2.18	30.92	0.85
T5	Sodium chlorate @0.9 %	133.66	78.85	23.68	4.48	43.23	0.53
T6	CICR Defoliant	161.69	78.74	35.17	2.64	37.42	0.79
T7	T2+Diuron@200 ppm	149.54	83.82	53.91	5.58	16.38	0.31
T8	T3+Diuron @200 ppm	161.45	75.94	56.80	5.98	38.27	1.55
T9	T4+Diuron @200 ppm	172.41	66.33	39.17	3.98	25.08	1.85
T10	T2+Paraquat @ 375ml (two times)/ha	185.75	67.33	25.20	4.28	38.73	1.55
T11	T2+Glyphosate @1500 ml/ha	160.46	66.33	30.03	3.41	42.58	1.29
T12	T2+T4	176.29	76.33	25.03	2.66	23.04	2.57
T13	T2+T5	180.67	69.33	42.37	2.70	23.15	1.88
	Mean	153.38	76.84	36.08	3.47	31.19	1.22
	SEM	**0.304**	**3.928**	**0.018**	**0.082**	**0.143**	**0.010**
	CD (5%)	**0.949**	**12.237**	**0.055**	**0.254**	**0.445**	**0.032**

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CROP PROTECTION

ENTOMOLOGY

The following experiments were conducted in Entomology under All India Coordinated Research Project (AICRP) on Cotton, in five center of North Zone (Faridkot, Bathinda, Hisar, Sirsa, Sriganganagar), eight centers in Central Zone (Akola, Nanded, Rahuri, Junagadh, Surat and Bharuch, Khandwa, Bhawanipatna and Banswara) and six centers in South Zone (Lam Guntur, Nandyal, Dharwad, Raichur, Chamarajanagar and Coimbatore).

Expt. No.	Title of the Experiment	Year	Participating Centers
Ent 1(a)	Screening of breeding material for resistance to insect-pests (National and Zonal Trials)	Continuous	All centers of North, Central & South zones
Ent 1(b)	Advance screening of promising entries for development of repository for sucking pests	Continuous	All North Centers **Central zone** (Surat, Nanded, Junagarh, Rahuri) **South zone** (Lam Guntur, Dharwad and Raichur)
Ent 2	Seasonal dynamics to develop suitable forecasting model	Continuous	All centers
Ent 3	Survey for key and emerging pests in farmers' fields for weekly advisory	Continuous	All centers
Ent4	Integrated Pest Management in Cotton	IstYear	All Centers
Ent 5	Evaluation of Refugia in bag against bollworm complex in cotton (2022-23)	IIndyear	**North Zone** (Hisar,Sirsa, Bathinda, Faridkot and Sriganganagar) **Central Zone** (Surat, Nanded, Junagarh, Rahuri & Akola) **South Zone** (Nandyal, Warangal, Dharwad, Raichur & Guntur)
Ent 6	Evaluation of prominent and label claimed insecticides against bollworm complex of cotton (2022-23)	IInd Year	All centers
Ent 6a	Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—**sponsored product**	IstYear	**North Zone** (Hisar, Bathinda & Sriganganagar). **Central Zone** (Nanded, Junagarh &Banswara) **South Zone** (Guntur & Raichur)
Ent 7	Microbial based volatiles for sucking pest management in Bt cotton **(Sponsored Technology)**	IstYear	**Locations : North Zone** (Hisar Sirsa, Sriganganagar, Bathinda), **Central Zone** (CICR, Nagpur, Junagarh, Surat, Nanded, Akola, Rahuri &Banswara) **South Zone** (Lam Guntur, Raichur, Dharwad, Coimbatore, Nandyal, Chamrajnagar)

Ent.1 (a): Preliminary screening of breeding material for resistance to insect pests (National & Zonal Trials)

NORTH ZONE

The results obtained from North Zone screening trials are presented in Table:1-15. The following genotypes were identified as tolerant/moderately tolerant to leafhopper& whitefly as indicated below.

Trial No.	Leafhopper cultures– Tolerant/ Moderately tolerant	Whitefly cultures– Tolerant/ Moderately tolerant	Trial No.	Leafhopper cultures– Tolerant/ Moderately tolerant	Whitefly cultures– Tolerant/ Moderately tolerant
Br02a	----	----	**Br 22a/b(NT)**	----	----
Br06a	----	----	**Br 24 a(ZT)**	----	----
Br04a(ZT)	----	----	**Br 25a(NT) (CHT)**	----	----
Br06a(CVT)	----	----	**Br 25a/b PHT (ZT)**	----	----

NT - National trials; ZT - Zonal trials. , Population was less to draw any conclusion.

CENTRAL ZONE

The results obtained from Central Zone screening trials are presented in Table: 16-29. The following genotypes were identified as tolerant/ moderately tolerant to leafhopper& whitefly as indicated below.

Trial No.	Leafhopper cultures– Tolerant/ Moderately tolerant	Whitefly cultures– Tolerant/ Moderately tolerant	Trial No.	Leafhopper cultures– Tolerant/ Moderately tolerant	Whitefly cultures– Tolerant/ Moderately tolerant
Br02a/bCC (NT)	----	----	**Br04b (ZT)**	----	----
Br 22 b (NT)	----	----	**Br 24b (ZT)**	----	----
Br 32b (NT)	----	----	**Br 24b CC (ZT)**	----	----
Br03a/bCC (ZT)	----	----	**Br14a (South-ZT)**	----	----
Br04a (ZT)	----	----	----	----	----

NT - National trials; ZT- Zonal trials., Population was less to draw any conclusion.

SOUTHZONE

The results obtained from South Zone screening trials are presented in Table:30-40. The following genotypes were identified as tolerant/moderately tolerant to leafhopper& whitefly as indicated below.

Trial No.	Moderately tolerant cultures– Leafhopper	Whitefly cultures– Tolerant/Moderately tolerant
Br-03a/b (ZT)	----	----
Br-04a(ZT)	----	----
Br – 14 a(ZT)	----	----
Br-04b(ZT)	----	----
Br-24 b(ZT)	----	----

NT - National trials; **ZT-**Zonal trials**.,** Population was less to draw any conclusion.

Ent.1 (b): Advanced screening of promising entries for development of repository for sucking pests (Leafhopper& Whitefly) (Table: 41-50)

Zone	Centres	Leafhopper cultures– Tolerant/ Moderately tolerant	Whitefly cultures– Tolerant/ Moderately tolerant
NorthZone	Bathinda, Faridkot, Sirsa, Hisar, Sriganganagar	**PBH-79 N-Bt, ACRV-44 Bt**	**F-2732, ACRV-44 Bt, HS-310**
CentralZone	Junagadh, Surat, Nanded and Rahuri	**AKH-2013-3, GISV 323**	**GJHV 522, RAH 1076**
SouthZone	Dharwad and Raichur	**RAH 1076, RHC 1409**	**RHC 1409, RAH-1076, AKH 2013-1**

Population was less to draw any conclusion.

Ent.2: Seasonal dynamics todevelopsuitableforecastingmodel (Table: 51-112)

North Zone

S.N.	States	Genotypes(Sucking pests)	Genotypes (Bollworm)		Center Name
			Non-Bt	BG-IIhybrid	
1	Rajasthan	GanganagarAgeti, RS-2013	HS-6	RCH 650 BG-II	Sriganganagar
2	Punjab	GanganagarAgeti, RS-2013	HS-6	RCH650BG-II	Faridkot,Bathinda
3	Haryana	GanganagarAgeti, RS-2013	HS-6	RCH-650BG-II	Sirsa, Hisar

Central and SouthZone

S.N.	States	Genotypes (Sucking Pests)	Genotypes (Bollworm)		Center Name
			Non-Bt	BG-II Hybrids	
1.	Rajasthan	DCH-32	-	RCH-2BG-II	Banswara
2.	Gujarat	DCH-32	Suraj	RCH-2BG-II	Surat, Junagarh, Bharuch
3.	MP	DCH-32	Suraj	RCH-2BG-II	Khandwa
4.	Maharashtra	DCH-32	Suraj	Ajeet155 BG II	Nanded, Akola,Rahuri
5.	Odisha	DCH-32	-	-	Bhawanipatna
6.	Karnataka	DCH-32	DCH-32/ BGDS 1063	JadooBG-II /BahubaliBG-II	Dharwad, Raichur, Chamarajanagar
7.	AP	DCH-32	DCH-32	JadooBG II	Guntur, Nandyal
8.	Tamilnadu	DCH-32	Suraj	JadooBG II	Coimbatore,Srivilliputhur

North Zone- Population Range and Peak Activity Period (SMW)

Centre Name	Population Range and Peak Activity Period (SMW) of sucking pests /3leaves				Natural Enemies / plant (Range)& Peak SMW
	Leafhopper	Thrips	Whitefly	Aphid	
Bathinda	0.30-4.60 (33)	0.00-40.80 (31)	4.20-122.10 (34)	-	0.00-3.90 (31)
Faridkot	0.10-7.90 (28)	0.0 -43.80 (28)	1.30-108.1 (28)	-	0.00-8.60 (30)
Hisar	0.73-9.60 (30)	0.27-93.00 (29)	2.13-95.00 (30)	-	0.13-0.93 (35)
Sirsa	0.00-9.30 (32)	0.00-46.30 (29)	0.40-84.30 (29)	-	0.00-4.80 (36)
Sriganganagar	0.00-6.78 (34)	0.00-28.11(32)	0.00-116.0(28)	-	0.00-2.56 (35)

North zone

Centre Name	Population Rangeand Peak Activityof Bollworm (SMW)/5plant				Range of Bollworm Damage (%) and Peak (SMW)							
	Non- Bt Cotton		Bt Cotton		Non- Bt Cotton (Damage %)				Bt Cotton (Damage %)			
	*P. gossypiella***	*Earias* spp.	*P. gossypiella***	*Earias* Spp.	Fruiting Body	PBW-Green boll	Open Boll ***	Locule	Fruiting Body	PBW-Green boll	Open Boll ***	Locule
Bathinda#	-	-	-	-	12.00-24.67 (35)	-	3.75	2.50	11.33-26.00 (35)	-	2.50	3.75
Faridkot	6.50	0.00-2.10 (40)	0.00	0.00	0.00-3.40 (36)	7.00	3.80	2.30	0.00	0.50	1.40	0.90
Hisar	2.00	0.00-1.60 (43)	2.50	0.00-0.80(43)	-	3.50	14.08	4.30	-	5.00	7.34	5.34
Sirsa	1.25	0.00-0.80 (44)	0.50	0.00-0.40 (44)	0.77-40.82 (44)	13.75	13.79	5.97	0.00-28.77 (44)	11.25	6.45	3.81
Sriganganagar	8.67	0.00-5.33 (39)	4.50	0.00	0.00-21.33 (39)	15.33	20.00	10.99	0.00	8.00	10.00	4.66

*Population of *H. armigera*&*S. litura*was nil. ** PBW population through destructive boll sampling. *** Open boll and locule damage at harvesting stage

#- *P.gossypiela and* Green boll damage due to PBW (%) based on destructive sampling/20 green bolls and rest of all locationsdestructive sampling based on 50 green bolls.

Central Zone

Centre Name	Population Range and Peak Activity Period (SMW) of sucking pests /3leaves				Natural Enemies / plant (Range)
	Leafhopper	Thrips	Whitefly	Aphid	
Banswara	0.33-14.33 (40)	-	1.00-25.67 (43)	-	-
Junagarh	0.00-19.40 (39)	0.00-12.65 (36)	0.00-9.70 (41)	0.00-186.75 (52)	0.45-1.10 (52)
Surat	1.70-25.25 (45)	0.00-38.40 (39)	0.00-6.80 (46)	0.00-62.75 (50)	0.00-3.00 (48)
Bharuch	1.80-24.10(41)	0.70-21.20 (39)	0.00-3.60 (45)	0.60-38.20 (52)	0.00-4.80 (51)
Akola	0.80-19.30 (42)	0.00-9.10 (34)	1.00-8.80 (44)	0.00-9.70 (52)	0.00-1.70 (45)
Nanded	0.30-13.40 (35)	0.00-21.50 (36)	0.00-9.70 (52)	2.60-34.40 (52)	0.00-3.80 (52)
Rahuri	0.50-10.12 (37)	0.25-79.50(35)	0.00-5.58 (46)	2.12-98.60 (52)	0.26-8.16 (52)
Khandwa	0.00-9.00 (43)	-	0.00-32.36 (41)	10.20-72.08 (42)	0.00-2.20 (42)
Bhawanipatna	0.21-15.41 (43)	0.12-10.87 (38)	0.24-3.89 (47)	0.24-36.51 (35)	0.15-3.55 (35)

Central zone

Centre Name	Population Range and peak Activity of Bollworm/ 5 plant								Range of Bollworm Damage () and peak SMW							
	Non- Bt Cotton				Bt Cotton				Non- Bt Cotton (Damage %)				Bt Cotton (Damage %)			
	H. armigera	*S. litura*	*P. gossypiella*	*Earias Spp.*	*H. armigera*	*S. litura*	*P. gossypiella*	*Earias Spp.*	Fruiting Body	PBW-Green boll	Open Boll ***	Locule	Fruiting Body	PBW-Green boll	Open Boll ***	Locule
Banswara	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Junagarh#	-	-	-	-	0.0-0.49 (41)	0.00	-	0.0-0.25 (44)	-	18.15	20.48	14.66	-	5.33	5.10	3.74
Surat	0.0-0.6 (42)	0.0-1.0 (44)	6.00	0.0-0.4 (41)	0.00	0.00	4.00	0.00	0.0-22.6 (44)	15.00	16.35	9.25	0.0-8.25 (46)	9.50	10.25	5.66
Bharuch	0.0-2.0 (41)	0.0-2.0 (40)	5.50	0.0-2.0 (43)	0.00	0.00	4.50	0.00	0.0-14.9 (41)	14.00	18.36	10.25	0.0-4.6 (43)	10.50	12.25	6.66
Akola#	0.0-0.5 (41)	-	13.0 (3)	0.0-0.3 (50)	0.0-0.2 (39)	-	-	0.0-0.2 (45)	0.0-5.76 (39)	0.0-45.0 (3)	-	-	0.00-2.13(40)	0.0-40.0 (2)	-	-
Nanded	0.0-0.6 (41)	0.0-0.2 (40)	3.00	0.0-0.1 (34)	0.0-0.1 (38)	0.0-0.2 (41)	2.00	0.00	0.0-7.95 (41)	5.20	16.30	8.80	0.0-0.75 (39)	3.60	13.82	7.34
Rahuri#	-	-	0.0-37.0 (52)	-	-	-	0.0-32.0 (52)	-	0.0-52.9 (52)	-	-	-	0.0-48.9 (52)	-	-	-
Khandwa#	0.0-0.6 (40)	-	0.0-0.8 (50)	0.0-0.8 (40)	0.0-0.4 (49)	-	0.0-0.8 (50)	0.0-0.6 (48)	0.0-90.0 (50)	-	-	-	0.0-80.0 (50)	-	-	-
Bhawanipatna#	0.2-1.5 (38)	0.0-1.4 (37)	-	0.1-1.2 (41)	-	-	-	-	0.9-15.3 (41)	-	9.10	8.77	-	-	-	-

#- *P.gossypiela and* Green boll damage due to PBW (%) based on destructive sampling/20 bollsand rest of all locationsdestructive sampling based on 50 green bolls.

South Zone

Centre Name	Population Range and Peak Activity Period (SMW) of sucking pests /3leaves				Natural Enemies / plant (Range)
	Leafhopper	Thrips	Whitefly	Aphid	
Lam Guntur	0.04-30.48 (39)	0.52-19.56 (34)	0.24-8.36 (39)	0.4-5.96 (48)	0.00-0.84 (49)
Nandyal	6.00-32.00(47)	1.00-42.00(44)	6.00-42.00(51)	0.00-25.00(47)	-
Dharwad	0.00-15.80 (45)	0.00-50.60 (37)	0.00-2.40 (41)	0.00-45.80 (48)	0.00-2.00 (46)
Raichur	0.00-16.50 (46)	2.66-30.10 (40)	0.00-5.35 (48)	0.00-11.51 (34)	0.00-4.60 (34)
Chamarajanagar	0.21-4.25(39)	0.00-4.50(38)	0.00-4.26(38)	8.60-40.60(39)	0.00-3.50(39)
Coimbatore	0.00-9.58 (45)	0.00-11.94 (43)	0.00-1.66 (47)	0.00-7.02 (43)	0.00-0.33 (50)

Centre Name	Population Rangeand Peak Activityof Bollworm (SMW)/5plant								Range of Bollworm Damage (%) and Peak (SMW)							
	Non- Bt Cotton				Bt Cotton				Non- Bt Cotton				Bt Cotton			
	H. armigera	*S. litura*	*P. Gossypiela**	*Earies* spp.	*H. armigera*	*S. litura*	*P. Gossypiella**	*Earias* Spp.	Fruiting Body Damage (%)	Green boll damage	Open Boll Damage (%)***	Locule Damage (%)	Fruiting Body Damage (%)	Green boll damage due to PBW	Open Boll Damage (%)***	Locule Damage (%)
Lam Guntur	-	0.04-0.72 (37)	22.00	-	-	-	-	-	-	25.00	35.45	17.34	-	-	-	-
Nandyal	-	0.00	2.00-20.00(1)	-	-	-	1.00-16.00(1)	-	8.0-40.0(52)	-	-	-	6.00-25.00 (52)	-	-	-
Dharwad#	0.0-5.60 (41)	-	39.00	0.0-2.40 (38)	0.0-0.20 (39)	-	33.00	0.0-0.10 (40)	-	29.20	35.60	-	-	27.40	33.60	-
Raichur	0.0-3.00 (36)	0.0-5.0 (35)	62.50	0.00	0.00	0.0-3.33 (40)	51.67	0.00	0-81.25 (34)	61.66	90.25	87.73	0.0-37.5 (43)	50.83	88.85	89.23
Chamarajanagar	0.00	0.00	13.12	0.00	-	-	8.63	-	0.00	19.23	30.23	32.5	-	10.90	12.3	15.2
Coimbatore	-	-	17.03	-	-	-	16.08	-	-	26.83	14.35	42.65	-	22.76	8.69	38.65

#- *P.Gossypiela and* Green boll damage due to PBW (%) based on destructive sampling/20 bolls and rest of all locationsdestructive sampling based on 50 green bolls.

North Zone:

LEAFHOPPER: In north zone the peak activity of Leafhopper was recorded from 28th to 34th SMW at different locations. In Haryana at **Hisar**peakofleafhoppers, was observed during 30th SMW& in**Sirsa** peak ofleafhoppers, was observed during 32ndSMW. In Punjab at **Bathinda**, maximum population of leafhopper was observed during 33rd SMW.In Faridkot, Leafhopper infestation was found maximum in 28th SMW. In **Sriganganagar,** peakleafhopper infestation was reported during34thSMW.

WHITEFLY:In north zone the peak activity of Whitefly was recorded from 28th to 30th SMW at different locations except Bathinda . In Haryana at **Hisar**&**Sirsa**whitefly adult population was at its peak during 30th SMW**(2.13-95.00 adults/3 leaves)**& 29th SMW **(0.4-84.30 adults/ 3 leaves)** respectively.InPunjabat**Bathinda**peak period of population of whitefly adults was observed during 34thSMW (**4.20-122.10 adults/3 leaves**) and at **Faridkot** whitefly adults were at peak (**1.30-108.10adults/3 leaves)** during 28thSMW.In **Sriganganagar,** whitefly peak appeared during28th SMW**(0.00-116.00 adults/3 leaves)**.

THRIPS: In north zone the peak activity of thrips was recorded from 28th to 32nd SMW at different locations. In Haryana, **Hisar and Sirsa** thrips showed their peak infestation during 29th**(0.27-93.30&0.00-46.30 thrips/ 3 leaves),** respectively.In Punjab, **Bathinda** and **Faridkot** thrips showed their peak infestation during 31st**(0.00-40.80 thrips /3 leaves)**and 28th SMW**(0.00-43.80 thrips /3 leaves),**respectively.In**Sriganganagar**population of thrips was observed with peak **(0.00-28.11 thrips/ 3 leaves)**during 32nd SMW.

NATURAL ENEMIES:**In North Zone, in general activity period of generalist predators was recorded between 30th to 36th SMW.** In**Haryana,** population range of predators and peak activity variedin Hisar and Sirsa withmaximum predators (0.13-0.93) recorded in Hisar during 23-35th SMW and in Sirsa predator's population ranged (0.00-4.80)and maximum during 36th SMW (4.80/plant). In Punjab, population range of predators per plant ranged between 0.00-3.90/plant in Bathinda and 0.00-8.60/plant in Faridkot whereas peak activity was recorded during 31stSMW in Bathinda and 30th SMW in **Faridkot**.In **Sriganganagar**, predator's population ranged between 0.00-2.56/plant and peak activity was recorded during 35thSMW.

BOLLWORMS (Non-Bt): In North Zone, Populationof*H. armigera* and *Spodoptera litura*found to be nil at all the centers of north zone. Population of *Earias spp*. ranged from 0.00-5.33/plant and maximum at **Sriganganagar** during 39th SMW. Larval recovery of PBW at all locations of North Zone was ranged from 1.25-8.67 percent through destructive sampling and maximum recovery (8.67%) was found at Sriganganagar. Fruiting body damage was found to be highest during 44th SMW at all locations with highest range between 0.77-40.82 percent at **Sirsa.**Green boll damage due to pink bollworm was reported to be highest (15.33%) at **Sriganganagar**. Open boll damage and locule damage ranged from 3.75-20.00 percent and 2.30-10.99 percent respectively, at all locations.

BOLLWORMS (Bt): In North Zone, Populationof*H. armigera* and *Spodoptera litura*found to be nil at all the centers. Population of *Earias spp*. ranged from 0.00-0.80/plant and maximum during 43rdSMW at **Hisar**. Larval recovery of PBW at various locations ranged from 0.00-4.50percent through destructive sampling and maximum recovery at **Sriganganagar**. Among all locations, fruiting body damage was found to be highest during 44thSMWat**Sirsa** with range of 0.00- 28.77 percent. Green boll damage due to pink bollworm was reported to be 11.25 percent and maximum at **Sirsa**. Open boll damage and locule damage ranged from 1.40-10.00 percent and 0.90-5.34 percent, respectively at all locations.

Central Zone:

LEAFHOPPER:In Central Zone the peak activity of leafhopper was recorded from 35th to 43rdSMW. At**Banswara**(Rajasthan) the maximum infestation of leafhoppers was observed during 40th SMW (0.33-14.33/ 3 leaves).In Gujarat at **Bharuch** peak of leafhoppers was observed during 41st SMW (1.80-24.10/ 3 leaves), in **Junagadh** maximum population of leafhoppers was observed during 39th SMW (0.00-19.40/ 3 leaves) and in **Surat** peak of leafhoppers, was observed during 45th SMW (1.70-25.25/ 3 leaves). In Maharashtra at **Akola** maximum population of leafhoppers was seen during 42nd SMW (0.80-19.30/ 3 leaves), in **Nanded** peak leafhopper infestation was reported during 35th SMW (0.30-13.40/ 3 leaves) and at**Rahuri**peak infestation of leafhoppers, was recorded during 37th SMW (0.50-10.12/3 leaves). In **Khandwa**(Madhya Pradesh)leafhopper infestation was found maximum during 43rd SMW (0.00-9.00/ 3 leaves) and at **Bhawanipatna**(Odisha)during 43rd SMW (0.21-15.41/ 3 leaves).

WHITEFLY: **In Central Zone the peak activity of Whitefly was recorded from 41st to 52ndSMW.**At**Banswara**(Rajasthan)the maximum infestation of whitefly was observed during 43rdSMW (1.00-25.67 whitefly/3 leaves).In Gujarat at **Bharuch**peak of Whitefly was observed during 45thSMW (0.00-3.60 whitefly/ 3 leaves), in **Junagadh**maximum population of Whitefly was observed during 41stSMW (0.00-9.70 whitefly/ 3 leaves) and in **Surat**peak of Whitefly, was observed during 46th SMW (0.00-6.80 whitefly/ 3 leaves). In Maharashtra, at **Akola** maximum population of Whitefly was seen during 44thSMW (1.00-8.80 whitefly/ 3 leaves), in **Nanded**peak Whitefly infestation was reported during 52ndSMW (0.00-9.70 whitefly/ 3 leaves) and at**Rahuri**peak infestation of Whitefly, was recorded during 46thSMW (0.00-5.58 whitefly/3 leaves).At **Khandwa**(Madhya Pradesh)**w**hitefly infestation was found maximum during 41st SMW (0.00-32.36 whitefly/ 3 leaves) and at **Bhawanipatna**(Odisha)during47th SMW (0.24-3.89 whitefly/ 3 leaves).

THRIPS:In Central Zone the peak activity of Thrips was recorded from 34th to 39thSMW. In Gujarat at **Bharuch**peak of Thrips was observed during 39th SMW (0.70-21.20 thrips/ 3 leaves), in **Junagadh**maximum population of thrips was observed during 36th SMW (0.00-12.65 thrips/ 3 leaves) and in **Surat**peak of thrips, was observed during 39th SMW (0.00-38.40 thrips/ 3 leaves). In Maharashtra at **Akola** maximum population of thrips was seen during 34th SMW (0.00-9.10/ 3 leaves) and in **Nanded**peak thrips infestation was reported during 36th SMW (0.00-21.50 thrips/ 3 leaves). At **Rahuri**peak infestation of thrips, was recorded during 35th SMW (0.25-79.50 thrips/3 leaves) and at **Bhawanipatna**(Odisha)during38th SMW(0.12-10.87 thrips/ 3 leaves).

APHID:In Central Zone the peak activity of Aphids was recorded from 35th to 52ndSMW. In Gujarat at **Bharuch**peak of Aphids was observed during 52nd SMW (0.60-38.20 aphids/ 3 leaves), in **Junagadh**maximum population of Aphids was observed during 52nd SMW (0.00-186.75 aphids/ 3 leaves) and in **Surat**peak of aphids, was observed during 50th SMW (0.00-62.75 aphids/ 3 leaves). In Maharashtra at **Akola** maximum population of Aphids was seen during 52nd SMW (0.00-9.70 aphids/ 3 leaves), in **Nanded**peak Aphids infestation was reported during 52nd SMW (2.60-34.40 aphids/ 3 leaves) and at**Rahuri**peak infestation of aphids, was recorded during 52nd SMW (2.12-98.60 aphids/3 leaves).At**Khandwa**(Madhya Pradesh)aphid infestation was found maximum during 42nd SMW (10.20-72.08 aphids/ 3 leaves) and at **Bhawanipatna** (Odisha)during 35thSMW (0.24-36.50 aphids/ 3 leaves).

NATURAL ENEMIES:In Central Zone, in general activity period of generalist predators was recorded between 35th to 52nd SMW. In Gujarat population range of predators and peak activity recorded at**Bharuch and Junagadh**during 51stSMW 0.00-4.80/plantand 52nd SMW 0.45-1.10/plant respectively and in **Surat** predator's population ranged 0.00-3.00/plantand peak during 48thSMW.InMaharashtrapredator's population per plant ranged between 0.00-1.70/plant in **Akola**and 0.00-2.20/plant at **Nanded** was seen during 45thSMWand 52nd SMW respectively. At **Rahuri,** predator's population ranged from 0.26-8.16/plant and peak during 52nd SMW. In **Khandwa**(Madhya Pradesh)

population range 0.00-2.20/plant and peak during 42nd SMW and 0.15-3.55/plant at **Bhawanipatna**(Odisha) and peak during 35th SMW.

BOLLWORMS (Non-Bt): In Central Zone population of *H. armigera,S. litura*and*Earias spp.* was 0.00-2.00/plant for all the three bollworms and was maximum at **Bharuch** during 41st, 40thand 43rd SMW respectively.*P. gossypiella*populationrangedbetween 0.00-37.00/20 green bolls and maximum at **Rahuri**andpeakduring 52ndSMW,whereas green boll damage due to pink bollworm ranged between 0.00-45.00 percent and maximum at **Akola** and fruiting body damage was highest at **Khandwa** (0.00-90.00percent) and peakduring 50thSMW.

BOLLWORMS (Bt): Peak population range of *H. armigera*(0.00-0.49/plant)was at **Junagadh** during 41stSMW. Population of S.*litura* (0.0-0.2/plant) was observed only at **Nanded**andpeakduring 41st SMW. Whereas population (0.00-0.6/plant) of *Earias spp.* wasobserved maximum at **Khandwa** during 48thSMW. *P. gossypiella*larval recovery(0.00-32.00/20 green bolls) observed maximum at **Rahuri** during 52nd SMW. Whereas range of green boll damage due to pink bollworm was maximum (0.00-40.00 percent) at **Akola**and fruiting body damage was highest at **Khandwa (**0.00-80.00percent) and peak during 50th SMW.

South Zone :

Leafhopper: In South Zone the peak activity of leafhopper was recorded from 39th to 46th SMW**.** In **Lam Guntur** leafhopper attained its peak during 39th SMW and ranged between 0.04-30.48/3 leaves, in **Nandyal** leafhopper attained their peak during 47th SMW and ranged between 6.00-32.00/3leaves.In **Dharwad** the peak of leafhoppers was observed during 45thSMWwith a range 0.00-15.80/3 leaves. In **Raichur**leafhopper infestation was found maximum during 46thSMWand ranged between0.00-16.50/3 leaves, In **Chamarajanagar** the leaf hopper attained peak in 39th SMW with a range 0.21-4.25/3 leaves and in **Coimbatore** the leafhoppers were observed maximumand ranged between 0.00-9.58/3 leaves during 45th SMW.

Whitefly: In South Zone the peak activity of whitefly was recorded from 38th to 48th SMW.In **Lam Guntur** whitefly attained its peak during 39th SMW and ranged between 0.24-8.36 whitefly/3 leaves, in **Nandyal** whitefly attained their peak during 51st SMW and ranged between 6.00-42.00 whitefly / 3leaves. In **Dharwad** the peak of whitefly was observed during 41st SMW and ranged between0.00-2.40 whitefly/3 leaves. In **Raichur** whitefly infestation was found maximum during 48th SMW and ranged between0.00-5.35 whitefly/3 leaves. In **Chamarajanagar** the whitefly attained peak in 38th SMW with a range 0.00-4.26 whitefly/3 leavesand in **Coimbatore** the whitefly was observed maximumand ranged between 0.00-1.66 whitefly/3 leaves during 47th SMW.

Thrips: In South Zone the peak activity of thrips was recorded from 37th to 43rd SMW.In **Lam Guntur** thrips attained its peak during 34th SMW and ranged between 0.52-19.56 thrips/3 leaves, in **Nandyal** thrips attained their peak during 44thSMW and ranged between 1.00-42.00thrips/3leaves. In **Dharwad** the peak of thrips was observed during 37thSMWand ranged between 0.00-50.60 thrips/3 leaves. In **Raichur** thrips infestation was found maximum during 40thSMWand ranged between2.66-30.10 thrips/3leaves. In **Chamarajanagar** the thrips attained peak in 38th SMW with a range 0.00-4.50 thrips/3 leaves and in **Coimbatore** the thrips population ranged between 0.00-11.94 thrips/3 leaves and maximum during 43rd SMW.

Aphid: In South Zone the peak activity of Aphids was recorded from 34th to 48th SMW**.** In **Lam Guntur** aphids attained its peak during 48th SMW and population ranged between 0.40-5.69 aphids/3 leaves,in**Nandyal** aphids attained their peak during 47th SMW and ranged between 0.00-25.00 aphids/3leaves. In **Dharwad** the peak of aphids was observed during 48thSMWand ranged between 0.00-45.80 aphids/3 leaves. In **Raichur** aphid infestation was found maximum during 34thSMWand ranged

between0.00-11.51 aphids/3 leaves, in **Chamarajanagar** the aphids attained peak in 39th SMW with a range 8.60-40.60/3 leaves and in **Coimbatore** the aphids were observed maximum during 43rd SMW and ranged between 0.00-7.02 aphids/3 leaves.

Natural Enemies: In South Zone, in general, activity period of generalist predators was recorded between 34th to 50th SMW**.** In Lam Guntur predator's population per plant ranged between 0.00-0.84/plant during 49th SMW. In **Dharwad**, predator's population ranged between 0.00-2.00/plant and peak activity was recorded during 46th SMW. The predator's population ranged between 0.00-4.60/plant in **Raichur**and peak was during 34th SMW. **In Chamarajanagar** the predator's population ranged between0.00-3.50/plant during 39th SMW and in **Coimbatore** peak was during 50th SMW with a population range of 0.00-0.33/plant.

BOLLWORMS (Non-Bt): In **South Zone** peak activity of *H. armigera,* and *Earias spp.* was maximum at **Dharwad** during 41st and 38th SMW respectively. Population of *S. litura*(0.00-5.00/5 plant) was observed maximum at **Raichur** and peakduring 35th SMW. *P. gossypiella*larval recovery observed 62.50/50 green bolls and green boll damage due to pink bollworm 61.66percent /50 green bolls and was found maximum at **Raichur**and fruiting body damage was also highest at**Raichur**with a range of 0.0-81.25percentand maximum during 34th SMW**.**

BOLLWORMS (Bt): In**South Zone** peak activity of *H. armigera*and*Eariasspp.*was found maximum at **Dharwad** during 39th and 40th SMW respectively. Population of *S. litura*ranged between0.00-3.33/5 plant and was maximum at **Raichur** during 40th SMW. *P. gossypiella*larval recovery observed 51.67/50 green bolls and green boll damage due to pink bollworm50.83 percent/50 green bolls and was found maximum at **Raichur,**similarly fruiting body damage was also highest at **Raichur**and ranged between 0.0-37.50percentand maximum during 43rd SMW**.**

Ent 3:Survey for key and emerging pests in cotton in farmers' fields for weekly advisory– Allcenters (Table:113)

NORTH ZONE

In Bathinda, a total of **159** locations were surveyed for surveillance of insect pests of cotton starting from May to October of kharif, in which whitefly, leafhopper and pink bollworm crossed ETL in 66, 10 and 27 locations, respectively. **In Faridkot,** a total of **354** locations were surveyed where thrips crossed ETL at 16 locations, leafhopper crossed ETL at 12 locations, and whitefly was above ETL at 200 locations and pink bollworm at 19 locations. **In Hisar**, a total of **238** locations were surveyed from June to Oct. Out of all locations of Hisar 48, 16, 08 and 96 locations were found to cross ETL for whiteflies, leafhoppers, thrips and PBW, respectively. **In Sirsa**, a total 229locations were surveyed, where 100, 35, 10 and 105 locations crossed ETL for whitefly, leafhopper, thrips and PBW, respectively. **In Sriganganagar,** atotal of **799** locations were surveyed during Kharif 2022-23 for infestation of insect pests, where whitefly, leafhopper, thrips and PBW crossed ETL in 294, 193, 15 and 146 locations, respectively. In North Zone, Whitefly and PBW was a major pest. The whitefly, leafhopper and pink bollworm crossed ETL at 39.79 percent, 14.95 percentand 22.09 percent, respectively.

CENTRAL ZONE

In **Banswara**, a total of 177 locations surveyed during January to December, out of all locations leafhopper crossed ETL at 80 locations. In **Junagadh**, 177 locations surveyed from January to December in which whitefly, thrips, aphids and *Pectinophoragossypiella* crossed ETL at 01, 20, 62, 37 locations, respectively. In **Surat & Bharuch**, 783 locations surveyed during June to December in which leafhopper, thrips, aphids and *P. gossypiella* crossed ETL at 42, 31, 59, 29 locations, respectively. In **Akola**, whitefly, leafhopper, thrips and *P. gossypiella*crossed ETL at 09, 12, 06, 12 locations out of 81 locations surveyed respectively. In **Nanded**, 625 locations surveyed during July to December, out of these 28, 63, 32, 54, 31

locations crossed ETL for whitefly, leafhopper, thrips, aphids and P. *gossypiella,* respectively. In **Rahuri**, 248 locations surveyed during January to December in which leafhopper, thrips, aphids, *P. gossypiella*and *S. litura*crossed ETL at 24, 49, 107, 22, and 02 locations, respectively. In **Bhawanipatna**, out of 660 locations surveyed during August to December, leafhopper crossed ETL at 79 locations. In Central Zone, PBW and leafhopper was major pest at all location except Bhawaniptna. The leafhopper,thrips, aphids and pink bollworm crossed ETL at 10.90percent, 5.01 percent, 10.25 percent and 4.76 percent, respectively.

SOUTH ZONE

In Lam Guntur, whitefly, leafhopper, thrips, aphids, PBW and *S. litura* crossed ETL in 4, 32, 05, 01, 95 and 02 locations, respectively out of 191 locations surveyed. **In Dharwad,** 224 locations were surveyed for pest infestation in which leafhopper, thrips, aphids and PBW crossed ETL in 115, 78, 52 and 89 locations, respectively. **In Raichur**, 1581 locations were surveyed in which whitefly, leafhopper, thrips, aphids and PBW crossed ETL in 08, 209, 118, 140 and 152 locations, respectively. **In Chamarajanagar,** 1256 locations surveyed where, leafhopper, aphids and PBW crossed ETL in 93, 43 and 13 locations, respectively.**In Coimbatore** out of 76 locations surveyed, leafhopper, thrips, aphids, and PBW crossed ETL in 16, 15, 04, and 06 locations, respectively. **In Nandyal,** out of 114 locations surveyed, whitefly, leafhopper, thrips, and PBW crossed ETL in 40, 86, 67, and 77 locations, respectively. The leafhopper, thrips, aphids and pink bollworm crossed ETL at 16.00percent, 8.22percent, 6.97percent and 12.55percent, respectively.

Ent 4: Integrated Pest Management in Cotton (Table: 114-128)

NORTH ZONE

In IPM plots, whitefly, leafhopper and thrips population crossed ETL for 23, 6 and 5 times whereas it was 40, 13 and 7 times, respectively in case of farmers practices (FP) during the entire cotton season (May-November, 2022). However in case of bollworms, pink bollworm crossed ETL 4 times in IPM and 9 times in Farmers'practices. Whereas in North zone, the population of sucking pest i.e. jassid, whitefly and thrips were comparatively more in farmer's practices than in IPM practices. These sucking pest showed non-significant difference from farmers' practices because the number of insect was more in IPM practices in Hisar, Faridkot, Sirsa and Sriganganagar except Bathinda. In case of natural enemies, significantly higher population was found in IPM as compared to FP in Hisar, Bathinda and Sriganganagar. The destructive sampling of green bolls showed that higher green boll damage (%) and PBW larval recovery was recorded in farmers'practices as compared to IPM. Similarly, number of sprays applied as well as cost of protection was more in farmers'practices (FP) than IPM. In case of seed cotton yield, IPM recorded higher yield as compared to FP. The incremental cost benefit ratio (FP: IPM) was recorded 1:4.30 in Sirsa.

CENTRAL ZONE

In IPM plots, whitefly, leafhopper, thrips and aphid population crossed ETL for 5, 11, 4 and 1 times whereas it was 5, 14, 8 and 4 times, respectively in case of farmers practices during the entire cotton season (**June-January, 2022-2023).** However in case of bollworms, pink bollworm crossed ETL 6 times in IPM and 7 times in farmers' practices and in Bhwanipatna, *Earias sp*. and *Helicoverpasp* crossed ETL once in IPM module only. Whereas in Central zone, the population of sucking pest *i.e.* jassid, whitefly, thrips and aphid were comparatively more in farmer's practices (FP) than in IPM practices except Akola and Rahuri. In Akola, Banswara and Rahuri, the sucking pest population i.e. jassid, whiteflies, thrips and aphid showed non-significant difference from farmer's practices except thrips population (Rahuri) significantly differed from farmers's practices. Similarly, in Nanded, jassid& aphid showed non significant and thrips as well as whiteflies showed significant difference from farmers' practices and in Surat,

jassid& thrips showed non-significant and aphid & whiteflies showed significant difference withfarmers' practices. Whereas in Bhawanipatna and Junagarh, all sucking pest as well as bollworms were significantly differed with farmers' practices. In case of natural enemies, significantly higher population was found in IPM as compared to FP in Banswara, Bhwanipatna and Surat. The destructive sampling of green bolls showed that higher green boll damage (%) and larval recovery (%) was recorded in FP as compared to IPM except in Akola and Rahuri. Similarly, number of sprays applied as well as cost of protection was more in FP than in IPM. In case of seed cotton yield, IPM recorded higher yield as compared to FP except in Akola. In Rahuri, the cost benefit ratio for IPM module was 1:1.9 whereas for farmers' practices was 1:1.5. Similarly, the incremental cost benefit ratio (FP: IPM) was recorded 1:4.40 in Surat.

SOUTH ZONE

In IPM plots, leafhopper, thrips and aphid population crossed ETL for 12, 2 and 2 times whereas it was 16, 3 and 5 times, respectively in case of farmers practices (FP) during the entire cotton season **(June-January, 2022-2023).** However in case of bollworms, pink bollworm crossed ETL 8 times in IPM and 10 times in farmers'practices. Whereas in South zone, the population of sucking pest i.e. jassid, whitefly thrips and aphid were comparatively more in farmer's practices than in IPM practices. This sucking pest showed non-significant difference with farmers' practices except aphid in Chamrajnagar, jassid& aphid in Dharwad as well as Nandyal and jassid in Lam Guntur. However, in Raichur, jassid, whiteflies and aphid was significantly differed with farmers' practices except thrips. In case of natural enemies, non-significantly higher population was found in IPM as compared to farmers' practices in Coimbatore, Chamrajnagar, Lam Guntur and Nandyal. The destructive sampling of green bolls showed that higher larval recovery was recorded in FP as compared to IPM. Similarly, number of sprays applied as well as cost of protection was more in FP than in IPM. In case of seed cotton yield, IPM recorded higher yield as compared to FP.

Ent 5: Evaluation of Refugia in bag against bollworm complex in cotton (Table no.129-158)

NORTH ZONE

In Bathinda, population of ABW/SBW/TC was not observed and no green boll damage (%) due to ABW/SBW/TC was reported in all the treatments at this location. Population of PBW in flowers was highest in T2 (100% Non-Bt). Among the combination treatment of non-Bt and Bt-plants (T3-T6), T3 (20% Structured Refugia) harbor more larvae of PBW and T5 harbor minimum number of larvae in flowers in case of **N-Bt** plants. Rosette flower due to PBW was highest in T2 i.e.10.69. However, among combination treatments, maximum rossete flowers were reported on non-Bt plants of T3 (7.61%) followed by T6 (6.48%) and minimum were seen in T5 (2.33%) in case of N-Bt plants.Green boll damage due to pink bollworm was highest in T2 (29.91%) on the other hand in the combination treatments, it was highest in T3 (23.10%) in case of N-Bt plants followed by T6 (18.05%). Open boll and locule damage were highest in T2 i.e. 24.95 percent and 12.08percent respectively but among the combination treatments, damage was highest in T3i.e. 18.95percent and 9.88percent, respectively and lowest in T5 i.e.7.95percent and 1.75percent, respectively in case of N-Bt plants. The green boll damage due to PBW in T3 (N-Bt plants) is significantly different with N-Bt plants of T5 and at par with N-Bt plants of T6. Highest seed cotton yield was in T6 (24.34q/ha) followed by T3 (23.33q/ha) and lowest yield was observed in T2 (18.26q/ha).

In Faridkot, population of ABW/TC was not reported on any Bt and Non-Bt plantof all the treatments at this location. Similarly, no PBW in flowers and rosette flower was reported. Population of SBW was observed inT2& in N-Bt plants of T3 i.e.- (0.1/plant& 0.05/plant respectively). Green boll damage due to ABW/SBW/TC was highest in T2 i.e. 1.01percent followed by N-Bt plants T3 i.e. 0.29 percent. Green boll damage due to PBW was only observed in N-Bt plants T3 (20% Structured Refugia) i.e.0.1 percent.Open

boll and locule damage percentage was highest in T2i.e. 5.99percent and 3.61percent respectively, on the other hand in the combination treatments, open boll damage was highest in T5 {RIB-Fixed pattern (5% minimal non-Bt seeds)} i.e.- 4.18 percent and the maximum locule damage was observed in T3 i.e.- 1.32percent followed by T5 i.e.- 1.20 percent in case of N-Bt plants.The green boll damage due to PBW in T3 (N-Bt plants) is at par with N-Bt plants of T5 and T6. T6 gave highest seed cotton yield of (11.49q/ha) followed by T4 (11.34q/ha) and lowest yield was observed in T5 (7.71q/ha).

In Sirsa,population of ABW was highest in T2 i.e. 0.10 and minimum population was seen in T4,T5 and T6 i.e. (0.01).Population of SBW was recorded highest in T2 i.e. (0.43) followed by N-Bt plants of T6 (0.41) and minimum in T4 i.e. (0.23). TC was not reported on any Bt and Non-Bt plant of all the treatments at this location. Similarly, no PBW in flowers and rosette flower was reported. Green boll damage due to ABW/SBW/TC was highest in T2 (0.15%) and minimum in T4 (0.04%).Green boll damage due to PBW was highest in T2 (20.27%). However, among the combination treatments T3 (13.73%) showed maximum and T4 (8.13%) showed minimum green boll damage in case of N-Bt plants.Open boll and locule damage percentage was maximum in T2 i.e. (35.52% and 31.25). On the other hand, among the combination treatments T6 bear maximum open boll damage and locule damage and T4 bears minimum damage in case of N-Bt plants. The green boll damage due to PBW in T3 (N-Bt plants) is at par with N-Bt plants of T5 and T6. T1 gave highest yield (24.11q/ha) and lowest yield was gained from T2 (20.18 q/ha).

In Hisar,InHisar,population of ABW/TC was not observed. Population of SBW was highest in T2 (100% Non-Bt) i.e.-0.56 and T5 showed the minimum population for SBW i.e.- 0.31. Green boll damage due to ABW/SBW/TC was recorded highest in T2 (6.25%) However, among the combination T3 and T6 showed maximum green boll damage i.e.- 4.38% in N-Bt plants. PBW larva per plant in flower was 0.88 in T2 (100% N-Bt) which was highest among all the treatments. T2 showed maximum green boll damage due PBW i.e.,(10.00%). Among the combination treatments, maximum green boll damage due to PBW was found T3 (8.13%) and minimum green boll damage in T4 (5.00%) in case of N-Bt plants.Open boll (%) and locule damage(%) was highest in T2i.e., 15.29% and 8.64%, respectively but among the combination treatments open boll and locule damage was lowest in T5i.e., 12.12% and 7.57%, respectively in case of N-Bt plants. The green boll damage due to PBW in T3 (N-Bt plants) is at par with N-Bt plants of T5 and T6.T1 (14.55q/ha) gave maximum yield followed by T6 (14.19q/ha) and lowest yield was obtained from T2(10.77q/ha).

In Sriganganagar,population of ABW/TC was not observed at this location. Population of SBW was highest in T2 (100% Non-Bt) i.e.4.75. Population of PBW/plant was highest in T2 3.65/plant. Among the combination treatment of non-Bt and Bt plants, T6 (2.82percent) harbor maximum and T5 (1.73percent) harbor minimum larvae of PBW in flowers in N-Bt Plants. Green boll damage due to ABW/SBW/TC was highest in T2 (17.96percent) and was found minimum inT5 (11.22percent) in case of N-Bt plants. Maximum rosette flower i.e. (11.07percent) was found in T2. On the otherhand, among the combination treatments it was highest in T3 (8.80percent) followed by T6 (8.55 percent) in case of N-Bt plants. Green boll damage due to PBW was highest in T2 (17.19percent). However, among the combination treatments T6 (14.38percent) showed maximum green boll damage and T5 (9.69percent) showed minimum green boll damage in case of N-Bt plants. Open boll and locule damage percentage was highest in T2(23.50percent& 12.37percent) respectively. On the other hand, among the combination treatments T6 (22.00) bear maximum and T5 (13.50percent&6.01percent) bear minimum open boll and locule damage in case of N-Btplants. The green boll damage due to PBW in T3 (N-Bt plants) is at par with N-Bt plants of T5 and significantly different with N-Bt plants of T6. T1 gave highest yield (24.47q/ha) and lowest yield was gained from T2 (18.95q/ha).

CENTRAL ZONE

In Junagadh, the population of ABW was seen highest in T2 (100% Non-Bt). The population of SBW is only observed in T2 (100% Non-Bt). Green boll damage due to ABW/SBW/TC was highest in T2 (25.44percent) and in the case of the combination of Bt and N-Bt plants the green boll damage was observed highest in N-Bt plants of T3 (20% Structured Refugia) i.e. 21.73percent and 18.54percent and minimum in N-Bt plants of T4. The green boll damage due to PBW was highest in T2 i.e. 17.42percent and on the other hand in the case of combination the damage was highest in T3 i.e. 14.73percent and minimum in T4 i.e.9.68percent in N-Bt plants. The open boll damage and locule damage were maximum in T2 i.e. 17.74percent and 10.89percent and in the combination treatments maximum in T6 i.e.10.25percent and 9.79percent, minimum in T4 i.e. 8.32percent and 7.99percent in case of N-Btplants. The green boll damage due to PBW in T3 (N-Bt plants) is significantly different with N-Bt plants of T5 and T6. T5 gave a maximum yield and a minimum yield was obtained from T2 .

In Surat, Population of ABW/SBW/TC was seen highest in T2 (100% Non-Bt). Green boll damage due to ABW/SBW/TC was highest in T2 (13.82%) and in the case of the combination of Bt and N-Bt plants treatment the green boll damage was observed highest in T3 (20% Structured Refugia) i.e. 7.79percent and 4.40percent minimum in T4 in case of N-Bt plants. The rosette flowers were observed maximum in T2 i.e. 8.75percent. Green boll damage due to PBW was found maximum in T2 i.e. 18.59percent and in the combination treatments, the damage was highest in T3 12.69percent and lowest in T4 6.78percent in N-Bt plants. Open boll and locule damage were found to be maximum in T2 i.e. 22.32percent and 9.63percent, in the combinations, it was maximum in T3 (9.59 percent and 5.56percent) and were found minimum in T5 (6.42percent and2.50percent) in case of N-Bt plants. In Bt plants the green boll damage ranged between 4.09percent - 11.08percent whereas in N-Bt plants it ranged between 6.78percent-18.59percent.The green boll damage due to PBW in T3 (N-Bt plants) is at par with N-Bt plants of T5 and T6. T5 gave the maximum yield (25.77q/ha) and the minimum yield was obtained from T2 (13.79 q/ha).

In Akola, the population of ABW/SBW was seen highest in T2. The green boll damage due to ABW/SBW/TC was maximum in T2 i.e. 12.82percent and in the case of combinations it was found maximum in T3 i.e. 8.06percent and, minimum in T4 i.e. 4.21percent in case of N-Bt plants. The maximum rosette flowers were observed in T2 i.e. 4.08percent. The green boll damage due to PBW was found maximum in T2 i.e. 23.17percent and in the combination, the maximum green boll damage was found in T6 i.e. 17.75percent and minimum in T4 i.e.9.67percent in case of N-Bt plants. The open boll and locule damage were maximum in T2 i.e. 21.55percent and 6.64percent. In the combination, the open boll and locule damage was maximum in T6 i.e.- 16.16percent and 4.99percent, and minimum in T4 i.e. 8.48percent and 2.62percent respectively in case of N-Bt plants. The green boll damage due to PBW in T3 (N-Bt plants) is significantly different with N-Bt plants of T5 and T6. T4 gave maximum yield (23.66q/ha) and minimum yield was obtained from T2 (12.42 q/ha).

In Rahuri, the population of ABW/plantwas seen highest in N-Bt plants of T5 i.e. 0.32/plant and population of SBW was seen highest in N-Bt plants of T2,T5 and T6 0.04/plant.The population of PBW/plant was seen highest in of T2 i.e. 13.80/plant and in the combination treatments it was seen maximum in T3 11.20/plant and minimum in T6 9.40/plant in case of N-Bt plants.The green boll damage due to ABW/SBW/TC was maximum in T2 i.e. 10.14percent and in the combination treatments it was maximum in T3 i.e. 7.91 percent and minimum in T4 i.e. 5.33 in case of N-Bt plants. The maximum rosette flowers were observed in N-Bt plants of T5 i.e. 8.20percent and minimum in the N-Bt plants of T6 5.80 percent. The green boll damage due to PBW was found maximum in T2 i.e. 19.50percent and in the combination treatments, the maximum green boll damage was found in T5 i.e.19.25percent, and minimum in T4 i.e.17.25percent in case of N-Bt plants. The open boll damage was maximum in T4 i.e.

33.92 percent and minimum in T5 i.e. 24.78 percent in case of N-Bt plants. The locule damage were maximum in T2 i.e.22.79percent and minimum in T4 i.e. 15.40percentin case of N-Btplants.The green boll damage due to PBW in T3 (N-Bt plants) is at par with N-Bt plants of T5 and T6.T1 gave maximum yield (17.72 q/ha) and minimum yield was obtained from T2 (11.17 q/ha).

In Nanded, the population of ABW/SBW was seen highest in T2.The green boll damage due to ABW/SBW/TC was maximum in T2 i.e. 8.06percentand among the combination treatments maximum damage was seen in T3 i.e. 7.69percent in case of N-Bt plants. The maximum rosette flowers were observed in T2 i.e. 4.03percent and among the combination treatments maximum rosette flowers were seen in T6 i.e.3.89percent in case of N-Bt plants. The green boll damage due to PBW was found maximum in T2 i.e. 10.00 percent and in the combination, the maximum green boll damage was found maximum in T3 i.e. 8.13percent, and minimum in T4 i.e. 5.63percent in case of N-Bt plants. The open boll damage was maximum in T2 i.e. 17.38percent and minimum in T5 i.e. 14.06percent in N-Bt plants. The locule damage were maximum in N-Bt plants of T2 i.e. 8.25percent and minimum in T5 i.e. 6.50percent in case of N-Bt plants. T3 gave maximum yield (32.59q/ha) and minimum yield was obtained from T2 (14.21 q/ha). The green boll damage due to PBW in T3 (N-Bt plants) was significantly different with N-Bt plants of T5 and at par with N-Bt plants of T6.

SOUTH ZONE

In Lam, Maximum rosette flower i.e. 6.67percent was found in T1&T2 followed by T4 i.e. 5.58percent and minimum inN-Bt plants of T3,T5 and T6 5.42percent. Green boll damage due to PBW was highest in T4 22.63percent and in combination treatments green boll damage was highest in T3 21.25percent, T5 and T6 showed the lowest green boll damage 20.00percent in N-Bt plants. Open boll damage was highest in T645.08percent followed by T242.37percent and minimum in T335.91percent in case of N-Bt plants. Maximum locule damage were found in N-Bt plants of T6 22.51percentand minimum in T3 17.54percent.The green boll damage due to PBW in T3 (N-Bt plants) is at par with N-Bt plants of T5 and T6. T6 gave maximum yield (12.49/ha) and minimum yield was obtained from T1 (7.03q/ha).

In Nandyal, population of ABW/SBW was not reported. Rosette flower were maximum in T2 0.67percentfollowed by T4 0.33percent. Green boll damage due to PBW was highest in T2 40percent. Among the combination treatments maximum damage was recorded in T438.33percent and minimum damage recorded in T6 25.00percent in case of N-Bt plants. Open boll damage percentage was highest in T3 and T6 28.33percent and T5 and T2 25percent bears minimum damage in case of N-Bt plants. Locule damage percentage was highest in T2 8.67percent. Among the combination treatments T3 and T4 8.00percent bears maximum damage and T6 5.67percent bears minimum damage in case of N-Bt plants. The green boll damage due to PBW in T3 (N-Bt plants) is at par with N-Bt plants of T5 and T6.

In Dharwad- ABW/plant was found maximum in T2 1.50/plant followed by T3 1.02/plant. Green boll damage due to ABW/SBW/TC was highest in T2(12.00percent) but among the combination treatments T3(9.50percent) bears maximum damage and T4 (6.00percent) bears minimum damage in case of N-Bt plant. Rosette flower due to PBW were obtained maximum in T2 i.e. 5.43 percent and in the combination treatments i.e. in T3, it was 4.19percent. PBW larva per plant was 21.81 in T2 which was highest among all the treatments and in the combination treatments it was highest in T315.65 and minimum larva per plant were observed in T512.00. Green boll damage due to PBW was highest in T2 30.87 percent. Among the combination treatments it was highest in T3 23.66percent and minimum in T5 16.78 percent in case of N-Bt plants. Open boll and locule damage were highest in T2 32.84 percent and 43.75 percent, however among the combination treatments open boll and locule damage was highest in T3 26.76 percent and 37.50percent and minimum in T5 20.15percent and T4 26.25percent

respectively in case of N-Bt plants. The green boll damage due to PBW in T3 (N-Bt plants) is significantly different with N-Bt plants of T5 and at par with N-Bt plants of T6. T1 gave maximum yield (14.95q/ha) and minimum yield was obtained from T2 (7.29q/ha).

In Raichur- Maximum larvae of ABW/plant was recorded in T2 2.66/plant but among the combination treatments maximum larvae reported in T3 2.00/plant and minimum in T4 0.00/plant. Incidence of SBW was nil. Maximum larvae of TC/plant were recorded in T2 3.33/plant but among the combination treatments maximum larvae reported in N-Bt plants of T3 2.00/plant and minimum in T4 0.00/plant. Green boll damage due to ABW/SBW/TC was highest in T2 36.76percent and minimum damage recorded in T4 0.00percent in case of N-Bt plants. Rosette flower were maximum in T2 36.70percent. Among the combination treatments the maximum rosette flower reported in T5 and T6 16.70percent in both and minimum in T4 10.00percent in case of N-Bt plants. Green boll damage due to PBW was highest in T3 54.58percent followed by T6 52.50percent and minimum in T4 46.28percent in case of N-Bt plants.Open boll damage percentage and locule damage percentage was highest in T6 88.33percent and 86.96percent and T4 70.13percent and 69.23percent bears minimum damage in case of N-Bt plants.The green boll damage due to PBW in T3 (N-Bt plants) is at par with N-Bt plants of T5 and T6. T5 gave maximum yield (19.12q/ha) and minimum yield was obtained from T2 (1.9q/ha).

Ent 6 Evaluation of prominent insecticides against bollworm complex of cotton (Table: 159-206)

Variety: Non-Bt (Popular) hirsutum

Locations: North Zone (Bathinda,Faridkot,Sirsa,HisarandSriganganagar)
Centre Zone (Junagarh, Surat, Akola, Nanded, Rahuri andBhawanipatna)
South Zone (Guntur, Nandyal, Dharwad, Chamrajnagar, Raichur and Coimbatore)

Observation – 14 DAS (Days After Spray)

Replications-3

Treatment	Name of Insecticides	Dosage in ml/ha
T1	Bifentherin 10EC	800
T2	Cypermethrin 25EC	160-280
T3	Fenpropathrin 10 EC	750
T4	Profenophos 50EC	1500-2000
T5	Ethion 50EC	1500-2000
T6	Chlorantraniliprole 18.5 SC	150
T7	Flubendamide 39.35SC	100-125
T8	Indoxacarb 14.5 SC	500
T9	Spinetoram 11.7 SC	420-470
T10	Spinosad 45 SC	165-220
T11	Emamectin benzoate 5 SG	190-220
T12	Pyridalyl 10 EC	750-1000
T13	Control	--

In Bathinda: Incidence of ABW/SBW/TC and green boll damage due to ABW/SBW/TC was found to be negligible. Minimum larval recovery of PBW (2.20 larvae/plant) was recorded in treatment Emamectin benzoate 5SG followed by Spinetoram 11.7SC and Fenpropathrin 10 EC. Highest reduction in green boll damage due to PBW (55.17%) was found in Emamectin benzoate 5SG followed by Spinetoram 11.7SC and Fenpropathrin 10EC. Minimum open boll damage (6.67%) and locule damage (2.66%) was recorded in treatment Emamectin benzoate 5 SG followed by Spinetoram 11.7 SC and Fenpropathrin 10 EC. The maximum population of natural enemies was recorded in Control (1.67 natural enemies/plant) followed by Spinetoram 11.7 SC and Flubendamide 39.35 SC. The highest yield (27.46 q/ha) was

recorded in plots treated with Emamectin benzoate 5 SG followed by Spinetoram 11.7 SC and Fenpropathrin 10 EC.

In Faridkot: Very less population of ABW/SBW/TC and PBW was reported at Faridkot. The maximum reduction of green boll damage due to ABW/SBW (100%) was found in Emamectin benzoate 5SG, Spinosad 45SC and Spinetoram 11.7SC. Similarly maximum reduction of green boll damage due to PBW (100%) was found in Spinosad 45SC, Spinetoram 11.7SC and Indoxacarb 14.5SC. Minimum open boll damage and locule damage was recorded in treatment Fenpropathrin 10EC followed by Spinetoram 11.7SC and Emamectin benzoate 5SG. The maximum population of natural enemies was recorded in Ethion (4.55 natural enemies/plant) andFenpropathrin 10 EC followed by Indoxacarb 14.5 SC. The highest yield (7.27 q/ha) was recorded in plots treated with Fenpropathrin 10EC followed by Spinetoram 11.7SC &Emamectin benzoate 5SG.

In Hisar: Minimum larval recovery of ABW/SBW/TC (0.93 larvae/plant) was reported in Spinetoram 11.7SC treated plot followed by Chlorantraniliprole 18.5SC and Spinosad 45 SC. The minimum larval recovery of PBW (1.47 larvae/plant) was recorded in treatment Emamectin benzoate 5SG and Spinetoram 11.7SC followed by Profenophos 50EC. The highest reduction in green boll damage due to ABW/SBW (62.50%) was found in Spinosad 45SC, Spinetoram 11.7SC and Chlorantraniliprole 18.5SC. Similarly higher reduction in green boll damage due to PBW was found in Emamectin benzoate 5SG (62.50%) and Spinetoram 11.7SC followed by Indoxacarb 14.5SC. Minimum open boll damage (8.25%) and locule damage (5.06%) was recorded in treatment Spinetoram 11.7SC followed by Chlorantraniliprole 18.5SC and Flubendamide 39.35SC. The maximum population of natural enemies was recorded in Control (1.50 natural enemies/plant) followed by Spinosad 45SC and Spinetoram 11.7SC. The highest yield (16.77q/ha) was recorded in plots treated with Spinetoram 11.7SC followed by Chlorantraniliprole 18.5SC and Spinosad 45 SC.

In Sirsa: Minimum larval recovery of ABW/SBW (0.03 larvae/plant) was reported in Cypermethrin 25EC followed by Spinetoram 11.7 SC and Profenofos 50 EC. The highest reduction in green boll damage due to ABW/SBW (68.40%) was found in Indoxacarb 14.5SC followed by Chlorantraniliprole 18.5 SC and Flubendamide 39.35SC, similarly highest reduction of green boll damage due PBW found in Emmamectin benzoate 5SG, Flubendamide 39.35SC and Ethion 50EC, respectively. Natural enemies were recorded highest in Control (0.90 natural enemies/plant) followed by Spinosad 45 SC and Spinetoram 11.7 SC. Minimum open boll damage (11.61%) and locule damage (9.01%) was observed in Flubendamide 39.35SC followed by Spinosad 45 SC. The highest yield (24.20q/ha) was recorded in plots treated with Pyridalyl 10EC followed by Profenophos 50EC and Fenpropathrin 10EC.

In Sriganganagar: Minimum larval recovery of ABW/SBW/TC (1.20 larvae/plant) was reported in Spinetoram 11.7SC treated plot followed by Spinosad 45 SC and Chlorantraniliprole 18.5 SC. Similarly minimum larval recovery of PBW was found in Spinetoram 11.7SC (0.87 larvae/plant) treated plot followed by Spinosad 45SC and Emamectin benzoate 5SG. The highest reduction in green boll damage due to ABW/SBW (76.47%) was found in Indoxacarb 14.5SC followed by Spinetoram 11.7SC and Ethion 50EC. Similarly higher reduction in green boll damage due to PBW (76.47%) was found in Spinetoram 11.7SC followed by Spinosad 45SC and Profenophos 50SC. The maximum population of natural enemies was recorded in Control (1.91 natural enemies/plant) followed by Spinetoram 11.7SC and Spinosad 45SC. Minimum open boll damage (6.67%) and locule damage (3.60%) was observed in Spinetoram 11.7SC followed by Spinosad 45SC and Profenophos 50EC. The highest yield (25.06q/ha) was recorded in plots treated with Spinetoram 11.7 SC followed by Spinosad 45SC and Chlorantraniliprole 18.5SC.

CENTRAL ZONE

In Junagadh: Based on sprays applied against bollworms, negligible incidence of ABW/SBW/TC and PBW was found at Junagarh. Minimum larval recovery of ABW (0.40 larvae/plant) was recorded in Chlorantraniliprole 18.5 SC followed by Emamectin benzoate5 SG and Spinosad 45 SC. The highest reduction in green boll damage due to PBW (70.41%) was recorded in Emamectin benzoate 5 SG, followed by Chlorantraniliprole 18.5SC and Indoxacarb 14.5SC. Minimum open boll damage (14.87%) and locule damage (11.83%) was recorded in treatment Emamectin benzoate 5 SG followed by Chlorantraniliprole 18.5 SC and Indoxacarb 14.5 SC. The maximum population of natural enemies was recorded in Control (6.27 natural enemies/plant) followed by Flubendamide39.35 SC and Pyridalyl10 EC. The highest yield (31.19q/ha) was recorded in plots treated with Emamectin benzoate 5 SG followed by Chlorantraniliprole 18.5 SC and Indoxacarb 14.5 SC.

In Surat: Minimum larval recovery of ABW (0.06 larvae/plant) was recorded in Indoxacarb 14.5SC followed by Chlorantraniliprole 18.5 SC and Emamectin benzoate 5 SG. Similarly minimum larval recovery of PBW (0.27 larvae/plant) was recorded in Emamectin benzoate 5 SG, Spinosad 45 SC and Chloroantranilliprole18.5 SC. The highest reduction in green boll damage due to ABW/SBW/TC was found in Indoxacarb 14.5SC (75.36%) followed by Chlorantraniliprole 18.5 SC and Emamectin benzoate 5 SG. Similarly highest reduction in green boll damage due to PBW was found in Indoxacarb 14.5SC (97.54%), Chlorantraniliprole 18.5 SC and Emamectin benzoate 5 SG. The maximum population of natural enemies was recorded in Control (4.40 natural enemies/plant) followed by Indoxacarb 14.5SC and Chlorantraniliprole 18.5 SC. Minimum open boll damage (3.75%) and locule damage (1.98%) was recorded in Indoxacarb 14.5SC. The highest yield (23.46 q/ha) was recorded in plots treated with Chlorantraniliprole 18.5 SC followed by Emamectin benzoate 5 SG and Indoxacarb 14.5SC.

In Akola: Minimum larval recovery of ABW (0.47 larvae/plant) was recorded in Indoxacarb 14.5SC and Chlorantraniliprole 18.5 SC and Emamectin benzoate 5 SG. Similarly minimum larval recovery of PBW (0.13 larvae/plant) was recorded in Indoxacarb 14.5SC and Chlorantraniliprole 18.5 SC followed byEmamectin benzoate 5 SG. The highest reduction in green boll damage due to ABW/SBW/TC was found in Indoxacarb 14.5SC (97.56%) followed by Chlorantraniliprole 18.5 SC and Emamectin benzoate 5 SG. Similarly highest reduction in green boll damage due to PBW was found in Indoxacarb 14.5SC (96.23%) followed by Chlorantraniliprole 18.5 SC and Emamectin benzoate 5 SG. The maximum population of natural enemies was recorded in Control (0.77 natural enemies/plant) followed by Emamectin benzoate 5 SG and Cypermethrin 25EC. Minimum open boll damage (7.69%) and locule damage (2.37%) was recorded in Indoxacarb 14.5SC followed by Emamectin benzoate 5 SG and Chlorantraniliprole 18.5 SC. The highest yield (18.68q/ha) was recorded in plots treated with Indoxacarb 14.5SC followed by Emamectin benzoate 5 SG and Chlorantraniliprole 18.5 SC.

In Nanded: Very less incidence of ABW/SBW/TC was found at Nanded.Similarly minimum larval recovery of PBW (0.04 larvae/plant) was recorded in Fenpropathrin 10 EC followed by Emamectin benzoate 5 SG and Chlorantraniliprole 18.5 SC. The highest reduction in green boll damage due to ABW/SBW/TC was found in Chlorantraniliprole 18.5 SC(80.61%) followed by Spinetoram 11.7 SC and Spinosad 45 SC. Similarly highest reduction in green boll damage due to PBW was found in Spinetoram 11.7 SC(75.00%) followed by Indoxacarb14.5 SC andEmamectin benzoate 5 SG. The maximum population of natural enemies was recorded in Control (2.70 natural enemies/plant) followed by Spinetoram 11.7 SC and Spinosad 45 SC. Minimum open boll damage (7.84%) and locule damage (3.40%) was observed in Profenophos 50EC followed by Spinetoram 11.7 SC and Fenpropathrin 10 EC. The highest yield (13.85q/ha) was recorded in plots treated with Spinetoram 11.7 SC followed by Chlorantraniliprole 18.5 SC and Emamectin benzoate 5 SG.

In Rahuri: Minimum larval recovery of ABW (0.20 larvae/plant) was recorded in Spinosad 45 SC followed by Spinetoram 11.7 SC and Pyridalyl10 EC. Similarly minimum larval recovery of PBW (2.56 larvae/plant) was recorded in Chlorantraniliprole 18.5SC followed by Emamectin benzoate 5SG and Spinetoram 11.7 SC. The highest reduction in green boll damage due to ABW/SBW/TC was found in

Chlorantraniliprole 18.5SC (64.65%) followed by Spinetoram 11.7SC and Flubendamide 39.35SC. Similarly higher reduction in green boll damage due to PBW was found in Chlorantraniliprole 18.5SC(54.01%) followed by Spinetoram 11.7SC and Emamectin benzoate 5SG. Minimum open boll damage (23.68%) and locule damage (17.27%) was observed in Spinetoram 11.7SC and Chlorantraniliprole 18.5SC, respectively. The maximum population of natural enemies was recorded in Control (2.45 natural enemies/plant) followed by Spinetoram 11.7SC and Chlorantraniliprole 18.5SC. The highest yield (18.65q/ha) was recorded in plots treated with Chlorantraniliprole 18.5SC followed by Spinetoram 11.7 SC and Emamectin benzoate 5SG.

In Bhawanipatna: Very less incidence of ABW/SBW/TC was found at Bhawanipatna. The highest reduction in green boll damage due to ABW/SBW/TC was found in Chlorantraniliprole 18.5SC (87.65%) followed by Pyridalyl 10EC and Emamectin benzoate 5SG. The maximum population of natural enemies was recorded in Control(2.90 natural enemies/plant) followed by Chlorantraniliprole 18.5SC andSpinetoram 11.7SC. Minimum open boll damage (17.75%) and locule damage (5.90%) was observed in Chlorantraniliprole 18.5SC and Ethion 50EC. The highest yield (18.76q/ha) was recorded in plots treated with Chlorantraniliprole 18.5SC followed by Pyridalyl 10EC and Emamectin benzoate 5SG.

SOUTH ZONE

In Lam Guntur: Based on sprays applied against bollworms, minimum larval recovery of ABW/SBW/TC and PBW was found to be negligible and inconclusive at Lam Guntur. The highest reduction in green boll damage due to PBW was found in Cypermethrin 25EC (56.86%) followed by Bifentherin 10EC and Fenpropathrin 10EC. The maximum population of natural enemies was recorded in Spinosad 45SC (0.49 natural enemies/plant) followed by Flubendamide 39.35SC and Indoxacarb 14.5SC. Minimum open boll damage (22.70%) and locule damage (13.35%) was observed in Cypermethrin 25EC followed by Bifentherin 10EC. The highest yield (9.94q/ha) was recorded in plots treated with Emamectin benzoate 5SG followed by Cypermethrin 25EC and Spinosad 45SC.

In Nandyal: Minimum larval recovery of PBW (1.00 larvae/plant) was recorded in Pyridalyl 10EC followed by Spinetoram 11.7SC and Chlorantraniliprole 18.5SC. The highest reduction in green boll damage due to PBW was found in Pyridalyl 10EC (83.53) followed by Bifentherin 10EC and Chlorantraniliprole 18.5SC. Minimum open boll damage (6.00%) and locule damage (5.33%) was observed in Pyridalyl 10EC.

In Dharwad: Minimum larval recovery of ABW (0.41 larvae/plant) was recorded in Spinetoram 11.7SC followed by Spinosad 45SC and Profenophos 50EC. The highest reduction in green boll damage due to PBW was found in Spinetoram 11.7SC (86.38%) followed by Spinosad 45SC and Profenofos 50 EC. Minimum open boll damage (16.49%) was observed in Spinetoram 11.7SC followed by Spinosad 45 SC and Bifentherin 10EC. The highest yield (15.17q/ha) was recorded in plots treated with Spinetoram 11.7SC followed by Spinosad 45 SC and Bifentherin 10EC.

In Raichur: Minimum larval recovery of PBW (0.33 larvae/plant) was recorded in Chlorantraniliprole 18.5SC&Spinosad 45SC followed by Emamectin benzoate 5SG and Flubendiamide 39.35 SC.Minimum larval recovery of ABW (0.22 larvae/plant) was recorded in Spinosad 45SC followed by Chlorantraniliprole 18.5SC andEmamectin benzoate 5 SG. The highest reduction in green boll damage due to ABW/SBW/TC was found in Spinosad 45 SC (85.22%) followed by Chlorantraniliprole 18.5SC and Emamectin benzoate 5SG. Similarly higher reduction in green boll damage due to PBW was found in Spinosad 45 SC (82.76%) followed by Chlorantraniliprole 18.5SC and Flubendiamide 39.35 SC. Minimum open boll damage (10.69%) and locule damage (8.16%) was observed in Spinosad 45 SC followed by Chlorantraniliprole 18.5SC. The maximum population of natural enemies was recorded in Control (1.89 natural enemies/plant) followed by Pyridalyl 10 EC andEmamectin benzoate 5 SG. The highest yield (29.50q/ha) was recorded in plots treated with Spinosad 45 SC followed by Chlorantraniliprole 18.5SC and Emamectin benzoate 5 SG.

In Chamrajnagar: Minimum larval recovery of PBW (3.40 larvae/plant) was recorded in Fenpropathrin 10 EC followed by Bifentherin 10EC and Spinetoram 11.7SC. The highest reduction in green boll

damage due to PBW was found in Fenpropathrin 10 EC (72.92%) followed by Bifentherin 10EC and Spinetoram 11.7SC. Minimum open boll damage (6.57%) and locule damage (7.69%) was observed in Fenpropathrin 10 EC followed by Bifentherin 10EC and Spinetoram 11.7 SC.

The maximum population of natural enemies was recorded in Spinosad 45SC (2.55 natural enemies/plant) followed by Control and Indoxacarb 14.5 SC. The highest yield (18.95q/ha) was recorded in plots treated with Fenpropathrin 10 EC followed by Spinetoram 11.7 SC andBifentherin 10EC.

In Coimbatore: Minimum larval recovery of PBW (7.67 larvae/plant) was recorded in Chlorantraniliprole 18.5SC followed by Flubendamide 39.35SC and Spinosad 45 SC. The highest reduction in green boll damage due to PBW was found in Chlorantraniliprole18.5SC (75.79%) followed by Flubendamide 39.35SC and Spinosad 45 SC. The maximum population of natural enemies was recorded in control (12.86 natural enemies/plant) followed by Chlorantraniliprole18.5SC andFlubendamide 39.35SC. Minimum open boll damage (9.52%) and locule damage (38.25%) was observed in Chlorantraniliprole 18.5 SC followed by Flubendamide 39.35SC and Spinosad 45SC. The highest yield (17.28q/ha) was recorded in plots treated with Chlorantraniliprole 18.5 SC followed by Flubendamide 39.35SC and Spinosad 45SC.

Ent 6(a): Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (Table:207-220)

Treatment Details :

SN	Name of the insecticides
1	Flonicamid 50 WG (Systemic)
2	Flonicamid 50 WG + **MakAdjuvol @0.75% (7.5ml/L water)**
3	Flonicamid 50 WG **+ MakAdjuvol @1.5% (15 ml/L water)**
4	Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora spinosa)
5	Spinetoram 11.7 SC + **MakAdjuvol @0.75 % (7.5 ml/L water)**
6	Spinetoram 11.7 SC + **MakAdjuvol @1.5% (15 ml/L water**
7	Emamectin benzoate 5 SG **(Translaminar)**
8	Emamectin benzoate 5 SG **+ MakAdjuvol @0.75 % (7.5 ml/L water)**
9	Emamectin benzoate 5 SG+ **MakAdjuvol @ 1.5% (15 ml/L water)**
10	Profenofos 50 EC **(Contact)**
11	Profenofos 50 EC+ **MakAdjuvol @0.75% (7.5 ml/L water)**
12	Profenofos 50 EC+ **MakAdjuvol @1.5% (15 ml/L water)**
13	Water+MAKHMO @ 0.75 % or 7.5 ml /litre (Control)
14	Water+MAKHMO @ 1.5 % @ 15 ml /litre (Control
15	Control (Water spray)

NORTH ZONE

The experiment was conducted to study the effect of mixing of MakAdjuvol @ 0.75 &1.5% with insecticides as adjuvants. Based on the three sprays applied against sucking pest at different locations of 3 zones, the overall effect was observed has been discussed as under;

In Bathinda (Punjab), this year severe infestation of whitefly was observed followed by jassid and thrips. Among the different treatments applied as insecticides (alone) or in combination with MakAdjuvol, Profenophos+Mak adjuval@1.50 % was found to be more effective against whitefly lowest population (10.33 whiteflies/ 3 leaves) observed and 74.17 % reduction in population over control was recorded and this was significantly superior over Profenophos 50 EC (alone) and Profenophos+Mak adjuval@0.75 %. Similarly in case of thrips, highest (90.72%) reduction over control was found in Spinetoram 11.7 SC+MakAdjuvol @ 0.75% and at par with Spinetoram 11.7 SC+MakAdjuvol @1.5%

followed by Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 %, Spinetoram 11.7 SC and Profenophos 50 EC+MakAdjuvol@1.50%. In case of jassid, highest reduction over control (87.18%) was recorded in Flonicamid 50 WG (alone) which was at par with Flonicamid 50 WG+ MakAdjuvol @ 1.5% and followed by Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % and Profenophos 50 EC + Mak Adjuvol@ 1.50% . Highest yield (31.00 q/ha) was recorded in plots treated with Profenophos 50 EC + Mak Adjuvol @ 1.5% which was at par with Spinetoram 11.7SC+Mak adjuvol 1.5 % and Profenophos 50 EC + Mak Adjuvol@0.75% .The lowest yield was recorded in Control (18.26 q/ha) followed by water + MAK HMO@1.5% and water + MAK HMO@0.75%.

In Hisar (Haryana),Flonicamid 50 WG + Mak Adjuvol@0.75% was found to be more effective against whitefly. The lowest whitefly population (44.57whiteflies/3 leaves) and 55.20 % reduction in population over control was recorded in Flonicamid 50 WG + Mak Adjuvol@0.75% which was at par with Flonicamid 50 WG (alone) and Flonicamid 50 WG + Mak Adjuvol@1.5%. Similarly in case of thrips, highest (54.20%) reduction over control found in Spinetoram 11.7 SC +MakAdjuvol @1.5% which was at par with Spinetoram 11.7 SC 5 + Mak Adjuvol @0.75% and Spintoram 11.7 SC (alone). In case of jassid, highest recuction over control (64.13%) was recorded in Flonicamid 50 WG + MakAdjuvol @ 0.75% which was at par with Flonicamid 50 WG + MakAdjuvol @ 1.5% and Flonicamid 50 WG (alone). Highest yield (18.44 q/ha) was recorded in plots treated with Flonicamid 50 WG + MakAdjuvol @ 0.75% which was significantly higher over Flonicamid 50 WG (alone) and Flonicamid 50 WG + MakAdjuvol @ 1.5%. The lowest yield was recorded in Control (14.17 q/ha) followed by water + MAK HMO@0.75% and water + MAK HMO@1.5%.

In case of Sriganganagar (Rajasthan),Flonicamid 50 WG+ MakAdjuvol @ 1.5% was found to be more effective against whitefly population (9.92 whiteflies/ 3 leaves) and 79.83% reduction in population over control was recorded. This was at par with Profenophos 50 EC+MakAdjuvol@ 1.5% and Flonicamid 50 WG+ MakAdjuvol @ 0.75%. Similarly in case of thrips, highest (87.29%) reduction over control was found in Spinetoram 11.7 SC 5+Mak Adjuvol @1.5% which was at par with Spinetoram SC 5 + MakAdjuvol @ 0.75% and Spinetoram 11.7 SC (alone). In case of jassid, highest (77.15%) reduction over control was found in Flonicamid 50 WG+ MakAdjuvol @ 1.5% which was at par with Flonicamid 50 WG+ MakAdjuvol @ 0.75% and Flonicamid 50 WG (alone). Highest yield (26.69 q/ha) was recorded in plots treated with Spinetoram 11.7 SC 5+Mak Adjuvol @1.5% which was at par with Spinetoram 11.7 SC +MakAdjuvol @0.75% and Profenofos 50 EC+ MakAdjuvol @ 1.5%. The lowest yield was recorded in Control (18.88 q/ha) followed by water+MAKHMO@0.75% and water+MAKHMO@1.5%.

In nutshell, insecticides like Flonicamid 50 WG (alone) vs Flonicamid 50 WG+MakAdjuvol@ 0.75% &1.5%, Spinetoram 11.7 SC (alone) vs Spinetoram 11.7 SC+ MakAdjuvol@ 0.75% &1.5% and Profenofos 50 EC (alone) vs Profenofos 50 EC + MakAdjuvol@ 0.75% &1.5% were found significantly differed as far the efficacy against sucking pest is concerned.

CENTRAL ZONE

In Nanded (Maharashtra),Flonicamid 50 WG+MakAdjuvol @1.5% was found to be more effective against whitefly population 2.73 whiteflies/ 3 leaves and 92.05 % reduction in population over control. This was followed by Flonicamid 50 WG+MakAdjuvol @0.75% and Flonicamid 50 WG (alone). Similarly in case of thrips, highest (81.95%) reduction over control was found in Spinetoram 11.7 SC+MakAdjuvol @1.5% followed by Flonicamid 50 WG +MakAdjuvol @1.5% and Spintoram 11.7 +MakAdjuvol @0.75% SC. In case of jassid, highest reduction over control (74.76%) was recorded in Flonicamid 50 WG+ MakAdjuvol @ 1.5% this was followed by Flonicamid 50 WG+MakAdjuvol @0.75% and Flonicamid 50 WG (alone)). Highest yield (24.93 q/ha) was recorded in plots treated with Spinetoram 11.7 SC+MakAdjuvol @ 1.5% which was at par with Flonicamid 50 WG+MakAdjuvol @1.5% and Spinetoram 11.7 SC +MakAdjuvol@0.75% .The lowest yield was recorded in Control (16.48 q/ha)

followed by water+MAKHMO@1.5% and water+MAKHMO@0.75%.

In Junagadh (Gujarat),Flonicamid 50 WG+MakAdjuvol@1.5% was found to be more effective against whitefly population (13.67whiteflies/ 3 leaves) with 80.98 % reduction in population over control. This was followed by Spinetoram 11.7 SC+ MakAdjuvol@1.5% and Emamectin benzoate 5 SG+MakAdjuvol@1.5%. Similarly in case of thrips, highest (73.00%) reduction over control was found in Spinetoram 11.7 SC +MakAdjuvol @1.5% which was at par with Flonicamid 50 WG+MakAdjuvol @1.5% and followed byEmamectin benzoate 5 SG+ MakAdjuvol @ 1.5 %. In case of jassid and aphid, highest reduction over control (68.79 and 68.94%, respectively) was recorded in Flonicamid 50 WG+ MakAdjuvol @ 1.5% followed by Spinetoram 11.7 SC+ MakAdjuvol @ 1.5% and Emamectin benzoate 5 SG+ MakAdjuvol @ 1.5% in case of jassid and Profenofos 50 EC+ MakAdjuvol @ 1.5%. Highest yield (31.53 q/ha) was recorded in plots treated with Flonicamid 50 WG+ MakAdjuvol @ 1.5% which was at par with Spinetoram 11.7 SC+ MakAdjuvol @ 1.5% and Emamectin benzoate 5 SG+ MakAdjuvol @ 1.5%. The lowest yield was recorded in Control (18.08 q/ha) followed by water+MAKHMO@1.5% and water+MAKHMO@0.75%.

In case of Banswara (Rajasthan),Flonicamid 50 WG+ MakAdjuvol @ 1.5% was found to be more effective against whitefly population (2.73 whiteflies/ 3 leaves) with 73.60 % reduction in population over control. This was at par with Flonicamid 50 WG+ MakAdjuvol @ 0.75% and followed byProfenofos 50 EC+ MakAdjuvol @ 1.5%In case of jassid, highest recuction over control (80.00%) was recorded inFlonicamid 50 WG+ MakAdjuvol @ 1.5% which was at par with Flonicamid 50 WG+ MakAdjuvol @ 0.75% and followed byProfenofos 50 EC+MakAdjuvol @1.5%and Emamectin Benzoate 5 SG (Translaminar).Highest yield (24.64 q/ha) was recorded in plots treated with Flonicamid 50 WG+MakAdjuvol @1.5% which was at par with Flonicamid 50 WG +MakAdjuvol @0.75% and Flonicamid 50 WG (alone). The lowest yield was recorded in Control (17.25q/ha) followed by water+MAKHMO@0.75% and water+MAKHMO@1.5%.In brief, insecticides like Flonicamid 50 WG (alone) vs Flonicamid 50 WG+MakAdjuvol@ 0.75% &1.5%, Spinetoram 11.7 SC (alone) vs Spinetoram 11.7 SC+ MakAdjuvol@ 0.75% &1.5%, Profenofos 50 EC (alone) vs Profenofos 50 EC + MakAdjuvol@ 0.75% &1.5% and Emamectin benzoate 5 SG vs Emamectin benzoate 5 SG + MakAdjuvol@ 0.75% &1.5% were found significantly differed from each other as far the efficacy against sucking pest is concerned.

SOUTH ZONE

In Lam Guntur (Andhra Pradesh),Flonicamid 50 WG+MakAdjuvol @ 0.75% was found to be more effective against whitefly (2.64 whiteflies/ 3 leaves) with 66.27 % reduction in population over control followed by Flonicamid 50 WG (alone) and Flonicamid 50 WG+MakAdjuvol @1.5% . Similarly in case of thrips, highest (77.79%) reduction over control was found in Spinetoram 11.7 SC+MakAdjuvol @1.5% and Spinetoram 11.7 SC (Product of fermentation of Saccropolyspora Sinosa) followed by Flonicamid 50 WG +MakAdjuvol @0.75% . In case of jassid, highest reduction over control (79.51%) was recorded in Flonicamid 50 WG+ MakAdjuvol @ 0.75% which was at par with Flonicamid 50 WG+MakAdjuvol @1.5% and Flonicamid 50 WG (alone). Highest yield (11.64 q/ha) was recorded in plots treated with Flonicamid 50 WG (alone) followed by Emamectin benzoate 5 SG+MakAdjuvol @0.75% and Spinetoram 11.7 SC (Product of fermentation of Saccropolyspora Sinosa).The lowest yield was recorded in water+MAKHMO@0.75% (6.44 q/ha) followed by water+MAKHMO@1.5% and Control.

In Raichur (Karnataka), Spinetoram 11.7 SC+MakAdjuvol@1.5% was found to be more effective against thrips population (0.41 thrips/ 3 leaves) with 95.44 % reduction in population over control. This was significantly superior over Spinetoram 11.7 SC+ MakAdjuvol@0.75% and Flonicamid 50 WG+MakAdjuvol @1.5%. Similarly in case of jassid, highest (99.65%) reduction over control found in Flonicamid 50 WG +MakAdjuvol @1.5% which was at par with Flonicamid 50 WG+MakAdjuvol @0.75% and Spinetoram 11.7 SC+MakAdjuvol @0.75% . In case of aphid, highest reduction over control (96.19%)

was recorded in Flonicamid 50 WG+ MakAdjuvol @ 1.5% which was at par with Flonicamid 50 WG+ MakAdjuvol @ 0.75% and Profenofos 50 EC+ MakAdjuvol @ 1.5%. Highest yield (19.93 q/ha) was recorded in plots treated with Emamectin benzoate 5 SG/+ MakAdjuvol @ 1.5% which was significantly superior over Profenofos 50 EC+ MakAdjuvol @ 1.5% and Emamectin benzoate 5 SG+ MakAdjuvol @ 0.75%. The lowest yield was recorded in Control (2.91 q/ha) followed by water+MAKHMO@1.5% and water+MAKHMO@0.75%.

Here it is concluded that, insecticides like Flonicamid 50 WG (alone) vs Flonicamid 50 WG+MakAdjuvol@ 0.75% &1.5%, Spinetoram 11.7 SC (alone) vs Spinetoram 11.7 SC+ MakAdjuvol@ 0.75% &1.5%, Profenofos 50 EC (alone) vs Profenofos 50 EC + MakAdjuvol@ 0.75% &1.5% and Emamectin benzoate 5 SG vs Emamectin benzoate 5 SG + MakAdjuvol@ 0.75% &1.5% were differed significantly as far the efficacy against sucking pest is concerned.

Ent 7: Microbial based volatiles for sucking pest management in Bt-Cotton (Sponsored Technology) (Table no.221-235)

Trt	Code	Insects	Trt	Code	Insects
T1	CICRMV-W	Whiteflies	**T6**	CICRMVBI-J	Jassid
T2	CICRMV-J	Jassid	**T7**	CICRMVBI-A	Aphids
T3	CICRMV-A	Aphids	**T8**	CICRMVBI-T	Thrips
T4	CICRMV-T	Thrips	**T9**	YST + Sovlent (S) (Positive)	Control
T5	CICRMVBI-W	Whiteflies	**T10**	YST only (Negative)	Control
			T11	Control	Control

NORTH ZONE

The pooled data of all four observations indicated that huge number of whiteflies, jassids and thrips were trapped in all treatments. **In Bathinda**, maximum population of whitefly was recorded in treatment CICRMVBI-**J** (1346.55 whitefly/trap) followed by CICRMVBI-**T** and CICIMV-**T** whereas minimum found in CICRMV-**W** (761.00 whitefly/trap) followed by CICRMVBI-**W** and YST only. The highest jassid population was observed in CICRBI-**T** (407.19 jassid/trap) followed by CICRMVBI-**J** and CICRMV-**T**. Lowest population was recorded in YST only (257.91 jassids/trap) followed by CICRMVBI-W and CICRMV-W (Table-221). **In Hisar and Sriganganagar**, maximum whitefly population was observed in treatment CICRMVBI-**W** (1337.92 and 1298.00 whitefly/trap, respectively) followed by CICRMV-**W** (1315.92 & 1247.33 whitefly/trap), respectively (Table-222& 224). Similarly jassid population was found highest in CICRMV-**J** (68.58/ jassids/trap) and CICRMVBI-**J** (25.33 jassids/trap), respectively (Table-222 & 224). In case of thrips in Sriganganagar, maximum population *i.e.* 63.67 thrips/trap was recorded in treatment CICRMVBI-**T** followed by CICRMV-**T** (60.42 thrips/trap) and CICRMVBI-**W** (52.83 thrips/trap). Minimum thrips population i.e. 50.17 thrips/trap was recorded in treatment– YST only(Table-224).**In Sirsa**, maximum population of whitefly was recorded in treatment CICRMV- W (837.50 whitefly/trap) followed by treatment CICRMVBI-**W** (830.83 whitefly/trap). The jassid and thrips was recorded in, CICRMV-J (60.50 jassids/trap) and CICRMV-**A** (76.25 thrips/trap), respectively. Whereas minimum population was recorded in treatment CICRMV-J (711.42 whiteflies/trap), CICRMV-W (38.25 jassid/trap) and T-10 ieYST only (72.92 thrips/trap), respectively (Table-223).

CENTRAL ZONE

The pooled data of all four observations indicated that good number of whiteflies, jassids and thrips were trapped in all treatments. **In Surat and Junagadh**, maximum population of whitefly (56.11 & 158.25 whietfly/trap), jassid(62.37 & 195.00 jassids/trap) and thrips(29.74 & 89.00 thrips/trap), was found in CICRMV-**W**, CICRMVBI-**J** and CICRMV-**T,** respectively whereas minimum was found in YST only (8.25 and 28.75 whitefly/trap, 18.39 & 53.50 jassid/trap and 5.40 and 14.25 thrips/trap)(Table-225-226).

In Surat and Akola, aphid population was found highest in CICRMV-A (24.73 & 27.25 aphid/trap) and lowest in YST only (3.15 & 13.25 aphids/trap, respectively) (Table-225& 229).Similarly,**inBanswara** and **Nanded**, minimum whitefly and jassid population was recorded in CICRMV-T & YST only (211 & 33.75 whitefly/trap and 58.00 & 37.00 jassid/trap) in CICRMV-A and YST only, respectively. The maximum population in CICRMVBI-**W** (238 &74.42 whitefly/trap) and CICRMVBI-J (83.00& 81.58 jassids/trap), respectively (Table-230& 228).

In Akola, maximum whitefly and jassid population was observed in CICRMV-J (74.92 whitefly/trap and 71.75 jassid/ trap) and minimum found in CICRMVBI-T (56.08 whitefly/trap) and YST only (40.67 jassid/trap). Highest population of thrips was recorded in CICRMV-**T** (73.08 thrips/trap) followed by CICRMV-W (70.50 thrips/trap) and CICRMBVBI-W (65.50 thrips/trap) and lowest was recorded in YST only (55.08 thrips /trap) followed by CICRMVBI-T (55.42 thrips/trap) in Akola (Table-229). In case of **Rahuri**, whitefly, jassid and thrips maximum population was recorded in treatment CICRMV-**J** (93.67 whitefly/trap, 91.42jassid/trap and 57.08 thrips/ trap, respectively) and minimum was observed in YST only (74.75 whitefly and 39.25 thrips/trap) and CICRMV-W (74.17 jassid/trap) (Table-227).

SOUTH ZONE

The pooled data of all four observations indicated that large number of whiteflies, jassids and thrips were trapped in all treatments. The highest population of whitefly, jassid and thrips was recorded in treatment **CICRMV-T** (56.50 whitefly, 100.67 jassids and 65.42 thrips/trap, respectively) and minimum was recorded YST only (25.92, 31.42 and 27.58 /trap) in **Chamrajnagar** (Table-233). **In Raichur**, maximum population of whitefly, jassid, aphid and thrips was found in treatment **CICRMV-W** (30.17whitefly/trap), **CICRMV-J** (104.67 jassid/trap & 40.11 aphid/trap) and **CICRMVBI-T** (55.83 thrips/trap), respectively whereas minimum was found in YST+solvent (11.00 whitefly/trap), CICRMV-W (68.67 jassid/trap), CICRMV-W (21.56 aphid/trap) and YST only (28.08 thrips/trap), respectively (Table-232). **In Dharwad and Lam Guntu**r, highest whitefly and thrips was recorded in treatment CICRMVBI-W (25.50 and 75.75 whitefly/trap) and CICRMVBI-T (48.00 and 26.17 thrips/trap), respectively. **In Dharwad**, maximum population of jassid and aphid was recorded in **CICRMVBI-J** (31.33 jassids/trap) and **CICRMVBI-A** (30.33 aphid/trap), respectively whereas minimum was recorded in YST+solvent (13.33 jassid/trap) and YST only (13.33aphid/trap) (Table-231). **In Lam Guntur**, maximum population of whitefly was recorded in treatment CICRMVBI- W (75.75whitefly/trap) followed by treatment CICRMVBI-T(53.42whitefly/trap). The maximum population of thrips was recorded in treatment CICRMVBI- T (26.17 thrips/trap) followed by treatment CICRMV-T(22.25 thrips/trap). The highest jassid population was recorded **in CICRMV-J** (286.00 jassids/trap) followed by **CICRMVBI-W** (274.17 jassids/trap) whereas minimum was recorded in YST only (203.44 jassids/trap) followed by CICRMVBI-T only (241.67 jassids/trap) (Table-234). **In Nandyal**, maximum population of whitefly was recorded in treatment CICRMVBI- W (20.25whitefly/trap) followed by treatment CICRMV-W(20.00 whitefly/trap). The maximum population of thrips was recorded in treatment CICRMVBI- T (24.08 thrips/trap) followed by treatment CICRMV-T(22.83 thrips/trap). The highest jassid population was recorded **in CICRMVBI-J** (12.25 jassids/trap) followed by **CICRMV-J** (10.08 jassids/trap) whereas minimum was recorded in YST only (2.17 jassids/trap) (Table-235).

Out of all locations in North, Central and South zone, it was concluded that the highest number of whitefly was recorded in treatment **CICRMV-W** followed by **CICRMVBI-W**&**CICRMVBI-J** and in case of jassid, maximum population was recorded in treatment **CICRMV-J** followed by **CICRMVBI-J & CICRMVBI-W** andthrips population was recorded highest in **CICRMV-T** followed by **CICRMVBI-T&CICRMVBI-W** and aphid was recorded highest in treatment **CICRMV-A.**

Table: 1.Ent 1a. Br 22a/b (IET): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at North Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*					No. of Jassid/ 3 leaves					Whitefly/ 3 leaves					Thrips/3 leaves				
		FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG
201	HD 545	-	II	I	I	I	0.00	2.90	1.53	1.17	0.45	15.71	4.50	16.97	9.50	17.90	1.00	3.10	3.63	3.29	1.80
202	FDK 341	-	II	I	I	I	0.00	1.70	1.63	0.92	0.30	23.13	5.80	15.77	8.92	23.80	0.00	4.00	3.33	2.17	2.30
203	RG 895	-	II	I	I	I	0.00	1.60	1.83	1.17	0.65	28.38	5.10	18.40	9.75	17.05	0.00	5.00	2.90	1.92	1.70
204	CISAA 33-9	-	II	I	I	I	0.13	2.60	2.03	0.88	0.55	27.50	4.70	19.33	7.96	21.25	0.00	5.60	5.03	2.42	2.15
205	LC	-	II	I	I	I	0.00	2.90	1.87	1.67	0.40	26.79	5.80	19.03	8.29	23.40	0.00	6.30	3.80	3.83	2.10
206	PBD 155	-	II	I	I	I	0.00	2.50	2.03	1.75	0.30	20.00	4.10	18.70	8.42	28.10	0.00	4.30	4.63	2.38	2.80
207	HD 563	-	II	I	I	I	0.25	2.30	1.63	1.38	0.15	31.63	4.70	14.87	9.04	29.00	0.00	3.90	1.83	1.92	2.65
208	FDK 331	-	II	I	I	I	0.00	3.10	1.47	1.25	0.30	29.13	6.60	16.63	8.29	23.00	0.00	6.00	1.57	3.92	3.25
209	ZC (FDK 124)	-	II	I	I	I	0.00	2.90	1.47	1.54	0.40	34.75	5.60	17.03	8.46	24.30	0.00	6.50	1.53	3.38	2.35
210	RG 892	-	II	I	I	I	0.00	2.60	1.60	1.92	0.60	61.88	5.00	19.00	8.46	24.55	0.00	3.40	1.53	1.79	2.15
211	FDK 345	-	II	I	I	I	0.00	2.50	1.20	1.46	0.45	33.42	6.60	19.20	9.54	20.40	0.00	6.60	1.50	2.63	2.65
212	PBD 154	-	II	I	I	I	0.00	2.80	0.95	1.04	0.25	17.00	5.90	18.72	9.00	21.35	0.00	5.70	1.56	2.54	3.15
213	CISAA 6-165	-	II	I	I	I	0.00	2.70	1.63	1.67	0.35	30.00	4.00	18.90	9.38	15.45	0.00	4.90	1.93	3.75	3.40

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirs**a; SG-** Sriganganagar***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave

Table: 2.Ent1a Br 22a/b (IET): Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) at North Zone during 2022-23.

Entry code	Name of entry	Natural Enemies/ Plant*					Rosette flower (%) due to PBW#					Green Boll Damage (%) due to ABW/SBW/TC				
		FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG
201	HD 545	0.09	-	0.27	0.00	0.60	0.00	-	0.00	0.00	7.50	0.00	-	20.00	5.15	11.70
202	FDK 341	0.16	-	0.40	0.08	0.40	0.00	-	0.00	0.00	10.75	5.68	-	15.00	2.32	14.64
203	RG 895	0.09	-	0.20	0.08	0.55	0.00	-	0.00	0.00	4.25	4.60	-	21.67	3.84	8.14
204	CISAA 33-9	0.19	-	0.27	0.13	0.40	0.00	-	0.00	0.00	5.50	3.02	-	20.00	2.08	9.12
205	LC	0.03	-	0.40	0.00	0.80	0.00	-	0.00	0.00	3.00	3.01	-	3.33	2.85	7.79
206	PBD 155	0.25	-	0.20	0.13	0.55	0.00	-	0.00	0.00	4.00	1.43	-	15.00	3.26	7.83
207	HD 563	0.22	-	0.40	0.00	0.45	0.00	-	0.00	0.00	8.50	2.25	-	8.33	3.58	11.37
208	FDK 331	0.23	-	0.33	0.21	0.50	0.00	-	0.00	0.00	8.25	0.37	-	3.33	1.36	11.56
209	ZC (FDK 124)	0.25	-	0.27	0.04	0.55	0.00	-	0.00	0.00	6.50	6.07	-	8.33	1.30	7.83
210	RG 892	0.22	-	0.20	0.00	0.60	0.00	-	0.00	0.00	3.25	3.75	-	11.67	2.20	7.56
211	FDK 345	0.11	-	0.33	0.21	0.75	0.00	-	0.00	0.00	9.75	4.88	-	8.33	2.91	5.84
212	PBD 154	-	-	0.33	0.08	0.55	-	-	0.00	0.00	9.50	-	-	6.67	2.15	10.51
213	CISAA 6-165	0.25	-	0.40	0.04	0.75	0.00	-	0.00	0.00	13.25	5.26	-	6.67	2.08	11.34

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirs**a; SG-** Sriganganagar, * Natural Enemies include coccinellids, chrysopids, syrphids and spider mites.
#Rosette flower percent based on 50 randomly observed flower/entry

Table: 3. Ent1a Br 22a/b: (IET): Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at North Zone during 2022-23.

Entry code	Name of Entry	Green Boll Damage (%) due to PBW##					Open Boll damage (%) $					Open Locule Damage (%) $					Number of Good Open Bolls/ plant				
		FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG
201	HD 545	20.00	-	8.33	17.50	11.67	29.67	-	11.23	18.48	11.00	15.26	-	9.39	10.03	6.43	70.33	40.50	-	20.50	89.00
202	FDK 341	40.00	-	5.00	12.50	17.50	27.72	-	14.41	13.33	16.00	12.42	-	6.48	9.34	9.25	72.28	43.50	-	31.50	84.00
203	RG 895	65.00	-	5.00	23.75	4.17	22.22	-	9.93	16.60	7.00	10.89	-	8.41	9.64	4.81	77.78	44.50	-	23.83	93.00
204	CISAA 33-9	55.00	-	3.33	7.50	7.50	14.94	-	11.07	18.51	8.00	6.47	-	6.34	10.56	4.35	85.06	39.50	-	23.50	92.00
205	LC	55.00	-	8.33	13.75	3.33	33.63	-	12.07	12.23	4.00	27.85	-	10.29	9.26	2.06	66.37	38.00	-	25.00	96.00
206	PBD 155	25.00	-	13.33	17.50	5.00	10.94	-	18.80	12.33	5.00	5.82	-	12.79	8.34	2.09	89.06	48.50	-	26.83	95.00
207	HD 563	30.00	-	6.67	22.50	8.33	17.56	-	13.07	14.16	12.00	9.32	-	9.28	8.00	8.18	82.44	39.50	-	24.00	88.00
208	FDK 331	45.00	-	11.67	13.75	10.83	25.15	-	13.12	16.20	12.00	10.29	-	7.80	8.85	7.59	74.85	46.00	-	24.33	88.00
209	ZC (FDK 124)	50.00	-	11.67	13.75	7.50	20.04	-	12.02	14.69	7.00	9.69	-	6.74	8.83	5.03	79.96	41.50	-	26.17	93.00
210	RG 892	45.00	-	8.33	3.75	4.17	12.36	-	10.71	13.10	5.00	5.42	-	7.15	8.69	2.68	87.64	41.50	-	26.50	95.00
211	FDK 345	35.00	-	8.33	15.00	12.50	24.04	-	20.21	10.95	12.00	11.41	-	9.71	6.49	6.29	75.96	46.00	-	28.33	88.00
212	PBD 154	-	-	3.33	20.00	14.17	-	-	11.25	18.51	13.00	-	-	8.33	9.42	5.77	-	50.00	-	21.50	87.00
213	CISAA 6-165	40.00	-	5.00	16.25	20.00	31.82	-	14.06	12.95	16.00	22.54	-	8.04	7.55	7.57	68.18	45.00	-	26.33	84.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirsa**; SG-** Sriganganagar, ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked) .
$ Open boll, locule damage (%) at harvest only

Table: 4. Ent1a. Br 25a/b (PHT): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at North Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*					No. of Jassid/ 3 leaves					Whitefly/ 3 leaves					Thrips / 3 leaves				
		FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG
221	CISAA 21-2	-	I	I	-	I	-	0.50	1.73	1.33	0.40	-	2.50	17.33	8.13	18.05	-	0.30	2.40	4.54	2.20
222	KR 161	-	I	I	I	I	-	1.10	2.03	1.50	0.05	-	4.70	18.93	8.58	17.80	-	1.20	2.60	2.54	2.00
223	ZC (KR 64-NZ)	-	I	I	I	I	-	1.10	1.70	1.13	0.45	-	6.10	18.70	9.33	20.40	-	1.00	1.77	3.21	3.00
224	AAH 47	-	I	I	I	I	-	1.10	2.53	1.21	0.40	-	6.60	21.00	8.75	24.85	-	1.10	2.51	2.75	2.60
225	KR 160	-	I	I	I	I	-	1.30	2.10	1.17	0.00	-	8.80	21.17	8.33	13.20	-	1.90	2.43	4.42	3.10
226	CISAA 21-1	-	I	I	I	I	-	1.30	2.40	1.21	0.45	-	8.70	20.80	8.54	17.70	-	1.80	3.10	2.79	2.50
227	LC	-	I	-	-	I	-	1.30	-	1.29	0.45	-	8.60	-	7.29	14.20	-	2.20	-	2.29	2.90
228	KR 162	-	I	I	I	I	-	1.10	2.13	1.00	0.15	-	8.10	22.43	7.92	14.25	-	1.80	2.20	5.08	2.15
229	AAH 46	-	I	I	I	I	-	1.30	2.07	1.46	0.80	-	8.50	21.97	6.75	21.50	-	1.80	2.70	4.67	3.15

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirsa**; SG-** Sriganganagar, ***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave

Table: 5.Ent1a Br 25a/b (PHT): Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) at North Zone during 2022-23.

Entry code	Name of entry	Natural Enemies/ Plant*					Rosette flower (%) due to PBW#					Green Boll Damage (%) due to ABW/SBW/TC				
		FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG
221	CISAA 21-2	-	-	0.40	0.08	0.80	-	-	0.00	0.00	4.25	-	-	6.67	2.23	5.51
222	KR 161	-	-	0.27	0.21	0.60	-	-	0.00	0.00	7.50	-	-	10.00	3.45	9.60
223	ZC (KR 64-NZ)	-	-	0.13	0.08	1.00	-	-	0.00	0.00	6.00	-	-	16.67	3.09	7.08
224	AAH 47	-	-	0.33	0.00	0.80	-	-	0.00	0.00	10.00	-	-	16.67	0.98	12.50
225	KR 160	-	-	0.27	0.13	0.50	-	-	0.00	0.00	8.50	-	-	11.67	2.67	10.96
226	CISAA 21-1	-	-	0.20	0.04	0.90	-	-	0.00	0.00	11.75	-	-	11.67	2.63	13.77
227	LC	-	-	-	0.00	0.80	-	-	-	0.00	7.50	-	-	-	4.60	9.01
228	KR 162	-	-	0.27	0.08	0.60	-	-	0.00	0.00	8.00	-	-	15.00	2.45	10.62
229	AAH 46	-	-	0.27	0.08	0.80	-	-	0.00	0.00	5.75	-	-	11.67	3.82	8.13

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirsa**; SG-** Sriganganagar, * Natural Enemies include coccinellids, chrysopids, syrphids and spider mites.
#Rosette flower percent based on 50 randomly observed flower/entry

Table: 6. Ent1a. Br 25a/b (PHT): Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at North Zone during 2022-23.

Entry code	Name of entry	Green Boll Damage (%) due to PBW##					Open Boll damage$					Open Locule Damage (%) $					Number of Good Open Bolls/Plant				
		FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG
221	CISAA 21-2	-	-	10.00	20.00	4.17	-	-	10.62	14.82	6.00	-	-	7.84	7.13	3.90	-	50.00	-	28.83	94.00
222	KR 161	-	-	6.67	23.75	9.17	-	-	14.28	15.32	10.00	-	-	7.81	6.95	4.04	-	49.00	-	30.00	90.00
223	ZC (KR 64-NZ)	-	-	8.33	22.50	5.83	-	-	5.07	15.80	9.00	-	-	4.27	7.10	4.62	-	52.00	-	26.83	91.00
224	AAH 47	-	-	6.67	12.50	11.67	-	-	15.55	16.20	13.00	-	-	7.02	7.47	6.16	-	43.50	-	26.00	87.00
225	KR 160	-	-	8.33	15.00	10.00	-	-	11.83	16.61	11.00	-	-	8.42	9.20	6.22	-	47.00	-	20.33	89.00
226	CISAA 21-1	-	-	16.67	12.50	13.33	-	-	10.75	14.82	15.00	-	-	6.34	7.15	8.80	-	41.00	-	28.50	85.00
227	LC	-	-	-	21.25	7.50	-	-	-	15.32	10.00	-	-	-	8.02	5.73	-	49.00	-	26.67	90.00
228	KR 162	-	-	3.33	12.50	10.83	-	-	9.11	15.80	11.00	-	-	6.18	8.02	6.49	-	44.00	-	25.17	89.00
229	AAH 46	-	-	11.67	22.50	7.50	-	-	9.40	16.20	8.00	-	-	6.30	7.62	4.43	-	42.50	-	27.00	92.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirs**a; SG-** Sriganganagar, ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked) .
$ Open boll, locule damage (%) at harvest only.

Table: 7. Ent1a. Br 04a (CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at North Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*					Jassid/ 3 leaves					Whitefly/ 3 leaves					Thrips / 3 leaves				
		BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
2001	Quality Check (CSH 3129)	II	III	III	I	I	2.30	2.50	4.77	1.17	1.85	10.40	35.13	25.80	35.92	37.50	21.20	9.50	13.53	11.92	11.50
2002	F 2732	II	III	II	I	I	2.80	2.13	3.50	0.92	1.60	7.50	54.13	24.20	22.33	52.05	16.80	12.75	10.27	7.17	15.65
2003	ZC (F 2228)	II	III	III	I	I	4.50	4.50	4.63	1.17	1.85	11.80	40.25	28.60	34.67	40.90	23.00	13.63	10.87	9.83	20.85
2004	F 2743	II	III	III	I	I	2.30	4.13	5.10	0.88	1.15	9.00	39.88	32.13	43.08	62.05	18.60	11.13	11.47	11.75	24.80
2005	LC	II	IV	III	I	I	2.50	6.00	3.90	1.67	1.50	4.50	43.50	24.47	36.17	40.40	11.10	12.00	10.07	10.83	22.95

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirs**a; SG-** Sriganganagar, ***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave

Table:8. Ent1a. Br 04a (CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) at North Zone during 2022-23.

Entry code	Name of entry	Natural Enemies/ Plant*					Rosette flower (%) due to PBW#					Green Boll Damage (%) due to ABW/SBW/TC				
		BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
2001	Quality Check (CSH 3129)	-	0.48	0.47	1.42	1.20	-	0.00	0.00	0.00	8.50	-	0.39	15.00	15.63	13.36
2002	F 2732	-	0.45	0.73	0.75	0.55	-	0.00	0.00	0.00	4.50	-	0.00	10.00	5.00	10.53
2003	ZC (F 2228)	-	0.50	0.67	0.92	1.00	-	0.00	0.00	0.00	14.75	-	0.00	15.00	8.75	16.50
2004	F 2743	-	0.39	0.33	0.67	0.45	-	0.00	0.00	0.00	4.75	-	0.35	11.67	10.00	10.24
2005	LC	-	0.52	0.67	0.83	1.60	-	0.00	0.00	0.00	9.25	-	2.58	10.00	5.00	11.54

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirs**a; SG-** Sriganganagar * Natural Enemies include coccinellids, chrysopids, syrphids and spider mites.
#Rosette flower percent based on 50 randomly observed flower/entry

Table: 9. Ent1a. Br 04a (CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at North Zone during 2022-23.

Entry code	Name of entry	Green Boll Damage (%) due to PBW##					Open Boll damage (%) $					Open Locule Damage (%) $					Number of Good Open Bolls/ Plant				
		BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
2001	QC(CSH 3129)	-	15.00	10.00	19.15	8.33	0.00	6.94	9.56	14.82	10.00	-	3.79	4.90	7.41	5.02	40.00	93.06	-	33.67	90.00
2002	F 2732	-	35.00	8.30	18.90	5.83	0.00	5.33	7.51	15.33	6.00	-	3.71	5.82	10.02	2.88	46.50	94.67	-	34.00	94.00
2003	ZC (F 2228)	-	20.00	10.00	17.80	16.67	0.63	1.83	7.94	15.80	17.00	-	0.94	4.56	8.74	9.53	41.00	98.17	-	35.33	83.00
2004	F 2743	-	15.00	15.00	20.51	4.12	0.00	7.50	15.62	16.20	4.00	-	3.99	11.53	9.93	1.75	48.00	92.50	-	34.67	96.00
2005	LC	-	25.00	11.67	19.57	10.83	0.00	6.94	11.11	16.61	11.00	-	3.96	7.94	11.83	5.53	36.00	93.06	-	32.67	89.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirsa**; SG-** Sriganganagar, ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked) .
$ Open boll, locule damage (%) at harvest only

Table: 10. Ent1a. Br 24a(CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at North Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*					No. of Jassid/ 3 leaves					Whitefly/ 3 leaves					Thrips / 3 leaves				
		FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG
2011	FDK 315	-	I	I	I	I	0.00	1.30	1.27	2.12	0.70	19.63	3.90	17.33	9.31	18.25	0.00	0.80	1.67	5.05	2.35
2012	FDK 124 (ZC)	-	I	I	I	I	0.00	0.90	1.13	3.04	0.25	39.25	4.60	16.83	8.74	14.45	0.00	0.50	1.37	4.09	2.20
2013	RG 888	-	I	I	I	I	0.00	1.00	1.30	1.58	0.50	27.38	4.80	16.47	9.56	15.80	0.00	0.70	1.97	4.18	2.10
2014	CISA 33-7	-	I	I	I	I	0.00	0.80	1.47	1.38	0.40	35.38	3.30	19.37	7.80	24.60	0.00	0.80	1.63	4.26	4.00
2015	FDK 312	-	I	I	I	I	0.13	1.10	1.37	1.58	0.60	34.88	5.30	16.27	8.13	19.05	0.00	1.00	1.73	3.90	2.70
2016	FDK 325	-	I	I	I	I	0.00	0.90	1.40	0.00	0.40	36.13	2.70	19.13	8.25	17.80	0.00	1.10	1.83	3.93	1.25
2017	Local Check	-	I	I	I	I	0.25	1.20	1.33	1.30	0.20	30.75	3.00	17.10	8.86	22.55	0.00	1.00	2.00	4.95	2.00
2018	PBD 156	-	I	I	I	I	-	0.60	1.43	0.53	0.45	-	2.40	18.14	8.13	20.55	-	0.00	2.28	3.40	2.05
2019	RG 868	-	I	I	I	I	0.00	0.80	1.17	2.35	0.55	31.00	2.20	15.10	8.29	14.30	0.00	0.70	1.37	4.18	2.10
2020	FDK 324	-	I	I	I	I	0.00	1.00	1.43	1.83	0.35	29.13	4.50	16.23	8.29	17.60	0.00	0.70	1.90	4.70	1.80

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirsa**; SG-** Sriganganagar, ***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave

Table: 11. Ent1a. Br 24a (CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) at North Zone during 2022-23.

Entry code	Name of entry	Natural Enemies/ Plant*					Rosette flower (%) due to PBW#					Green Boll Damage (%) due to ABW/SBW/TC				
		FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG
2011	FDK 315	0.13	-	0.27	0.25	1.00	0.00	-	0.00	0.00	11.25	10.54	-	6.67	4.89	13.45
2012	FDK 124 (ZC)	0.25	-	0.33	0.13	0.75	0.00	-	0.00	0.00	8.50	5.84	-	8.33	2.20	10.96
2013	RG 888	0.04	-	0.47	0.13	0.85	0.00	-	0.00	0.00	6.75	10.03	-	20.00	3.65	12.91
2014	CISA 33-7	0.38	-	0.47	0.19	1.20	0.00	-	0.00	0.00	12.75	4.32	-	8.33	1.97	15.53
2015	FDK 312	0.22	-	0.33	0.38	0.70	0.00	-	0.00	0.00	4.75	5.00	-	18.33	2.71	8.57
2016	FDK 325	0.31	-	0.33	0.31	0.75	0.00	-	0.00	0.00	3.50	6.10	-	3.33	3.10	6.53
2017	Local Check	0.03	-	0.33	0.00	0.55	0.00	-	0.00	0.00	8.00	11.31	-	3.33	3.40	10.56
2018	PBD 156	-	-	0.53	0.31	0.75	-	-	0.00	0.00	4.75	-	-	3.33	1.29	8.69
2019	RG 868	0.31	-	0.27	0.06	0.55	0.00	-	0.00	0.00	7.00	5.06	-	18.33	1.24	10.92
2020	FDK 324	0.19	-	0.53	0.25	0.70	0.00	-	0.00	0.00	14.50	6.49	-	11.67	2.09	16.60

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirsa**; SG-** Sriganganagar * Natural Enemies include coccinellids, chrysopids, syrphids and spider mites.
#Rosette flower percent based on 50 randomly observed flower/entry

Table: 12. Ent1a. Br 24a (CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at North Zone during 2022-23.

Entry code	Name of entry	Green Boll Damage (%) due to PBW##					Open Boll damage (%)$					Open Locule Damage (%)$					Number of Good Open Bolls/Plant				
		FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG
2011	FDK 315	27.50	-	5.00	13.75	12.50	16.34	-	10.45	11.40	15.00	8.74	-	5.28	7.94	8.34	83.66	46.50	-	34.67	85.00
2012	FDK 124 (ZC)	35.00	-	3.33	8.75	10.00	20.00	-	11.25	11.19	11.00	9.55	-	7.08	4.99	5.19	80.00	42.50	-	33.33	89.00
2013	RG 888	30.00	-	3.33	13.75	7.50	22.38	-	11.34	16.55	9.00	12.39	-	7.47	9.68	4.10	77.62	39.50	-	28.00	91.00
2014	CISA 33-7	50.00	-	13.33	7.50	15.83	13.62	-	10.26	11.62	17.00	6.33	-	6.92	11.62	8.67	86.38	40.00	-	30.00	83.00
2015	FDK 312	25.00	-	5.00	12.50	5.00	19.99	-	11.51	15.44	6.00	9.34	-	6.88	9.12	4.56	80.01	46.50	-	23.67	94.00
2016	FDK 325	40.00	-	5.00	17.50	3.33	14.37	-	11.08	15.44	3.00	7.42	-	6.91	8.28	2.39	85.63	45.00	-	27.33	97.00
2017	Local Check	52.50	-	15.00	12.50	9.17	29.31	-	9.54	10.51	9.00	13.45	-	6.40	7.61	4.74	70.69	40.50	-	30.33	91.00
2018	PBD 156	-	-	6.67	11.25	5.00	-	-	7.61	17.38	5.00	-	-	5.15	8.37	3.11	-	50.00	-	31.00	95.00
2019	RG 868	35.00	-	3.33	12.50	7.50	20.20	-	12.15	16.00	7.00	9.36	-	8.95	6.02	3.83	79.80	41.00	-	29.67	93.00
2020	FDK 324	35.00	-	3.33	10.00	15.00	16.87	-	11.64	10.29	18.00	8.03	-	7.37	4.90	11.30	83.13	47.00	-	30.00	82.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirs**a; SG-** Sriganganagar, ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked) .
$ Open boll, locule damage (%) at harvest only.

Table: 13. Ent1a. Br 25a (CHT): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at North Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*					No. of Jassid/ 3 leaves					Whitefly/ 3 leaves					Thrips / 3 leaves				
		BT	FA	SR	HI	SG	BT	FA	SR	HI	SG	BT	FA	SR	HI	SG	BT	FA	SR	HI	SG
2021	KR 153	I	-	I	I	I	1.10	0.25	1.63	1.17	0.40	2.60	31.38	7.96	18.30	24.05	3.50	0.00	11.13	2.30	2.85
2022	KR 149	I	-	I	I	I	0.90	0.13	3.15	0.87	0.35	3.10	37.13	8.41	18.13	17.70	3.90	0.00	3.36	1.93	1.90
2023	Zonal Check (KR 64)	I	-	I	I	I	1.20	0.13	1.83	1.53	0.15	2.60	33.63	9.15	20.20	19.75	5.00	0.00	5.23	2.87	1.65
2024	CISAA 20-1	I	-	I	I	I	1.00	0.00	0.53	1.83	0.30	2.30	27.50	8.58	21.20	22.15	2.00	0.00	7.58	2.83	2.30
2025	Local Check	I	-	I	-	I	1.20	0.13	2.10	-	0.00	3.70	31.38	8.17	-	20.25	3.20	0.00	4.20	-	3.25
2026	KR 150	I	-	I	I	I	1.30	0.00	1.58	2.70	0.45	2.40	29.75	8.37	23.30	19.10	3.70	0.00	4.73	4.07	1.80
2027	KR 152	I	-	I	I	I	1.10	0.13	0.00	2.07	0.30	3.10	31.13	7.15	21.73	17.25	3.20	0.00	3.15	3.93	3.50
2028	CISAA 19-4	I	-	I	I	I	1.10	0.13	3.93	2.00	0.60	3.00	29.75	7.76	23.47	24.60	2.40	0.00	7.85	3.03	3.90

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirs**a; SG-** Sriganganagar, ***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave

Table: 14. Ent1a. Br 25a (CHT): Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) at North Zone during 2022-23.

Entry code	Name of entry	Natural Enemies/ Plant*					Rosette flower (%) due to PBW#					Green Boll Damage (%) due to ABW/SBW/TC					Green Boll Damage (%) due to PBW##				
		BT	FA	SR	HI	SG	BT	FA	SR	HI	SG	BT	FA	SR	HI	SG	BT	FA	SR	HI	SG
2021	KR 153	-	0.27	0.13	0.47	0.75	-	0.00	0.00	0.00	9.25	-	6.68	3.22	16.67	11.55	-	73.33	12.50	8.33	10.00
2022	KR 149	-	0.34	0.56	0.47	1.05	-	0.00	0.00	0.00	11.00	-	4.85	3.63	3.33	13.03	-	68.33	16.25	11.67	12.50
2023	ZC(KR 64)	-	0.39	0.38	0.40	0.90	-	0.00	0.00	0.00	6.00	-	6.66	3.83	6.67	11.60	-	53.33	13.75	11.67	6.67
2024	CISAA 20-1	-	0.25	0.58	0.47	0.60	-	0.00	0.00	0.00	4.50	-	6.41	0.90	18.33	10.09	-	80.00	10.00	6.67	5.00
2025	Local Check	-	0.30	0.44	-	0.90	-	0.00	0.00	-	7.00	-	7.68	2.84	-	11.91	-	58.33	11.25	-	9.17
2026	KR 150	-	0.29	0.31	0.60	0.60	-	0.00	0.00	0.00	9.25	-	5.48	2.42	18.33	12.43	-	32.50	12.50	8.33	13.33
2027	KR 152	-	0.38	0.25	0.27	1.30	-	0.00	0.00	0.00	4.75	-	6.52	4.68	20.00	8.68	-	50.00	13.75	5.00	5.83
2028	CISAA 19-4	-	0.30	0.38	0.47	1.45	-	0.00	0.00	0.00	11.50	-	9.59	2.64	6.67	12.27	-	51.43	10.00	6.67	12.50

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirs**a; SG-** Sriganganagar**,** * Natural Enemies include coccinellids, chrysopids, syrphids and spider mites.**,** #Rosette flower percent based on 50 randomly observed flower/entry**,** ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked).

Table: 15. Ent1a. Br 25a (CHT): Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at North Zone during 2022-23.

Entry code	Name of entry	Open Boll damage (%)$					Open Locule Damage (%)$					Good Open Bolls$				
		BT	FA	SR	HI	SG	BT	FA	SR	HI	SG	BT	FA	SR	HI	SG
2021	KR 153	0.00	14.84	15.17	10.34	11.00	0.00	7.35	9.14	6.15	5.24	51.50	85.16	29.67	-	89.00
2022	KR 149	0.83	9.44	15.13	5.31	14.00	0.78	5.43	6.33	3.51	6.86	43.00	90.56	30.00	-	86.00
2023	Zonal Check (KR 64)	0.00	8.28	16.71	8.30	7.00	0.00	4.74	7.97	4.63	3.49	44.50	91.72	28.33	-	93.00
2024	CISAA 20-1	0.72	17.36	20.25	11.96	6.00	0.00	9.37	10.79	9.09	3.44	48.50	82.64	25.33	-	94.00
2025	Local Check	0.00	14.22	17.13	-	9.00	0.00	6.89	10.96	-	4.29	39.50	85.78	26.00	-	91.00
2026	KR 150	0.00	8.14	15.61	10.95	12.00	0.00	4.30	8.96	5.22	5.97	49.50	91.86	30.67	-	88.00
2027	KR 152	0.00	12.47	15.30	6.24	6.00	0.00	6.86	10.90	4.14	3.08	44.50	87.53	24.67	-	94.00
2028	CISAA 19-4	0.00	20.31	18.71	8.78	13.00	0.00	10.54	10.41	7.37	6.87	38.50	79.69	27.00	-	87.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **SR-** Sirs**a; SG-** Sriganganagar, $ Open boll, locule damage (%)at harvest only

Table: 16. Ent1a. Br. 22 b (IET): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at Central Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*				No. of Jassid/ 3 leaves				Whitefly/ 3 leaves				Thrips / 3 leaves				Aphids/ 3 leaves			
		BH	NG	KH	AK	BH	NG	KH	AK	BH	NG	KH	AK	BH	NG	KH	AK	BH	NG	KH	AK
231	CNA 1085	I	I	-	I	2.18	1.62	5.77	1.20	1.18	1.15	14.70	4.40	1.97	0.13	-	-	4.79	3.53	18.77	-
232	GAM 296	I	I	-	I	2.81	1.60	1.76	1.10	2.87	1.41	8.77	5.10	4.35	0.15	-	-	3.70	3.98	8.46	-
233	PA 919	I	I	-	I	3.38	1.31	7.19	1.40	1.34	1.17	16.41	4.00	2.80	0.15	-	-	2.94	3.79	16.89	-
234	GBav 181	I	I	-	I	2.19	1.52	1.90	1.30	2.15	1.58	8.40	4.00	3.77	0.27	-	-	2.91	3.69	9.15	-
235	JLA 1707	I	I	-	I	2.89	1.54	5.02	1.80	1.62	1.48	17.62	2.90	4.06	0.02	-	-	2.99	3.23	16.36	-
236	ZC (AKA 7)	I	I	-	I	2.06	1.39	3.64	1.20	1.36	1.24	15.36	3.60	3.35	0.20	-	-	3.71	3.62	20.31	-
237	PA 929	I	I	-	I	2.87	1.40	6.03	1.50	1.05	1.68	14.87	2.50	2.43	0.13	-	-	2.98	3.75	15.37	-
238	CNA 1084	I	I	-	I	1.97	1.27	1.60	1.60	1.14	1.52	9.50	3.40	2.32	0.35	-	-	3.85	3.82	8.00	-
239	GVav 1332	I	I	-	I	1.71	1.23	5.52	1.50	1.40	1.35	20.12	3.50	3.03	0.31	-	-	2.52	2.58	17.39	-
240	LC	I	I	-	I	1.83	1.64	1.50	1.40	0.98	1.48	7.81	5.00	4.69	0.42	-	-	6.08	3.33	8.80	-
241	CNA20178	I	I	-	I	1.95	1.79	5.75	0.70	1.22	1.74	17.62	3.30	3.09	0.33	-	-	4.41	3.03	16.36	-
242	AKA 2016-3	I	I	-	I	1.99	1.43	3.77	1.70	0.87	1.28	19.10	3.30	2.72	0.24	-	-	3.13	3.10	18.44	-
243	CNA 1086	I	I	-	I	1.52	1.42	4.14	1.60	0.76	1.41	15.73	3.60	3.99	0.07	-	-	3.68	3.65	16.615	-
244	GAM 288	I	I	-	I	1.18	1.81	1.81	1.60	1.07	1.47	8.05	3.90	2.50	0.16	-	-	2.48	2.30	9.915	-
245	QC (PA 255)	I	I	-	I	1.22	1.94	1.40	1.20	1.05	1.17	8.17	3.00	3.02	0.16	-	-	1.89	2.28	7.335	-
246	JLA 1641	I	I	-	I	0.91	1.13	2.10	1.60	0.81	1.13	8.38	3.40	2.99	0.02	-	-	2.23	2.23	8.02	-
247	GBav 137	I	I	-	I	0.93	1.55	6.11	1.50	0.96	1.55	20.04	2.70	3.22	0.00	-	-	2.27	1.59	20.57	-

BH- Bharuch, **NG-**Nagpur, **KH-** Khandwa**, AK-**Akola, ***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave

Table: 17. Ent1a. Br. 22 b (IET): Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies &Bollworm) at Central Zone during 2022-23.

Entry code	Name of entry	Natural Enemies/ Plant*				Rosette flower (%) due to PBW#				Green Boll Damage (%) due to ABW/SBW				Green Boll Damage (%) due to PBW##				PBW larvae/ 20 green bolls			
		BH	NG	KH	AK	BH	NG	KH	AK	BH	NG	KH	AK	BH	NG	KH	AK	BH	NG	KH	AK
231	CNA 1085	1.70	0.11	-	-	2.25	-	-	-	3.59	0.16	-	1.95	7.45	31.11	-	15.00	-	-	1.15	-
232	GAM 296	1.38	0.38	-	-	3.87	-	-	-	5.79	0.69	-	2.54	7.45	32.22	-	22.50	-	-	0.66	-
233	PA 919	1.31	0.24	-	-	4.64	-	-	-	2.33	0.00	-	1.56	11.32	26.67	-	12.50	-	-	1.20	-
234	GBav 181	1.41	0.42	-	-	3.26	-	-	-	7.85	0.00	-	2.22	12.72	28.89	-	20.00	-	-	1.22	-
235	JLA 1707	1.32	0.22	-	-	1.87	-	-	-	1.16	0.16	-	4.78	6.35	18.89	-	28.75	-	-	1.41	-
236	ZC (AKA 7)	1.46	0.33	-	-	1.70	-	-	-	1.16	0.28	-	3.79	7.56	23.33	-	10.00	-	-	0.61	-
237	PA 929	1.35	0.29	-	-	4.52	-	-	-	4.22	0.47	-	7.03	13.01	26.67	-	17.50	-	-	1.29	-
238	CNA 1084	1.72	0.29	-	-	4.17	-	-	-	9.50	0.18	-	2.01	15.87	28.89	-	10.00	-	-	1.35	-
239	GVav 1332	1.63	0.18	-	-	1.57	-	-	-	4.22	0.41	-	2.81	9.98	33.33	-	8.75	-	-	1.13	-
240	LC	2.44	0.40	-	-	4.01	-	-	-	8.16	0.00	-	3.89	14.34	36.66	-	23.75	-	-	0.30	-
241	CNA20178	2.02	0.20	-	-	4.06	-	-	-	1.16	0.00	-	8.09	10.12	42.22	-	15.00	-	-	1.24	-
242	AKA 2016-3	1.64	0.47	-	-	4.27	-	-	-	8.16	0.54	-	3.46	12.86	41.11	-	20.00	-	-	1.33	-
243	CNA 1086	1.79	0.24	-	-	2.40	-	-	-	9.50	0.19	-	2.54	8.74	47.78	-	7.50	-	-	1.95	-
244	GAM 288	1.06	0.34	-	-	1.85	-	-	-	8.87	0.00	-	3.63	8.61	36.67	-	12.50	-	-	0.97	-
245	QC (PA 255)	1.05	0.33	-	-	1.95	-	-	-	7.24	0.00	-	2.79	10.12	35.56	-	20.00	-	-	0.98	-
246	JLA 1641	1.12	0.15	-	-	2.23	-	-	-	3.59	0.00	-	3.61	11.59	41.11	-	8.75	-	-	1.36	-
247	GBav 137	0.94	0.40	-	-	1.72	-	-	-	6.06	0.48	-	5.01	6.35	40.00	-	15.00	-	-	1.03	-

BH- Bharuch, **NG**-Nagpur, **KH**- Khandwa**, AK**-Akola, * Natural Enemies include coccinellids, chrysopids, syrphids and spider mites.
#Rosette flower percent based on 50 randomly observed flower/entry, ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked) .

Table: 18. Ent1a. Br. 22 b (IET): Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at Central Zone during 2022-23.

Entry code	Name of entry	Open Boll damage (%) $				Locule damage (%) $				Number of Good open bolls/plant			
		BH	NG	KH	AK	BH	NG	KH	AK	BH	NG	KH	AK
231	CNA 1085	5.72	26.00	-	15.49	2.92	16.65	-	5.66	30.50	-	-	-
232	GAM 296	6.62	31.10	-	20.62	3.73	20.54	-	6.10	28.93	-	-	-
233	PA 919	11.92	43.00	-	13.48	5.93	34.88	-	4.43	25.89	-	-	-
234	GBav 181	9.26	42.50	-	21.51	5.97	33.64	-	8.95	25.70	-	-	-
235	JLA 1707	8.24	15.20	-	25.89	5.03	11.38	-	10.29	25.30	-	-	-
236	ZC (AKA 7)	4.94	25.30	-	9.54	3.30	16.93	-	6.52	34.56	-	-	-
237	PA 929	10.80	16.90	-	19.07	5.49	13.58	-	6.42	25.03	-	-	-
238	CNA 1084	12.17	20.00	-	12.84	5.95	14.45	-	4.73	26.30	-	-	-
239	GVav 1332	3.82	19.70	-	8.72	2.09	16.09	-	2.72	34.64	-	-	-
240	LC	4.47	24.70	-	19.98	3.02	18.34	-	6.61	27.06	-	-	-
241	CNA20178	10.62	25.40	-	16.25	5.02	20.98	-	7.43	26.72	-	-	-
242	AKA 2016-3	7.02	24.70	-	19.58	3.73	18.47	-	8.18	28.82	-	-	-
243	CNA 1086	7.21	22.90	-	8.86	3.35	16.56	-	2.76	27.82	-	-	-
244	GAM 288	7.60	24.30	-	11.97	4.15	17.8	-	3.81	26.48	-	-	-
245	QC (PA 255)	12.17	22.10	-	21.35	5.92	16.46	-	7.29	23.62	-	-	-
246	JLA 1641	6.44	23.50	-	8.68	3.32	18.13	-	3.17	27.44	-	-	-
247	GBav 137	6.65	20.30	-	16.68	3.71	15.01	-	6.00	29.27	-	-	-

BH- Bharuch, **NG**-Nagpur, **KH**- Khandwa**, AK**-Akola, $ Open boll, locule damage (%)at harvest only.

Table: 19. Ent1a. Br. 32 b (IET): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at Central Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*		No. of Jassid/ 3 leaves		Whitefly/ 3 leaves		Thrips / 3 leaves		Aphids/3 leaves		Natural Enemies/ Plant*		Rosette flower (%) due to PBW#		Green Boll Damage (%) due to ABW/SBW	
		SU	BH	SU	BH	SU	BH	SU	BH	SU	BH	SU	BH	SU	BH	SU	BH
251	CNh 66	I	I	3.18	1.00	2.79	0.92	7.01	1.78	27.17	2.03	1.12	1.31	4.94	3.33	7.05	6.75
252	GBhv 340	I	I	2.31	1.74	2.05	1.07	7.55	2.70	33.19	3.98	1.52	1.89	0.45	6.00	7.94	3.50
253	CNh-33	I	I	2.00	3.53	2.97	1.20	5.85	4.04	22.87	1.93	1.93	1.49	5.97	4.67	6.24	10.00
254	GBhv 334	I	I	2.05	2.61	1.68	1.75	9.38	4.08	20.65	2.97	1.40	1.33	2.31	2.67	10.29	3.50
255	ZC (G Cot 23)	I	I	2.10	1.67	3.49	0.82	14.72	2.90	22.31	4.52	1.45	2.00	0.76	4.00	8.86	3.50
256	GBhv 356	I	I	3.87	1.81	3.70	1.29	17.86	3.89	27.30	2.11	1.19	1.40	5.09	4.00	9.45	6.75
257	GShv 843/17	I	I	2.60	2.12	3.78	1.05	12.63	2.60	27.23	1.89	1.20	1.10	2.04	3.33	9.61	6.75
258	LC	I	I	2.71	1.50	3.11	1.32	16.95	2.57	26.85	1.14	0.72	0.93	0.81	2.00	8.88	10.08
259	GShv 812/17	I	I	2.51	2.77	3.26	0.75	12.85	2.17	31.38	3.92	1.06	2.21	0.49	2.67	9.24	3.50

BH- Bharuch, **SU-**Surat, ***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave, * Natural Enemies include coccinellids, chrysopids, syrphids and spider mites, #Rosette flower percent based on 50 randomly observed flower/entry

Table: 20. Ent1a. Br. 32 b (IET): Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at Central Zone during 2022-23.

Entry code	Name of entry	Green Boll Damage (%) due to PBW##		Open Boll damage (%)$		Open Locule Damage (%) $		Number of Good Open Bolls/plant	
		SU	BH	SU	BH	SU	BH	SU	BH
251	CNh 66	6.69	13.33	11.69	7.15	4.83	4.24	30.26	24.77
252	GBhv 340	6.69	20.00	11.51	10.24	4.58	6.09	36.56	24.54
253	CNh-33	13.00	3.33	8.64	4.33	3.56	2.89	27.95	28.69
254	GBhv 334	13.00	13.33	9.77	9.97	4.17	5.67	29.03	26.25
255	ZC (G Cot 23)	2.37	16.67	12.50	10.25	4.47	6.47	24.32	22.07
256	GBhv 356	13.00	3.33	11.15	7.87	3.94	4.69	33.35	23.63
257	GShv 843/17	4.53	16.67	10.30	10.13	3.97	5.06	31.24	22.11
258	LC	9.99	3.33	11.58	5.00	4.53	3.33	27.66	30.08
259	GShv 812/17	6.69	10.00	10.58	5.18	4.08	4.04	29.88	29.71

BH- Bharuch, **SU-**Surat, ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked), $ Open boll, locule damage (%)at harvest only.

Table: 21. Ent1a. Br-03 a/b (PVT-CC): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at Central Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*			No. of Jassid/ 3 leaves			Whitefly/ 3 leaves			Thrips / 3 leaves		
		SU	KH	NG	SU	KH	NG	SU	KH	NG	SU	KH	NG
2101	CCH 20452	I	-	I	1.39	1.91	2.68	3.87	5.80	2.01	19.47	-	0.65
2102	Phule Yamuna (ZC)	I	-	I	2.10	1.00	2.68	5.68	4.86	1.37	28.09	-	0.51
2103	DHCC 2151	II	-	I	6.16	7.19	2.80	3.47	10.64	1.59	29.09	-	0.33
2104	CNH 19325	I	-	I	1.39	1.78	3.19	3.39	16.65	1.59	21.39	-	0.56
2105	CNH 19480	I	-	I	3.96	0.96	2.67	4.42	5.68	1.56	25.42	-	0.29
2106	16301 DB	I	-	I	4.97	3.93	2.46	5.79	11.61	1.68	22.11	-	0.42
2107	CNH 17395	I	-	I	3.27	4.71	2.80	3.50	15.73	1.50	26.78	-	0.40
2108	CNH 20449	I	-	I	3.98	4.14	2.66	4.69	14.19	1.61	23.68	-	0.60
2109	Local Check	I	-	I	4.09	1.72	2.38	5.68	6.05	1.19	21.99	-	0.64

NG-Nagpur, **KH-** Khandwa**, SU-**Surat, ***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave

Table: 22. Ent1a. Br-03 a/b (PVT-CC): Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) at Central Zone during 2022-23.

Entry code	Name of entry	Aphids/3 leaves			Natural Enemies/ Plant*			Rosette flower (%) due to PBW#			Green Boll Damage (%) due to ABW/SBW			PBW larvae/20 green bolls		
		SU	KH	NG	SU	KH	NG	SU	KH	NG	SU	KH	NG	SU	KH	NG
2101	CCH 20452	32.39	8.28	5.79	1.80	-	0.82	1.68	-	-	7.11	-	0.48	-	0.65	-
2102	Phule Yamuna (ZC)	33.79	9.14	7.09	0.99	-	0.87	0.25	-	-	6.59	-	0.60	-	1.43	-
2103	DHCC 2151	36.73	19.68	6.64	2.30	-	0.74	4.55	-	-	10.28	-	0.93	-	0.76	-
2104	CNH 19325	25.00	18.84	6.05	1.49	-	0.51	4.45	-	-	10.29	-	0.70	-	1.10	-
2105	CNH 19480	22.17	8.59	6.69	1.20	-	0.60	1.52	-	-	7.12	-	1.58	-	1.80	-
2106	16301 DB	20.78	19.13	5.55	0.70	-	0.44	1.74	-	-	6.51	-	0.59	-	2.00	-
2107	CNH 17395	30.08	20.37	6.17	1.00	-	0.64	7.37	-	-	8.41	-	0.00	-	1.21	-
2108	CNH 20449	25.18	22.29	6.59	2.29	-	0.63	1.97	-	-	8.47	-	0.00	-	1.50	-
2109	Local Check	26.76	7.89	4.99	1.10	-	0.78	2.54	-	-	5.27	-	1.17	-	1.44	-

NG-Nagpur, **KH**- Khandwa, **SU**-Surat, * Natural Enemies include coccinellids, chrysopids, syrphids and spider mites, #Rosette flower percent based on 50 randomly observed flower/entry

Table: 23. Ent1a. Br-03 a/b(PVT-CC): Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at Central Zone during 2022-23.

Entry code	Name of entry	Green Boll Damage (%) due to PBW##			Open Boll damage (%)$			Open Locule Damage (%) $			Number of Good Open Bolls/Plant		
		SU	KH	NG	SU	KH	NG	SU	KH	NG	SU	KH	NG
2101	CCH 20452	3.41	-	37.78	6.31	-	18.48	3.16	-	11.47	27.96	-	-
2102	Phule Yamuna (ZC)	0.00	-	27.78	4.33	-	20.38	2.48	-	13.45	31.40	-	-
2103	DHCC 2151	9.99	-	26.67	8.84	-	18.48	4.39	-	13.49	30.48	-	-
2104	CNH 19325	14.63	-	36.66	10.44	-	21.19	4.49	-	14.24	30.87	-	-
2105	CNH 19480	0.00	-	37.78	5.77	-	21.08	3.06	-	10.32	30.26	-	-
2106	16301 DB	9.99	-	34.44	6.25	-	20.84	3.02	-	14.31	38.49	-	-
2107	CNH 17395	3.41	-	41.11	6.09	-	22.23	2.94	-	14.27	22.47	-	-
2108	CNH 20449	3.41	-	35.55	6.45	-	18.55	3.03	-	12.52	39.48	-	-
2109	Local Check	3.41	-	27.78	4.42	-	19.56	2.20	-	13.42	55.45	-	-

NG-Nagpur, **KH**- Khandwa, **SU**-Surat, ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked) , $ Open boll, locule damage (%)at harvest only

Table: 24. Ent1a. Br-24 b (CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at Central Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*			No. of Jassid/ 3 leaves			Whitefly/ 3 leaves			Thrips / 3 leaves		
		NG	KH	AK	NG	KH	AK	NG	KH	AK	NG	KH	AK
2111	JLA-1430	I	-	I	1.55	1.50	1.20	1.48	9.77	2.90	0.27	-	-
2112	GAM 269	I	-	I	1.61	5.15	1.50	1.69	16.06	3.10	0.16	-	-
2113	ZC (AKA 7)	I	-	I	1.23	5.90	0.70	1.66	14.01	2.60	0.28	-	-
2114	GAM 283	I	-	I	1.18	1.96	1.70	1.99	8.50	2.80	0.29	-	--
2115	CNA 1072	I	-	I	1.45	5.86	1.30	1.92	16.61	2.90	0.29	-	-
2116	QC (PA 255)	I	-	I	1.41	1.68	0.70	1.71	7.40	2.80	0.09	-	-
2117	AKA 2016-11	I	-	I	1.11	1.60	1.40	1.82	9.05	3.50	0.18	-	-
2118	GAM 266	I	-	I	1.13	2.23	1.70	2.05	10.15	3.80	0.16	-	-
2119	LC	I	-	I	1.47	4.58	1.60	2.09	18.64	4.00	0.18	-	-
2120	JLA 1204	I	-	I	1.50	1.80	1.00	1.83	6.72	2.90	0.09	-	-

NG-Nagpur, **KH**- Khandwa, **AK**-Akola ,***JIG**- Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave

Table: 25.Ent1a Br-24 b(CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) at Central Zone during 2022-23.

Entry code	Name of entry	Aphids/ 3 leaves			Natural Enemies/ Plant*			Rosette flower (%) due to PBW#			Green Boll Damage (%) due to ABW/SBW			PBW larvae/ 20 green bolls		
		NG	KH	AK	NG	KH	AK	NG	KH	AK	NG	KH	AK	NG	KH	AK
2111	JLA-1430	2.30	7.66	-	0.36	-	-	-	-	-	0.38	-	2.28	-	1.13	-
2112	GAM 269	3.31	14.86	-	0.11	-	-	-	-	-	0.59	-	4.35	-	1.01	-
2113	ZC (AKA 7)	3.48	15.24	-	0.29	-	-	-	-	-	0.00	-	1.93	-	1.22	-
2114	GAM 283	2.91	7.73	-	0.24	-	-	-	-	-	0.84	-	2.60	-	0.92	-
2115	CNA 1072	3.30	17.13	-	0.29	-	-	-	-	-	0.50	-	3.77	-	1.30	-
2116	QC (PA 255)	2.95	7.11	-	0.27	-	-	-	-	-	0.74	-	8.60	-	1.70	-
2117	AKA 2016-11	3.90	7.93	-	0.42	-	-	-	-	-	0.00	-	3.91	-	1.05	-
2118	GAM 266	2.71	8.11	-	0.35	-	-	-	-	-	0.32	-	2.11	-	1.50	-
2119	LC	2.06	17.00	-	0.29	-	-	-	-	-	0.41	-	1.69	-	1.70	-
2120	JLA 1204	2.68	7.38	-	0.35	-	-	-	-	-	0.47	-	6.59	-	1.50	-

NG-Nagpur, **KH-** Khandwa**, AK-**Akola **,** * Natural Enemies include coccinellids, chrysopids, syrphids and spider mites, #Rosette flower percent based on 50 randomly observed flower/entry

Table: 26. Ent1a. Br-24 b(CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at Central Zone during 2022-23.

Entry code	Name of entry	Green Boll Damage (%) due to PBW##			Open Boll damage (%) $			Open Locule Damage (%) $			Number of Good Open Bolls/plant		
		NG	KH	AK	NG	KH	AK	NG	KH	AK	NG	KH	AK
2111	JLA-1430	25.56	-	10.00	23.65	-	14.76	15.31	-	6.81	-	-	-
2112	GAM 269	44.45	-	13.75	14.56	-	16.59	13.55	-	7.36	-	-	-
2113	ZC (AKA 7)	28.89	-	12.50	38.14	-	13.45	24.89	-	4.64	-	-	-
2114	GAM 283	34.44	-	16.25	32.99	-	17.91	25.47	-	7.60	-	-	-
2115	CNA 1072	25.55	-	10.00	33.24	-	12.22	24.86	-	4.35	-	-	-
2116	QC (PA 255)	24.45	-	11.25	32.75	-	15.82	15.59	-	6.17	-	-	-
2117	AKA 2016-11	44.44	-	15.00	36.32	-	17.22	24.44	-	7.43	-	-	-
2118	GAM 266	47.78	-	23.75	39.61	-	16.75	26.55	-	7.01	-	-	-
2119	LC	50.00	-	18.75	34.56	-	8.82	22.66	-	3.72	-	-	-
2120	JLA 1204	26.67	-	13.75	34.59	-	14.25	22.94	-	5.05	-	-	-

NG-Nagpur, **KH-** Khandwa**, AK-**Akola, ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked), $ Open boll, locule damage (%) harvest only.

Table: 27. Ent1a. Br-24b (CVT-CC): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at Central Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*			No. of Jassid/ 3leaves			Whitefly/ 3 leaves			Thrips / 3 leaves		
		NG	KH	SU	NG	KH	SU	NG	KH	SU	NG	KH	SU
2121	CNA 1092	I	-	I	1.65	1.15	2.00	0.82	7.01	3.06	0.88	-	18.21
2122	Local Check	I	-	I	1.57	5.94	1.96	0.88	16.05	4.08	0.58	-	19.60
2123	CNA 20402	I	-	I	1.50	1.71	1.98	1.08	8.40	4.59	0.78	-	14.67
2124	CNA 19475	I	-	I	1.47	4.71	1.38	0.90	12.12	3.69	0.78	-	14.69
2125	AKA 7 (Zonal Check)	I	-	I	1.72	6.28	2.88	1.22	12.53	4.59	0.68	-	21.58
2126	DDCC 2001	I	-	I	1.77	1.56	1.90	1.00	7.91	3.67	0.45	-	27.29

NG-Nagpur, **KH-** Khandwa**, SU-** Surat, ***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave

Table: 28.Ent1a Br-24 b (CVT-CC): Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) at Central Zone during 2022-23.

Entry code	Name of entry	Aphids/ 3 leaves			Natural Enemies/ Plant*			Rosette flower (%) due to PBW#			Green Boll Damage (%) due to ABW/SBW			PBW larvae/20 green bolls		
		NG	KH	SU	NG	KH	SU	NG	KH	SU	NG	KH	SU	NG	KH	SU
2121	CNA 1092	2.52	7.83	21.69	0.63	-	1.70	-	-	0.25	0.36	-	11.97	-	1.00	-
2122	Local Check	2.50	18.29	16.29	0.48	-	1.20	-	-	1.68	1.01	-	11.14	-	1.37	-
2123	CNA 20402	3.07	8.33	21.58	0.53	-	1.58	-	-	5.80	0.18	-	8.20	-	1.90	-
2124	CNA 19475	2.75	20.54	16.28	0.45	-	1.30	-	-	6.90	0.00	-	8.21	-	1.21	-
2125	AKA 7 (Zonal Check)	2.33	16.48	14.78	0.48	-	1.78	-	-	0.25	0.67	-	11.51	-	1.10	-
2126	DDCC 2001	3.13	9.04	15.36	0.55	-	0.88	-	-	8.52	0.14	-	10.12	-	1.03	-

NG-Nagpur, **KH-** Khandwa**, SU-**Surat**,** * Natural Enemies include coccinellids, chrysopids, syrphids and spider mites, #Rosette flower percent based on 50 randomly observed flower/entry

Table: 29. Ent1a. Br-24b (CVT-CC): Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at Central Zone during 2022-23.

Entry code	Name of entry	Green Boll Damage (%) due to PBW##			Open Boll damage (%) due to PBW$			Open Locule Damage (%) due to PBW$			Number of Good Open Bolls/plant		
		NG	KH	SU	NG	KH	SU	NG	KH	SU	NG	KH	SU
2121	CNA 1092	50.00	-	14.63	35.18	-	9.48	25.49	-	5.55	-	-	30.48
2122	Local Check	40.83	-	14.63	27.98	-	7.02	17.21	-	4.14	-	-	37.37
2123	CNA 20402	44.17	-	9.99	28.09	-	5.73	21.25	-	3.34	-	-	30.45
2124	CNA 19475	29.17	-	9.58	27.21	-	8.53	17.62	-	5.02	-	-	32.93
2125	AKA 7 (Zonal Check)	30.00	-	14.63	26.16	-	10.33	17.30	-	5.68	-	-	18.34
2126	DDCC 2001	40.00	-	3.41	27.47	-	9.66	19.14	-	5.21	-	-	28.92

NG-Nagpur, **KH-** Khandwa**, SU-**Surat **,** ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked), $ Open boll, locule damage (%) at harvest only.

Table: 30. Ent1a. Br-03 a/b (PVT-CC): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at South Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*					No. of Jassid/ 3 leaves					Whitefly/ 3 leaves					Thrips / 3 leaves				
		LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE
2201	DHCC 2002	III	-	-	III	-	7.45	8.00	-	18.67	-	2.10	12.00	-	2.35	-	5.45	17.33	-	5.27	-
2202	Suraj (Zonal Check)	III	-	-	IV	-	6.40	11.33	-	40.75	-	2.00	10.00	-	1.67	-	7.95	21.33	-	8.75	-
2203	DHCC 2151	III	-	-	III	-	6.80	7.33	-	32.08	-	2.25	8.00	-	2.42	-	8.00	24.67	-	8.50	-
2204	Local Check	III	-	-	III	-	4.60	12.00	-	30.00	-	3.80	15.33	-	2.48	-	9.05	14.00	-	8.08	-
2205	Vaidehi 1 (ZC CC)	III	-	-	III	-	5.40	8.33	-	24.50	-	3.85	12.67	-	2.50	-	8.00	12.67	-	7.83	-

CBE- Coimbatore, **DW**- Dharwad**, LG-**Lam Guntur**, ND-**Nandyal, **RC-**Raichur, ***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave

Table: 31. Ent1a Br-03 a/b b (PVT-CC): Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) at South Zone during 2022-23.

Entry code	Name of entry	Aphid/3 leaves					Natural Enemies/ Plant*					Rosette flower (%) due to PBW#					Green Boll Damage (%) due to ABW/SBW/TC				
		LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE	LG	ND	DW	RC**	CBE
2201	DHCC 2002	4.15	-	-	2.33	-	0.65	0.00	-	1.30	-	20.00	-	-	6.03	-	-	-	-	22.22	-
2202	Suraj (ZC)	5.80	-	-	4.08	-	0.45	0.13	-	1.41	-	20.00	-	-	5.56	-	-	-	-	20.29	-
2203	DHCC 2151	3.80	-	-	4.83	-	0.50	0.13	-	1.15	-	16.25	-	-	5.83	-	-	-	-	19.25	-
2204	Local Check	4.60	-	-	4.75	-	0.60	0.00	-	1.39	-	20.00	-	-	6.86	-	-	-	-	20.44	-
2205	Vaidehi 1 (ZC CC)	5.25	-	-	3.25	-	0.55	0.00	-	1.53	-	17.50	-	-	6.75	-	-	-	-	15.18	-

CBE- Coimbatore, **DW**- Dharwad**, LG-**Lam Guntur**, ND-**Nandyal, **RC-**Raichur,* Natural Enemies include coccinellids, chrysopids, syrphids and spider mites, #Rosette flower percent based on 50 randomly observed flower/entry, **square damage due to ABW.

Table: 32. Ent1a Br-03 a/ b (PVT-CC): Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at South Zone during 2022-23.

Entry code	Name of Entry	Green Boll Damage (%) due to PBW##					Open Boll damage (%) $					Open Locule Damage (%)$					Number of Good Open Bolls/plant				
		LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE
2201	DHCC 2002	20.00	15.78	-	52.50	-	10.95	8.33	-	83.19	-	7.68	6.00	-	79.90	-	89.05	-	-	16.81	-
2202	Suraj (ZC)	50.00	16.67	-	60.00	-	9.30	15.00	-	82.88	-	7.77	7.67	-	77.52	-	90.70	-	-	17.12	-
2203	DHCC 2151	40.00	19.44	-	56.67	-	15.70	21.67	-	76.92	-	12.98	8.00	-	68.91	-	84.30	-	-	23.08	-
2204	Local Check	20.00	50.00	-	57.50	-	7.88	21.67	-	75.49	-	5.19	16.67	-	75.11	-	92.12	-	-	24.51	-
2205	Vaidehi 1 (ZC CC)	30.00	25.00	-	70.00	-	9.25	16.67	-	77.19	-	7.47	11.67	-	74.14	-	90.75	-	-	22.81	-

CBE- Coimbatore, **DW**- Dharwad**, LG-**Lam Guntur**, ND-**Nandyal, **RC-**Raichur, ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked) .
$ Open boll, locule damage (%) at harvest only

Table: 33. Ent1a. Br-04a (CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at South Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*			No. of Jassid/ 3 leaves			Whitefly/ 3 leaves			Thrips / 3 leaves		
		LG	RC	SVPR	LG	RC	SVPR	LG	RC	SVPR	LG	RC	SVPR
2211	RAH 1083	III	II	-	6.25	12.33	-	3.45	2.08	-	7.35	11.25	-
2212	ZC (Suraj)	III	II	-	5.35	15.92	-	2.20	1.75	-	8.95	11.33	-
2213	RAH 1081	III	II	-	5.40	15.58	-	3.05	2.17	-	8.70	10.58	-
2214	TSH 387	III	II	-	6.75	11.58	-	2.00	1.87	-	8.15	8.83	-
2215	LC	III	II	-	4.60	8.58	-	2.20	1.67	-	7.30	11.17	-
2216	RAH 1082	III	I	-	5.20	4.75	-	2.60	1.08	-	7.85	6.25	-

LG-Lam Guntur**, RC-**Raichur **, SPVR-** Sirivilliputhur**, *JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave

Table: 34. Ent1a. Br-04a (CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies &Bollworm) at South Zone during 2022-23.

Entry code	Name of entry	Aphids / 3 leaves			Natural Enemies/ Plant*			Rosette flower (%) due to PBW#			Green Boll Damage (%) due to ABW/SBW		
		LG	RC	SVPR	LG	RC	SVPR	LG	RC	SVPR	LG	RC**	SVPR
2211	RAH 1083	4.75	3.58	-	0.75	1.20	-	20.00	9.00	-	-	21.67	-
2212	ZC (Suraj)	4.85	2.33	-	0.50	1.41	-	15.00	8.50	-	--	20.83	-
2213	RAH 1081	5.25	0.75	-	0.35	1.17	-	25.00	9.33	-	--	18.32	-
2214	TSH 387	3.60	3.83	-	0.60	1.30	-	13.75	10.50	-	-	21.40	-
2215	LC	4.70	3.58	-	0.50	1.45	-	16.25	10.00	-	-	15.77	-
2216	RAH 1082	4.90	3.17	-	0.30	1.53	-	16.25	8.00	-	-	18.08	-

LG-Lam Guntur**, RC-**Raichur **, SPVR-** Sirivilliputhur**,** * Natural Enemies include coccinellids, chrysopids, syrphids and spider mites, #Rosette flower percent based on 50 randomly observed flower/entry, ** square damage due to ABW.

Table: 35. Ent1a. Br-04a(CVT): Preliminary screening of breeding material for resistance to insect pest of cotton(Bollworm) at South Zone during 2022-23.

Entry code	Name of entry	Green Boll Damage (%) due to PBW##			Open Boll damage (%)$			Open Locule Damage (%)$			Number of Good Open Bolls/Plant		
		LG	RC	SVPR	LG	RC	SVPR	LG	RC	SVPR	LG	RC	SVPR
2211	RAH 1083	60.00	69.17	-	9.53	77.10	-	7.29	74.30	-	90.47	22.90	-
2212	ZC (Suraj)	70.00	61.67	-	15.84	81.46	-	10.74	79.70	-	84.16	18.54	-
2213	RAH 1081	40.00	62.92	-	13.28	77.46	-	9.43	73.89	-	86.72	22.54	-
2214	TSH 387	40.00	69.17	-	24.13	77.27	-	17.08	72.25	-	75.87	22.73	-
2215	LC	40.00	60.00	-	13.59	77.01	-	10.33	74.47	-	86.41	22.99	-
2216	RAH 1082	40.00	53.33	-	8.42	82.50	-	6.23	78.47	-	91.58	39.17	-

LG-Lam Guntur**, RC-**Raichur**, SPVR-** Sirivilliputhur**,** ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked), $ Open boll, locule damage (%) at harvest only.

Table: 36. Ent1a. Br – 14a (CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at South Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*			No. of Jassid/ 3 leaves			Whitefly/ 3 leaves			Thrips / 3 leaves		
		DW	CBE	RA	DW	CBE	RA	DW	CBE	RA	DW	CBE	RA
2221	CCB 26	III	III	II	8.60	4.55	5.56	2.70	0.53	3.07	10.66	2.40	14.89
2222	CCB22-2	III	IV	I	8.50	5.63	5.22	1.40	0.33	2.56	9.56	8.29	15.07
2223	ZC (Rhcb-011-CZ; Suvin-SZ)	III	IV	I	6.80	5.90	4.78	0.80	0.64	2.56	8.70	3.26	15.44
2224	CCB22-1	III	III	I	6.70	5.97	5	1.10	0.32	2.22	8.71	7.84	14.78
2225	SIMA B-8	III	III	III	6.20	5.97	6	1.00	0.29	1.78	8.01	1.11	14.78
2226	CCB 6	III	III	II	7.00	5.87	5.41	1.10	0.36	1.78	7.94	6.18	15.56

CBE- Coimbatore**, DW-**Dharwad, **, RA**-Rahuri,***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave)

Table: 37. Ent1a. Br – 14 a (CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) at South Zone during 2022-23.

Entry code	Name of entry	Aphids/3 leaves			Natural Enemies/ Plant*			Rosette flower (%) due to PBW#			Green Boll Damage (%) due to ABW/SBW/TC		
		DW	CBE	RA	DW	CBE	RA	DW	CBE	RA	DW	CBE	RA
2221	CCB 26	11.30	9.30	15.11	-	0.30	2.04	-	4.85	9.27	10.62	-	9.23
2222	CCB22-2	13.10	8.60	12.74	-	0.61	1.76	-	5.38	8.97	11.23	-	10.12
2223	ZC (Rhcb-011-CZ; Suvin-SZ)	13.10	9.33	14.41	-	0.32	2.18	-	7.25	6.97	10.19	-	7.13
2224	CCB22-1	11.10	6.28	16.81	-	0.33	1.81	-	8.24	8.39	11.74	-	8.24
2225	SIMA B-8	12.90	5.77	20	-	0.27	1.94	-	8.24	7.29	7.01	-	7.28
2226	CCB 6	11.70	4.47	15.11	-	0.43	2.61	-	10.74	7.19	10.08	-	8.14

CBE- Coimbatore**, DW-**Dharwad**, RA**-Rahuri,* Natural Enemies include coccinellids, chrysopids, syrphids and spider mites, #Rosette flower percent based on 50 randomly observed flower/entry, #Rosette flower percent based on 50 randomly observed flower/entry**,** ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked) .$ Open boll, locule damage (%) at harvest only

Table: 38. Ent1a. Br – 14 a (CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at South Zone during 2022-23.

Entry code	Name of entry	Green Boll Damage (%) due to PBW##			Open Boll damage (%) $			Open Locule Damage (%)$			Number of Good Open Bolls/plant		
		DW	CBE	RA	DW	CBE*	RA	DW	CBE*	RA	DW	CBE	RA
2221	CCB 26	8.58	12.35	22.13	32.13	19.26	23.16	10.53	38.81	9.53	67.87	87.65	-
2222	CCB22-2	11.57	14.68	20.13	34.88	18.25	21.42	10.39	41.66	8.21	65.12	85.32	-
2223	ZC (Rhcb-011-CZ; Suvin-SZ)	11.73	18.35	16.00	47.57	17.36	29.50	12.43	45.00	10.65	52.43	83.65	-
2224	CCB22-1	10.59	20.50	19.00	31.25	15.32	26.40	11.81	52.50	7.61	68.75	81.65	-
2225	SIMA B-8	10.55	18.36	23.00	34.80	11.25	20.99	10.34	47.72	12.16	65.20	79.50	-
2226	CCB 6	10.41	24.10	14.00	32.29	12.89	20.30	10.88	54.32	6.56	67.71	81.64	-

CBE- Coimbatore**, DW-**Dharwad, **, RA**-Rahuri, ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked), $ Open boll, locule damage (%) at harvest only,

Table: 39. Ent1a. Br-24 b (CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at South Zone during 2022-23.

Entry code	Name of entry	Jassid Injury Grade(JIG)*		Jassid/ 3 leaves		Whitefly/ 3 leaves		Thrips / 3 leaves		Aphids/3 leaves		Natural Enemies/ Plant*		Rosette flower (%) due to PBW#	
		ND	DW	ND	DW	ND	DW	ND	DW	ND	DW	ND	DW	ND	DW
2231	CNA 2034	-	I	-	4.60	-	1.20	-	6.63	-	6.10	-	-	-	-
2232	DWDa 2051	-	I	-	4.30	-	0.80	-	7.44	-	7.80	-	-	-	-
2233	PAIG 411	-	I	-	4.30	-	0.80	-	7.02	-	7.40	-	-	-	-
2234	MDL 2674	-	I	-	3.40	-	0.80	-	7.96	-	7.30	-	-	-	-
2235	NDLA 3152-1	-	I	-	3.90	-	0.60	-	6.89	-	7.50	-	-	-	-
2236	PA 887	-	I	-	6.10	-	0.90	-	7.76	-	8.40	-	-	-	-
2237	CNA 1085	-	I	-	4.90	-	1.00	-	8.29	-	7.30	-	-	-	-
2238	DWDa 2252	-	I	-	4.90	-	1.40	-	7.59	-	5.70	-	-	-	-
2239	LC	-	I	-	4.00	-	1.30	-	7.69	-	9.20	-	-	-	-
2240	CNA 1086	-	I	-	4.60	-	0.80	-	7.94	-	8.50	-	-	-	-
2241	NDLA 3146-2	-	I	-	3.80	-	0.60	-	8.09	-	9.20	-	-	-	-
2242	ZC (DLSa 17)	-	I	-	3.90	-	1.20	-	7.94	-	7.20	-	-	-	-
2243	PA 888	-	I	-	3.80	-	1.10	-	7.03	-	8.60	-	-	-	-
2244	PA 898	-	I	-	4.70	-	1.40	-	7.62	-	8.60	-	-	-	-
2245	DWDa 2251	-	I	-	4.50	-	0.50	-	8.61	-	8.30	-	-	-	-
2246	CNA 1084	-	I	-	4.70	-	1.10	-	8.08	-	8.30	-	-	-	-

ND- Nandyal **, DW**- Dharwad, ***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave, * Natural Enemies include coccinellids, chrysopids, syrphids and spider mites,#Rosette flower percent based on 50 randomly observed flower/entry

Table: 40. Ent1a. Br-24 b(CVT): Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworms) at South Zone during 2022-23.

Entry code	Name of entry	Green Boll Damage (%) due to ABW/SBW/TC		Green Boll damage (%) due to PBW##		Open Boll damage (%) $		Open Locule Damage (%) $		Number of Good Open Bolls/plant	
		ND	DW	ND	DW	ND	DW	ND	DW	ND	DW
2231	CNA 2034	-	8.22	-	8.37	-	17.98	-	10.45	-	82.02
2232	DWDa 2051	-	8.83	-	10.58	-	11.11	-	10.41	-	88.89
2233	PAIG 411	-	9.52	-	10.57	-	15.50	-	10.96	-	84.50
2234	MDL 2674	-	8.46	-	10.77	-	4.40	-	11.07	-	95.60
2235	NDLA 3152-1	-	6.92	-	11.36	-	9.82	-	11.21	-	90.18
2236	PA 887	-	9.78	-	11.03	-	12.33	-	11.30	-	87.67
2237	CNA 1085	-	9.23	-	10.44	-	6.72	-	10.73	-	93.28
2238	DWDa 2252	-	11.36	-	12.35	-	10.02	-	12.65	-	89.98
2239	LC	-	9.19	-	10.27	-	14.49	-	10.27	-	85.51
2240	CNA 1086	-	9.91	-	10.33	-	11.16	-	10.88	-	88.84
2241	NDLA 3146-2	-	10.98	-	10.94	-	10.27	-	10.77	-	89.73
2242	ZC (DLSa 17)	-	10.60	-	12.72	-	11.22	-	12.65	-	88.78
2243	PA 888	-	7.53	-	10.36	-	9.24	-	11.76	-	90.76
2244	PA 898	-	8.12	-	10.48	-	2.92	-	11.05	-	97.08
2245	DWDa 2251	-	7.78	-	10.44	-	6.93	-	11.19	-	93.07
2246	CNA 1084	-	8.08	-	8.29	-	7.59	-	11.30	-	92.41

ND- Nandyal **, DW**- Dharwad, ## Green boll damage due to PBW through destructive sampling from 10 green boll/entry (randomly picked), $ Open boll, locule damage (%) at harvest only.

Table: 41. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests at North Zone during 2022-23.

Entry code	Entry Name	Mean Jassid grade(JIG)					Jassids / 3 leaves					Whitefly / 3 leaves					Thrips /3 leaves				
		BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
1	PBH-79 Nbt	I	III	III	-	I	1.40	1.31	5.37	-	0.27	41.03	33.96	30.77	43.33	26.63	17.53	-	26.00	-	24.30
2	F-2732	II	IV	III	-	I	1.90	1.27	6.17	-	0.63	44.03	37.38	36.68	40.27	18.17	22.23	-	21.67	-	16.70
3	PBH BT-16	I	III	III		I	1.30	2.42	4.93		0.17	43.27	48.17	27.98	37.33	34.13	19.37		20.90		31.53
4	FBT- 1911	I	III	III	-	I	1.27	3.08	5.83	-	0.20	42.17	44.15	33.65	39.93	28.60	21.67	-	20.63	-	26.13
5	ACRV-44 BT	I	II	II	-	I	1.23	2.38	4.40	-	0.27	39.60	34.73	28.35	34.07	23.20	19.03	-	31.27	-	21.93
6	HAU BT-2	II	III	III	-	I	1.40	1.71	5.13	-	0.57	43.03	61.35	26.20	46.73	26.77	20.87	-	30.05	-	24.83
7	FBT- 1908	II	III	III	-	I	1.53	4.15	4.77	-	0.43	43.10	46.10	35.98	36.47	23.13	19.17	-	22.93	-	21.37
8	RS-2943	II	III	III	-	I	1.67	3.42	6.13	-	0.27	44.43	29.71	37.15	21.27	38.17	20.17	-	33.98	-	34.93
9	HS-310	I	III	III	-	I	1.37	3.35	5.60	-	0.50	39.80	47.85	33.37	28.53	27.87	20.93	-	26.00	-	25.60
10	CICRS BT-27-1	I	II	III	-	I	1.37	2.21	4.90	-	0.10	41.17	47.25	32.95	36.00	24.53	20.63	-	22.33	-	22.87

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar, ***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave.

Table: 42. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests at North Zone during 2022-23.

Entry code	Entry Name	Whitefly Ovipositional preference (No. of eggs average of 3 cage)			Jassid Ovipositional preference (No. of eggs/plant)		Adult Longevity (Jassids)					No. of Normal adult emergence (Jassids)				
		BT	FA	SR*	FA	SG#	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
1	PBH-79 N-Bt	-	-	15.50	-	3.67	-	-	-	-	36.33	-	-	-	-	1.67
2	F-2732	-	-	24.00	-	2.67	-	-	-	-	38.00	-	-	-	-	1.33
3	PBH BT-16			27.33		3.33					36.67					1.67
4	FBT- 1911	-	-	19.67	-	3.00	-	-	-	-	37.00	-	-	-	-	1.33
5	ACRV-44 BT	-	-	22.50	-	4.33	-	-	-	-	35.33	-	-	-	-	2.33
6	HAU BT-2	-	-	21.33	-	2.67	-	-	-	-	38.67	-	-	-	-	1.00
7	FBT- 1908	-	-	16.67	-	3.33	-	-	-	-	36.33	-	-	-	-	1.33
8	RS-2943	-	-	25.00	-	2.67	-	-	-	-	39.33	-	-	-	-	1.33
9	HS-310	-	-	13.67	-	3.67	-	-	-	-	36.00	-	-	-	-	2.00
10	CICRS BT-27-1	-	-	22.33	-	3.00	-	-	-	-	36.67	-	-	-	-	1.67

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar. * 1 pair of Whitefly/cage, # number of eggs per plant

Table: 43. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests at North Zone during 2022-23.

Entry code	Entry Name	Growth and development of immature stages (Jassids)														
		Larval/Nymphal duration					Nymph mortality (%)					Settling Preference (in polyhouse)				
		BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
1	PBH-79 N-Bt	-	-	-	-	11.67	-	-	-	-	54.50	-	-	-	17.33	-
2	F-2732	-	-	-	-	12.33	-	-	-	-	50.19	-	-	-	34.67	-
3	PBH BT-16					12.00					49.85				22.00	-
4	FBT- 1911	-	-	-	-	11.33	-	-	-	-	55.67	-	-	-	-	-
5	ACRV-44 BT	-	-	-	-	10.67	-	-	-	-	46.19	-	-	-	-	-
6	HAU BT-2	-	-	-	-	13.00	-	-	-	-	62.55	-	-	-	33.33	-
7	FBT- 1908	-	-	-	-	11.67	-	-	-	-	60.06	-	-	-	10.67	-
8	RS-2943	-	-	-	-	13.33	-	-	-	-	50.19	-	-	-	-	-
9	HS-310	-	-	-	-	11.00	-	-	-	-	45.50	-	-	-	17.67	-
10	CICRS BT-27-1	-	-	-	-	12.67	-	-	-	-	44.33	-	-	-	10.67	-

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar

Table: 44. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests at Central Zone during 2022-23.

Entry Name	Mean Jassid Injury Grade (JIG)*				Leaf hopper / 3 leaves				Whitefly / 3 leaves			
	JU	SU**	NA	RA	JU	SU**	NA	RA	JU	SU**	NA	RA
AKH-1302	III	I	II	I	7.57	3.30	2.33	2.00	7.63	2.28	6.67	1.84
AKH-2013-3	II	I	II	I	4.20	3.08	1.93	1.73	7.17	2.44	6.13	1.50
DSC-1851	III	II	II	II	9.53	6.22	2.13	2.83	8.57	4.32	5.43	1.95
GISV-312	III	I	II	I	6.97	1.89	2.40	3.06	6.53	2.75	6.13	1.61
GISV-323	II	I	II	I	5.83	2.28	1.47	2.72	6.40	2.32	5.27	2.11
GJHV-328	II	I	II	II	7.20	2.26	1.87	3.34	6.73	2.53	4.83	1.78
GJHV-522	III	I	II	II	7.17	2.65	2.00	3.00	3.70	2.85	5.57	2.00
GJHV-548	II	I	II	I	5.07	2.70	1.73	3.72	6.80	2.98	5.27	2.28
GJHV-566	II	I	II	II	5.50	3.49	2.00	3.51	4.03	3.00	5.67	2.00
NDLH-2035-5	III	II	II	II	10.37	4.95	3.47	3.11	5.80	4.69	7.10	2.25
NDLH-2057-1	III	II	II	II	7.73	5.23	2.40	3.23	4.97	3.78	6.27	2.00
RAH-1076	II	I	II	I	6.27	2.51	1.47	3.00	5.67	2.08	4.80	2.00
RHC-1409	II	I	II	I	6.73	2.79	2.33	2.17	4.27	3.20	5.13	2.06
TSH-367	III	II	II	II	8.87	4.27	3.53	3.11	5.73	4.73	7.53	2.00
TVH-007	III	I	II	II	8.17	3.09	3.80	3.06	4.63	4.22	7.80	1.94
NDLH-1938	III	I	II	II	11.10	3.32	1.40	3.06	8.40	3.55	4.80	1.89
DCH-32	III	IV	IV	IV	11.37	12.17	5.70	6.44	7.27	3.91	5.77	2.89
Suraj	-	-	II	-	-	-	2.43	-	-	-	7.40	-
Ajeet-155 BG-II	-	-	II	-	-	-	2.83	-	-	-	6.60	-

****(Open field condition)-JU-** Junagadh**, SU-** Surat**, NA-** Nanded, **RA-** Rahuri, ***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave).

Table: 45. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests at Central Zone during 2022-23.

Entry Name	Thrips/3 leaves				Aphid / 3 leaves			
	JU	SU*	NA	RA	JU	SU*	NA	RA
AKH-1302	-	22.33	-	-	7.50	22.34	7.33	-
AKH-2013-3	-	21.65	-	-	4.49	22.21	6.37	-
DSC-1851	-	25.85	-	-	8.50	24.48	6.77	-
GISV-312	-	20.84	-	-	6.70	20.71	5.13	-
GISV-323	-	21.40	-	-	5.30	22.05	4.60	-
GJHV-328	-	20.11	-	-	7.00	21.54	4.83	-
GJHV-522	-	19.48	-	-	6.65	20.59	4.90	-
GJHV-548	-	21.06	-	-	4.10	22.32	4.83	-
GJHV-566	-	21.95	-	-	4.85	22.94	6.40	-
NDLH-2035-5	-	23.38	-	-	8.65	26.87	8.10	-
NDLH-2057-1	-	24.47	-	-	7.40	25.64	6.47	-
RAH-1076	-	19.64	-	-	6.45	24.20	4.47	-
RHC-1409	-	21.69	-	-	6.25	22.84	4.73	-
TSH-367	-	22.93	-	-	8.05	23.20	8.33	-
TVH-007	-	19.86	-	-	7.50	21.04	8.90	-
NDLH-1938	-	25.57	-	-	9.50	24.46	4.70	-
DCH-32	-	24.36	-	-	10.05	25.17	5.20	-
Suraj	-	-	-	-	-	-	7.60	-
Ajeet-155 BG-II	-	-	-	-	-	-	8.27	-

***(Open field condition)-JU-** Junagadh**, SU-** Surat**, NA-** Nanded, **RA-** Rahuri

Table: 46. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests at Central Zone during 2022-23.

Entry Name	WhiteflyNymphal population / 3 leaves				Yield (q./ha)				*Av. No. of eggs laid/plant (Jassid Oviposition preference)			
	JU	SU	NA	RA	JU	SU	NA	RA	JU	SU	NA	RA
AKH-1302	-	-	2.97	-	-	12.86	7.75	9.64	-	15.67	-	-
AKH-2013-3	-	-	2.57	-	-	15.43	7.60	8.86	-	9.67	-	-
DSC-1851	-	-	1.93	-	-	11.84	7.80	7.36	-	19.67	-	-
GISV-312	-	-	1.67	-	-	15.95	8.35	6.60	-	8.33	-	-
GISV-323	-	-	2.07	-	-	14.92	8.25	5.69	-	8.67	-	-
GJHV-328	-	-	1.50	-	-	12.35	8.50	6.00	-	9.67	-	-
GJHV-522	-	-	2.30	-	-	14.67	8.15	6.79	-	9.33	-	-
GJHV-548	-	-	1.73	-	-	10.81	8.10	6.83	-	10.00	-	-
GJHV-566	-	-	2.57	-	-	13.89	7.90	6.81	-	16.67	-	-
NDLH-2035-5	-	-	2.73	-	-	10.81	7.45	7.67	-	18.67	-	-
NDLH-2057-1	-	-	2.40	-	-	11.83	7.75	8.41	-	19.00	-	-
RAH-1076	-	-	1.63	-	-	13.38	8.75	6.64	-	9.33	-	-
RHC-1409	-	-	1.70	-	-	15.69	8.20	6.12	-	17.33	-	-
TSH-367	-	-	2.90	-	-	8.23	6.50	6.36	-	18.00	-	-
TVH-007	-	-	3.10	-	-	13.38	6.20	5.00	-	12.33	-	-
NDLH-1938	-	-	1.67	-	-	9.52	8.15	3.45	-	10.00	-	-
DCH-32	-	-	1.90	-	-	5.66	5.70	7.99	-	20.00	-	-
Suraj	-	-	2.90	-	-	-	7.55	-	-	-	-	-
Ajeet-155 BG-II	-	-	2.53	-	-	-	12.55	-	-	-	-	-

JU- Junagadh**, SU-** Surat**, NA-** Nanded, **RA-** Rahuri,* Presumend based on the successful emergence of neonate nymphs from the puncture on midrub and vein during 5th to 8th day of pair release.

Table: 47. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests at Central Zone during 2022-23.

Entry Name	Total number of neonate release for study (Jassid)				No. of live nymphs during development (Jassid)				No. of dead nymphs during development (Jassid)			
	JU	SU	NA	RA	JU	SU	NA	RA	JU	SU	NA	RA
AKH-1302	-	10.00	-	-	-	7.00	-	-	-	3.00	-	-
AKH-2013-3	-	10.00	-	-	-	6.00	-	-	-	4.00	-	-
DSC-1851	-	10.00	-	-	-	5.00	-	-	-	5.00	-	-
GISV-312	-	9.00	-	-	-	6.00	-	-	-	3.00	-	-
GISV-323	-	10.00	-	-	-	7.00	-	-	-	3.00	-	-
GJHV-328	-	10.00	-	-	-	6.00	-	-	-	4.00	-	-
GJHV-522	-	10.00	-	-	-	7.00	-	-	-	3.00	-	-
GJHV-548	-	10.00	-	-	-	5.00	-	-	-	5.00	-	-
GJHV-566	-	10.00	-	-	-	6.00	-	-	-	4.00	-	-
NDLH-2035-5	-	10.00	-	-	-	6.00	-	-	-	4.00	-	-
NDLH-2057-1	-	10.00	-	-	-	4.00	-	-	-	6.00	-	-
RAH-1076	-	10.00	-	-	-	6.00	-	-	-	4.00	-	-
RHC-1409	-	10.00	-	-	-	7.00	-	-	-	3.00	-	-
TSH-367	-	10.00	-	-	-	6.00	-	-	-	4.00	-	-
TVH-007	-	10.00	-	-	-	6.00	-	-	-	4.00	-	-
NDLH-1938	-	10.00	-	-	-	5.00	-	-	-	5.00	-	-
DCH-32	-	10.00	-	-	-	6.00	-	-	-	4.00	-	-
Suraj	-	-	-	-	-	-	-	-	-	-	-	-
Ajeet-155 BG-II	-	-	-	-	-	-	-	-	-	-	-	-

JU- Junagadh**, SU-** Surat**, NA-** Nanded, **RA-** Rahuri

Table: 48. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests at Central Zone during 2022-23.

Entry Name	Nymphal duration and mortality (Jassid)			Nymphal duration and mortality (Jassid)			Nymphal duration and mortality (Jassid)			Nymphal duration and mortality (Jassid)		
	Total nymphal duration#		Mortality** (%)	Total nymphal duration#		Mortality** (%)	Total nymphal duration# Range (Days)		Mortality** (%)	Total nymphal duration# Range (Days)		Mortality** (%)
	Range (Days)	Mean ±SD		Range (Days)	Mean ±SD		Range (Days)	Mean ±SD		Range (Days)	Mean ±SD	
	JU			SU			NA			RA		
AKH-1302	-	-	-	13.00 - 15.00	14.29 ± 0.76	30.00	-	-	-	-	-	-
AKH-2013-3	-	-	-	16.00 - 18.00	17.00 ± 0.89	40.00	-	-	-	-	-	-
DSC-1851	-	-	-	9.00 - 11.00	9.80 ± 0.84	50.00	-	-	-	-	-	-
GISV-312	-	-	-	18.00 - 20.00	19.33 ± 0.82	33.33	-	-	-	-	-	-
GISV-323	-	-	-	17.00 - 20.00	18.71 ± 1.11	30.00	-	-	-	-	-	-
GJHV-328	-	-	-	15.00 - 17.00	16.00 ± 0.89	40.00	-	-	-	-	-	-
GJHV-522	-	-	-	16.00 - 19.00	17.71 ± 1.11	30.00	-	-	-	-	-	-
GJHV-548	-	-	-	15.00 - 17.00	16.20 ± 0.84	50.00	-	-	-	-	-	-
GJHV-566	-	-	-	13.00 - 15.00	14.00 ± 0.89	40.00	-	-	-	-	-	-
NDLH-2035-5	-	-	-	12.00 - 14.00	13.00 ± 0.89	40.00	-	-	-	-	-	-
NDLH-2057-1	-	-	-	10.00 - 11.00	10.50 ± 0.58	60.00	-	-	-	-	-	-
RAH-1076	-	-	-	16.00 - 19.00	17.50 ± 1.05	40.00	-	-	-	-	-	-
RHC-1409	-	-	-	12.00 - 15.00	13.71 ± 1.11	30.00	-	-	-	-	-	-
TSH-367	-	-	-	12.00 - 15.00	13.17 ± 1.17	40.00	-	-	-	-	-	-
TVH-007	-	-	-	14.00 - 16.00	15.00 ± 0.89	40.00	-	-	-	-	-	-
NDLH-1938	-	-	-	14.00 - 16.00	14.80 ± 0.84	50.00	-	-	-	-	-	-
DCH-32	-	-	-	8.00 - 10.00	9.00 ± 0.89	40.00	-	-	-	-	-	-
Suraj	-	-	-	-	-	-	-	-	-	-	-	-
Ajeet-155 BG-II	-	-	-	-	-	-	-	-	-	-	-	-

JU- Junagadh**, SU-** Surat**, NA-** Nanded, **RA-** Rahuri,** Dead nymph on the surface of midrib/vein during growth and development, # Recoreded based on the emergence and removal of freshly formed adults on successive days from the same day emerged 10 neonate nymphs exposed separetly for studing total nymphal duration.

Table: 49. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests & Natural Enemies at South Zone during 2022-23

Entry Name	Aphid/ 3 leaves			Leaf hopper / 3 leaves			Whitefly / 3 leaves			Thrips/ 3 leaves			Natural enemies/plant		
	LG	DW	RC	LG	DW	RC	LG	DW	RC	LG	DW	RC	LG	DW	RC
RAH-1076	-	-	5.00	-	8.60	7.00	-	-	1.44	-	-	10.78	-	-	1.71
DCH-32	-	-	1.33	-	4.78	24.44	-	-	0.89	-	-	7.00	-	-	1.22
RHC-1409	-	-	4.89	-	4.20	15.00	-	-	0.89	-	-	18.89	-	-	1.45
NDLH-1938	-	-	9.78	-	4.20	15.33	-	-	1.11	-	-	18.56	-	-	1.56
AKH 2013- I	-	-	3.11	-	2.80	11.22	-	-	1.11	-	-	7.89	-	-	1.13

LG-lam Guntur**, DW-**Dharwad, **RC-**Raichur,

Table: 50. Ent 1 b. Advanced screening of promising entries for development of repository for Bollworms & Yield at South Zone during 2022-23

Entry Name	Rosette flower damage (%) by PBW (10 Flower/Plant)			Green boll damage (%) due to PBW/10 bolls through destructive sampling			Open Boll damage (%)			Locule damage (%)			Number of Good open bolls/Plant			Yield (q./ha)		
	LG	DW	RC	LG	DW	RC	LG	DW	RC	LG	DW	RC	LG	DW	RC	LG	DW	RC
RAH-1076	-	-	13.33	-	-	26.67	-	-	21.07	-	-	11.80	-	-	78.93	-	-	8.45
DCH-32	-	-	21.67	-	-	36.67	-	-	51.33	-	-	27.27	-	-	48.67	-	-	4.95
RHC-1409	-	-	18.33	-	-	36.67	-	-	16.76	-	-	12.55	-	-	83.24	-	-	10.36
NDLH-1938	-	-	5.00	-	-	10.00	-	-	20.15	-	-	8.22	-	-	79.85	-	-	9.33
AKH 2013- I	-	-	13.33	-	-	30.00	-	-	44.75	-	-	11.16	-	-	55.25	-	-	4.05

LG-Lam Guntur**, DW-**Dharwad, **RC-**Raichur

Table: 51. Ent 2: Seasonal dynamics of key pests of cotton (Sucking Pests & Natural Enemies) under unprotected condition in North Zone during 2022-23 in RCH 650 BG- II

Standard Meteorological Week	Sucking Pests															Natural Enemies/plant*				
	Jassid/ 3 leaves					Whitefly/ 3 leaves					Thrips/ 3 leaves									
	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
22	-	-	-	-	0.00	-	-	-	-	2.67	-	-	-	-	0.00	-	-	-	-	0.00
23	-	-	2.60	-	0.22	-	-	2.67	-	6.89	-	-	4.80	-	0.89	-	-	0.13	-	0.00
24	2.70	-	3.80	0.10	0.22	19.80	-	4.80	6.50	8.00	8.90	-	34.80	7.30	1.00	0.00	-	0.53	0.00	0.00
25	3.70	0.20	2.53	0.20	0.22	3.70	2.50	4.67	2.10	20.00	38.90	1.40	26.47	11.5	1.00	0.00	0.00	0.40	0.00	0.22
26	1.30	2.30	2.53	1.70	1.00	31.90	5.60	12.80	7.60	61.56	23.60	16.30	30.53	8.20	10.86	1.40	0.00	0.40	0.80	0.44
27	0.40	4.30	3.47	1.50	1.56	27.80	41.60	18.13	18.60	88.89	24.40	37.50	52.07	21.80	22.67	1.60	0.20	0.67	0.30	0.56
28	0.70	5.60	3.73	4.00	1.89	19.80	82.80	38.93	63.40	111.11	12.00	51.50	76.47	31.00	13.78	3.00	4.30	0.53	0.89	0.67
29	0.40	1.10	3.93	2.70	1.44	18.40	39.00	49.40	74.10	64.89	23.20	19.10	97.87	35.50	19.11	3.00	2.10	0.53	0.90	0.89
30	5.00	1.60	8.80	2.00	2.11	94.20	28.50	85.53	29.50	80.00	25.90	8.00	57.27	25.40	19.67	3.80	2.50	0.40	0.20	0.56
31	4.30	1.50	6.87	3.30	2.78	87.10	6.70	83.80	34.70	106.67	36.10	5.60	18.53	11.80	15.56	4.60	3.30	0.53	0.40	1.33
32	2.10	1.50	4.80	9.90	1.67	29.10	6.10	39.13	65.00	90.00	24.30	0.00	4.93	6.50	28.33	4.30	5.60	0.67	0.50	1.33
33	1.90	0.90	4.47	6.90	1.89	19.90	4.00	32.53	57.70	110.00	4.30	0.00	5.53	3.00	7.33	3.20	3.90	0.67	0.60	1.11
34	3.60	0.40	8.20	3.57	2.78	43.80	11.40	21.53	58.20	93.33	10.70	0.00	3.00	16.72	9.33	2.50	4.30	0.40	0.51	1.44
35	1.40	1.20	3.53	2.20	0.56	9.50	7.10	18.20	54.20	76.44	1.50	0.00	2.47	0.20	4.44	2.60	4.20	1.07	2.40	2.00
36	1.10	0.50	2.20	4.70	0.78	12.20	6.60	16.67	16.50	62.00	0.80	0.00	2.30	0.60	6.11	2.50	3.70	0.67	2.80	1.22
37	1.00	0.60	1.40	3.20	0.44	11.70	21.20	17.00	19.00	25.56	3.90	0.00	1.13	0.00	10.89	2.10	5.70	0.53	2.40	0.89
38	1.10	0.60	1.13	0.00	0.89	28.80	8.10	14.47	19.10	24.00	0.70	2.50	1.47	0.00	4.00	1.80	2.30	0.67	1.90	0.67
39	0.50	0.00	1.27	1.50	0.11	17.90	6.30	5.60	11.00	34.44	0.00	5.30	1.00	0.00	3.00	1.20	3.50	0.13	1.90	0.78
40	0.30	0.00	1.43	1.40	0.44	6.70	3.70	5.13	19.50	16.44	0.00	1.30	1.20	0.00	7.89	1.00	4.10	0.27	0.60	0.67
41	1.80	0.00	0.73	1.80	0.00	4.50	2.20	3.20	10.50	10.22	0.00	2.00	0.60	0.00	2.67	0.60	2.20	0.27	0.80	0.44
42	1.50	-	0.67	1.40	0.33	5.10	-	2.73	1.70	9.56	0.00	-	0.60	0.00	5.56	0.20	-	0.40	0.80	0.11
43	-	-	0.80	1.00	0.00	-	-	2.27	0.60	4.43	-	-	1.27	0.00	3.22	-	-	0.53	0.90	0.00
44	-	-	-	0.90	0.00	-	-	-	0.40	3.33	-	-	-	0.00	0.00	-	-	-	1.20	0.00
45	-	-	-	-	0.00	-	-	-	-	1.56	-	-	-	-	0.00	-	-	-	-	0.00
46	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar* Natural Enemies include coccinellids, chrysopids, syrphids and spider

Table: 52. Ent 2: Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in North Zone during 2022-23 in RCH 650 BG- II.

SMW	No. of Larvae /5plants																			
	H.armigera										*Eariasspp*									
	BT		FA		HI		SR		SG		BT		FA		HI		SR		SG	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
22	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00
23	-	-	-	-	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00
24	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.00	0.00	0.00
25	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	0.00	0.00	0.00
26	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	0.00	0.00	0.00
27	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	0.00	0.00	0.00
28	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
29	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
30	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
31	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
32	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
33	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
34	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
35	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
36	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
37	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
38	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
39	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
40	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.20	0.00	0.00
41	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
42	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.10	0.00	0.00
43	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.80	-	0.00	0.00	0.00
44	-	-	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.40	0.00	0.00
45	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00
46	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar

Table: 53. Ent 2: Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in North Zone during 2022-23 in RCH 650 BG- II.

SMW	No. of larvae/5 plant										Fruiting Body Damage (%) **				
	S.litura														
	BT		FA		HI		SR		SG		BT	FA	HI	SR	SG
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae					
22	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	0.00
23	-	-	-	-	0.00	0.00	-	-	0.00	0.00	-	-	-	-	0.00
24	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
25	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
26	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
27	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
28	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
29	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
30	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
31	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
32	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
33	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	15.33	0.00	-	-	0.00
34	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	16.67	0.00	-	-	0.00
35	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	26.00	0.00	-	-	0.00
36	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	18.67	0.00	-	-	0.00
37	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	18.67	0.00	-	-	0.00
38	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	17.33	0.00	-	0.00	0.00
39	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	17.33	0.00	-	0.84	0.00
40	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	14.66	0.00	-	0.00	0.00
41	2.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	14.66	0.00	-	1.48	0.00
42	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	11.33	-	-	2.76	0.00
43	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	6.41	0.00
44	-	-	-	-	-	-	-	0.00	0.00	0.00	-	-	-	28.77	0.00
45	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	0.00
46	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	0.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar, ** Fruiting Body damage includes damage in squares, flowers and boll

Table: 54 .Ent 2: Seasonal dynamics of key pests of cotton (Sucking Pests & Natural Enemies) under unprotected condition in North Zone during 2022-23 in HS-6.

Standard week	Sucking Pests															Natural Enemies/plant*				
	Jassid/ 3 leaves					Whitefly/ 3 leaves					Thrips/ 3 leaves									
	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
22	-	-	-	-	0.00	-	-	-	-	4.43	-	-		-	0.00	-	-	-	-	0.00
23	-	-	2.07	-	0.44	-	-	3.87	-	17.11	-	-	5.87	-	0.22	-	-	0.13	-	0.00
24	2.00	-	4.20	0.20	0.33	26.90	-	4.27	11.10	7.56	8.70	-	32.07	6.70	1.33	0.00	-	0.53	0.00	0.00
25	4.00	0.10	2.27	0.30	0.33	13.30	4.60	4.20	8.70	17.33	30.10	4.80	25.07	9.20	0.89	0.00	0.00	0.27	0.00	0.11
26	3.30	3.00	4.33	0.50	0.67	36.10	6.60	16.60	10.70	46.22	44.50	22.20	43.20	9.80	4.78	3.10	0.10	0.67	0.90	0.33
27	0.40	5.00	5.53	3.80	1.89	27.10	38.40	18.40	35.20	112.67	25.70	40.60	53.80	22.20	20.22	2.80	0.40	0.67	0.40	0.44
28	0.60	4.10	5.93	4.60	1.89	18.00	113.70	45.60	76.80	146.22	10.20	49.10	83.27	31.90	24.22	3.40	7.70	0.80	1.10	0.73
29	0.80	1.90	3.47	3.30	1.56	19.80	34.60	48.93	84.10	86.89	10.00	17.70	96.33	41.10	23.22	2.20	1.70	0.67	0.80	0.67
30	1.40	3.10	9.47	3.00	1.33	105.20	45.90	103.67	31.50	104.22	20.40	15.40	65.13	25.10	13.89	2.10	7.10	0.27	0.20	1.33
31	3.10	2.80	8.07	2.50	2.56	85.00	8.60	90.27	40.20	91.78	30.30	8.60	16.27	13.00	14.67	3.20	4.40	0.67	0.30	1.44
32	2.40	0.30	3.93	8.80	2.11	24.40	2.60	30.00	56.30	74.22	24.70	0.50	6.13	6.50	28.11	3.80	3.80	0.40	0.50	1.78
33	2.90	1.10	2.93	8.90	1.67	15.70	5.90	28.73	53.20	60.22	6.40	0.00	3.40	1.60	8.56	2.00	2.40	0.67	0.70	1.33
34	4.70	1.00	5.87	5.20	2.67	69.60	13.10	11.13	65.00	51.78	8.70	0.00	1.73	0.60	6.22	1.00	4.20	0.40	2.00	2.11
35	1.30	1.00	2.47	1.40	1.78	10.60	5.40	10.13	30.10	25.33	1.80	0.00	0.93	1.10	7.56	1.40	4.80	1.07	2.80	2.44
36	1.20	0.10	2.38	2.90	1.21	10.10	11.50	15.80	30.20	41.11	2.80	0.00	2.22	0.90	5.22	1.20	3.10	0.27	1.60	1.11
37	0.80	0.20	1.27	2.20	0.56	18.40	20.20	12.33	21.20	23.33	1.00	0.00	0.87	0.00	10.44	1.00	4.10	0.53	2.20	0.78
38	1.10	0.20	1.13	0.00	0.33	23.70	7.70	13.13	31.30	36.89	0.90	0.00	1.40	0.00	3.78	1.00	3.00	0.40	1.80	0.78
39	0.60	0.10	0.93	1.50	0.44	10.20	3.70	4.53	14.50	32.89	0.00	3.50	0.67	0.00	3.00	0.50	5.30	0.13	1.90	0.67
40	0.70	0.20	1.00	0.80	0.33	10.10	3.20	3.27	25.00	10.89	0.00	0.00	0.53	0.00	1.89	0.40	4.70	0.13	0.70	0.67
41	1.00	0.30	0.67	1.40	0.11	4.40	1.90	2.33	8.80	6.89	0.00	0.00	0.33	0.00	4.44	0.20	2.50	0.27	0.90	0.33
42	1.50	-	1.00	0.90	0.11	5.30	-	3.27	3.90	7.56	0.00	-	0.53	0.00	3.67	0.20	-	0.13	0.70	0.33
43	-	-	0.60	0.90	0.00	-	--	2.00	0.90	5.26	-	-	0.73	0.00	1.89	-	-	0.40	1.10	0.00
44	-	-	-	0.60	0.00	-	-	-	0.70	2.76	-	-	-	0.00	0.00	-	-	-	1.20	0.00
45	-	-	-	-	0.00	-	-	-	-	0.67	-	-	-	-	0.00	-	-	-	-	0.00
46	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar, * Natural Enemies include coccinellids, chrysopids, syrphids and spider.

Table: 55. Ent 2: Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in North Zone during 2022-23 in HS-6.

SMW	No. of Larvae /5plants																			
	H.armigera										*Earias* spp.									
	BT		FA		HI		SR		SG		BT		FA		HI		SR		SG	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
22	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00
23	-	-	-	-	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00
24	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.00	0.00	0.00
25	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	0.00	0.00	0.00
26	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	0.00	0.00	0.00
27	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	0.00	0.00	0.00
28	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
29	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
30	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
31	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
32	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	1.00
33	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
34	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	1.33
35	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	0.00	0.00	2.67
36	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.20	-	0.00	0.00	1.67
37	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	1.70	-	1.00	-	0.00	0.00	2.67
38	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	2.00	-	0.80	-	0.00	0.00	3.33
39	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	1.80	-	0.20	-	0.10	0.00	5.33
40	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	2.10	-	1.00	-	0.50	0.00	4.67
41	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	1.70	-	0.60	-	0.40	0.00	3.67
42	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.80	-	0.60	0.00	2.33
43	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	1.60	-	0.40	0.00	1.67
44	-	-	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.80	0.00	0.00
45	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00
46	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar

Table: 56. Ent 2: Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in North Zone during 2022-23 in HS-6.

SMW	No. of larvae/5 plant										Fruiting Body Damage (%) **				
	S.litura														
	BT		FA		HI		SR		SG		BT	FA	HI	SR	SG
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae					
22	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	0.00
23	-	-	-	-	0.00	0.00	-	-	0.00	0.00	-	-	-	-	0.00
24	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
25	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
26	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	--	0.00	-	-	0.00
27	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
28	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
29	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
30	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
31	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	0.00
32	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	2.00
33	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	3.33
34	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	24.67	0.00	-	-	5.33
35	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	24.67	2.80	-	-	12.00
36	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	16.00	3.40	-	-	14.00
37	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	19.33	3.10	-	-	19.33
38	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	20.67	2.10	-	0.77	14.00
39	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	12.00	2.10	-	0.90	21.33
40	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	22.67	1.60	-	3.36	15.33
41	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	16.00	1.30	-	6.57	10.00
42	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	16.00	-	-	13.58	4.00
43	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	17.78	2.00
44	-	-	-	-	-	-	-	0.00	0.00	0.00	-	-	-	40.82	0.00
45	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	0.00
46	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	0.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar ** Fruiting Body damage includes damage in squares, flowers and boll

Table: 57 .Ent 2: Seasonal dynamics of key pests of cotton (Sucking Pests & Natural Enemies) under unprotected condition in North Zone during 2022-23 in GA.

SMW	Sucking Pests															Natural Enemies/plant*				
	Jassid/ 3 leaves					Whitefly/ 3 leaves					Thrips/ 3 leaves									
	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
22	-	-	-	-	0.00	-	-	-	-	3.27	-	-	-	-	0.00	-	-	-	-	0.00
23	-	-	4.00	-	0.22	-	-	2.73	-	13.11	-	-	7.47	-	0.22	-	-	0.13	-	0.00
24	2.10	-	3.33	0.10	0.33	21.90	-	6.67	10.30	11.56	8.10	-	39.07	7.70	1.11	0.00	-	0.53	0.00	0.00
25	1.30	0.20	2.07	0.10	0.44	14.40	4.10	4.87	8.60	17.56	36.50	5.70	23.07	10.20	1.89	0.00	0.00	0.27	0.50	0.33
26	2.80	3.90	2.40	0.60	0.33	32.00	7.80	15.40	10.00	40.44	39.60	23.00	34.27	6.90	7.67	1.40	0.00	0.67	0.40	0.44
27	0.30	4.20	4.13	1.56	1.89	27.10	46.90	18.33	33.11	107.56	22.70	36.10	49.87	18.11	12.33	2.60	1.50	0.53	0.56	0.44
28	0.80	7.90	4.53	4.10	2.56	18.60	108.10	46.27	77.40	110.89	10.30	43.80	84.47	34.20	14.33	2.80	8.00	0.67	1.20	0.56
29	1.10	4.90	4.13	3.10	3.33	14.80	32.90	51.40	84.30	83.11	11.10	18.80	86.67	40.20	14.44	2.90	3.30	0.67	0.80	1.11
30	2.70	6.50	9.60	2.10	4.27	86.60	11.80	95.00	33.20	65.78	19.80	7.90	71.40	25.20	18.89	1.60	5.50	0.67	0.20	1.22
31	4.00	3.60	5.47	2.30	6.21	72.50	6.80	77.07	37.30	89.11	32.20	3.40	15.13	13.10	16.11	1.80	4.20	0.27	0.20	1.33
32	2.30	1.80	5.33	8.80	4.67	5.90	3.40	48.07	62.90	72.22	24.10	0.00	6.07	7.10	28.11	2.50	3.30	0.53	0.50	2.22
33	4.60	2.60	3.07	6.00	3.33	23.10	6.70	27.47	27.50	68.00	13.60	0.00	3.60	2.30	9.33	2.70	3.70	0.80	0.80	1.22
34	3.20	1.50	9.13	3.40	6.78	122.10	8.20	19.60	55.30	58.89	7.60	0.00	3.80	0.50	6.22	2.60	2.40	0.40	2.00	1.78
35	1.50	1.20	2.67	1.70	3.56	11.80	4.80	14.47	32.30	41.11	2.50	0.00	1.20	0.70	1.11	2.20	4.70	0.80	3.20	2.56
36	0.80	0.10	1.82	5.20	2.56	11.70	17.40	23.27	24.90	42.00	1.10	0.00	2.50	1.10	5.78	2.90	3.20	0.40	3.50	1.22
37	0.90	1.20	1.53	1.70	2.11	15.90	21.10	16.07	18.40	21.78	1.80	0.00	0.80	0.00	5.44	2.20	4.40	0.53	1.90	1.11
38	0.80	0.80	1.27	0.00	0.78	26.00	9.60	10.60	18.50	32.44	0.00	0.00	1.20	0.00	2.11	2.00	2.70	0.40	1.10	1.00
39	0.30	0.50	1.33	1.10	0.56	10.20	3.90	5.13	15.20	27.78	0.00	0.00	0.73	0.00	5.00	1.90	3.70	0.27	1.10	0.78
40	0.50	0.80	1.13	1.10	0.56	10.30	2.70	3.73	15.30	7.78	0.00	0.00	0.47	0.00	9.33	1.20	3.00	0.27	0.90	0.78
41	0.90	1.00	0.73	1.40	0.33	4.20	1.30	3.00	9.70	4.22	0.00	0.00	0.53	0.00	5.33	1.00	2.30	0.67	1.60	0.33
42	1.00	-	0.87	0.80	0.33	4.40	-	3.27	1.10	5.56	0.00	-	0.33	0.00	5.44	1.00	-	0.40	0.80	0.22
43	-	-	0.93	0.90	0.00	-	-	2.13	0.90	3.96	-	-	1.53	0.00	2.11	-	-	0.53	0.90	0.00
44	-	-	-	1.00	0.00	-	-	-	0.40	3.27	-	-	-	0.00	0.00	0.60	-	-	1.20	0.00
45	-	-	-	-	0.00	-	-	-	-	1.63	-	-	-	-	0.00	-	-	-	-	0.00
46	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar, * Natural Enemies include coccinellids, chrysopids, syrphids and spider.

Table: 58. Ent 2: Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in North Zone during 2022-23 in GA.

SMW	No. of Larvae /5plants																			
	H.armigera										*Earias spp.*									
	BT		FA		HI		SR		SG		BT		FA		HI		SR		SG	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
22	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00
23	-	-	-	-	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00
24	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.00	0.00	0.00
25	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.00	0.00	0.00
26	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.00	0.00	0.00
27	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.00	0.00	0.00
28	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	0.00
29	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	0.00
30	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	0.00
31	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	0.00
32	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	1.33
33	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	2.33
34	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	1.67
35	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	1.33
36	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.40	-	0.00	0.00	2.67
37	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	1.60	-	0.00	0.00	2.67
38	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	1.20	-	0.00	0.00	4.67
39	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.40	-	0.20	0.00	6.33
40	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	1.20	-	0.40	0.00	3.67
41	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.60	-	0.60	0.00	3.33
42	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	1.00	-	0.80	0.00	1.67
43	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	2.20	-	0.30	0.00	0.67
44	-	-	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.60	0.00	0.00
45	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00
46	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar

Table: 59. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in North Zone during 2022-23 in GA.

SMW	No. of larvae/5 plant										Fruiting Body Damage (%)**				
	S.litura														
	BT		FA		HI		SR		SG		BT	FA	HI	SR	SG
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae					
22	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	0.00
23	-	-	-	-	0.00	0.00	-	-	0.00	0.00	-	-	-	-	0.00
24	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
25	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
26	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
27	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
28	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
29	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
30	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
31	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.67
32	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	1.33
33	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	2.67
34	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	22.67	-	-	-	4.00
35	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	16.00	-	-	-	10.67
36	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	14.67	-	-	-	12.00
37	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	20.67	-	-	-	16.67
38	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	18.00	-	-	4.24	15.33
39	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	11.33	-	-	1.50	20.67
40	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	18.00	-	-	1.62	13.33
41	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	15.33	-	-	4.29	8.67
42	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	16.67	-	-	11.65	3.33
43	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	19.05	1.33
44	-	-	-	-	-	-	-	0.00	0.00	0.00	-	-	-	44.44	0.00
45	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	0.00
46	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	0.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar ** Fruiting Body damage includes damage in squares, flowers and boll

Table: 60. Ent 2: Seasonal dynamics of key pests of cotton (Sucking Pests & Natural Enemies) under unprotected condition in North Zone during 2022-23 in RS 2013.

SMW	Sucking Pests															Natural Enemies/plant*				
	Jassid/ 3 leaves					Whitefly/ 3 leaves					Thrips/ 3 leaves									
	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
22	-	-	-	-	0.00	-	-	-	-	2.83	-	-	-	-	0.00	-	-	-	-	0.00
23	-	-	2.27	-	0.11	-	-	2.47	-	11.33	-	-	3.73	-	0.22	-	-	0.13	-	0.00
24	2.90	-	2.93	0.00	0.22	21.50	-	4.67	7.90	7.56	10.70	-	36.13	8.10	1.11	0.00	-	0.53	0.00	0.00
25	1.90	0.40	1.20	0.00	0.33	16.70	4.80	3.33	3.20	13.56	34.50	5.00	20.00	8.10	1.67	0.00	0.00	0.40	0.50	0.22
26	1.90	4.80	3.47	0.40	0.11	55.90	6.10	14.73	8.80	40.00	24.10	24.70	27.80	9.80	4.78	1.80	0.50	0.40	0.60	0.78
27	0.40	4.30	3.33	0.90	1.00	27.80	40.20	16.60	21.50	93.78	24.40	42.00	48.67	22.00	9.78	2.60	1.40	0.53	0.40	0.56
28	1.00	5.10	4.87	5.10	1.44	21.80	104.20	44.07	64.60	116.00	12.90	41.10	82.53	37.40	15.67	2.40	5.00	0.67	0.70	0.78
29	1.50	2.80	3.47	3.30	1.44	12.80	38.50	53.87	75.80	80.89	17.90	18.30	93.00	46.30	16.11	2.00	2.00	0.53	0.70	0.78
30	2.00	3.70	8.53	1.40	2.11	89.30	46.00	75.87	28.60	70.22	22.90	11.10	71.47	24.30	15.89	3.60	8.60	0.40	0.10	1.26
31	4.10	2.20	4.60	2.60	2.22	83.70	8.80	74.33	35.70	94.89	40.80	7.60	11.87	11.80	17.22	3.90	5.30	0.27	0.40	1.78
32	2.30	1.70	2.60	9.30	2.00	25.60	3.00	34.40	51.50	101.56	24.90	0.00	4.60	8.80	15.56	3.10	4.40	0.53	0.50	1.67
33	3.40	0.80	1.87	7.30	1.67	22.80	6.10	18.47	28.00	80.00	6.40	0.00	2.07	2.80	10.56	2.70	4.30	0.67	0.70	1.00
34	3.40	0.90	8.47	3.00	2.56	101.30	13.20	19.00	36.70	73.78	9.50	0.00	3.27	0.30	5.00	2.50	2.30	0.67	2.10	1.11
35	1.50	1.60	2.93	1.50	1.67	13.20	6.90	13.33	30.70	41.11	2.90	0.00	1.87	0.40	4.33	2.80	4.60	0.93	2.30	1.89
36	1.60	0.00	1.63	3.50	1.11	10.60	10.90	18.53	17.30	31.78	1.00	0.00	2.25	0.90	2.44	1.60	5.20	0.13	4.80	1.44
37	1.60	0.80	1.27	3.00	1.00	14.50	14.30	16.80	17.70	20.89	4.10	0.00	1.07	0.00	1.89	1.70	4.90	0.40	2.10	1.11
38	0.80	0.00	1.07	0.00	0.33	28.50	9.90	8.27	18.60	28.00	0.30	0.70	1.47	0.00	3.00	1.20	3.90	0.27	1.70	0.78
39	0.60	0.00	0.87	1.00	0.11	11.90	3.40	5.20	12.70	36.67	0.00	1.70	0.53	0.00	2.89	1.40	3.90	0.13	0.70	0.56
40	0.40	0.20	1.00	1.20	0.11	8.70	2.20	3.13	18.00	8.00	0.00	0.80	0.47	0.00	5.44	1.00	2.30	0.13	1.10	0.56
41	0.80	0.00	0.60	1.80	0.11	5.20	2.80	2.67	7.60	4.67	0.00	0.00	0.27	0.00	6.78	0.40	2.40	0.40	1.30	0.44
42	1.10	-	0.73	0.70	0.11	5.00	--	4.73	0.70	7.11	0.00	-	0.60	0.00	8.44	0.20	-	0.40	0.80	0.11
43	-	-	1.00	0.80	0.00	-	-	1.87	0.60	4.03	-	-	1.60	0.00	7.22	-	-	0.27	1.20	0.00
44	-	-	-	0.60	0.00	-	-	-	0.30	2.23	-	-	-	0.00	0.00	-	-	-	1.00	0.00
45	-	-	-	-	0.00	-	-	-	-	1.07	-	-	-	-	0.00	-	-	-	-	0.00
46	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar * Natural Enemies include coccinellids, chrysopids, syrphids and spider.

Table: 61. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in North Zone during 2022-23 in RS-2013.

SMW	No. of Larvae /5plants																			
	H.armigera										*Earias spp.*									
	BT		FA		HI		SR		SG		BT		FA		HI		SR		SG	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
22	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00
23	-	-	-	-	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00
24	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.00	0.00	0.00
25	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.00	0.00	0.00
26	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.00	0.00	0.00
27	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.00	0.00	0.00
28	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	0.00
29	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	0.00
30	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	0.00
31	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	0.67
32	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	1.33
33	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	1.67
34	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	2.33
35	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.00	-	0.00	0.00	2.33
36	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.40	-	0.00	0.00	2.67
37	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	1.80	-	0.00	0.00	3.33
38	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	1.20	-	0.40	0.00	4.33
39	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.40	-	0.20	0.00	5.67
40	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	1.40	-	0.50	0.00	4.00
41	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	0.80	--	0.40	0.00	3.67
42	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	1.60	-	0.40	0.00	1.33
43	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	2.40	-	0.60	0.00	1.33
44	-	-	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	0.60	0.00	0.00
45	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00
46	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	0.00	0.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar

Table: 62. Ent 2: Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in North Zone during 2022-23 in RS-2013.

SMW	No. of larvae/5 plant										Fruiting Body Damage (%) **				
	S.litura														
	BT		FA		HI		SR		SG		BT	FA	HI	SR	SG
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae					
22	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	0.00
23	-	-	-	-	0.00	0.00	-	-	0.00	0.00	-	-	-	-	0.00
24	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
25	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
26	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
27	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
28	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
29	-	-	-	-	0.00	0.00	--	0.00	0.00	0.00	-	-	-	-	0.00
30	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
31	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	0.00
32	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	1.33
33	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	2.00
34	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	20.00	-	-	-	3.33
35	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	22.00	-	-	-	8.00
36	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	18.00	-	-	-	12.00
37	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	24.67	-	-	-	15.33
38	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	18.67	-	-	2.46	16.00
39	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	16.00	-	-	2.02	22.00
40	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	19.33	-	-	2.59	14.00
41	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	13.33	-	-	4.14	10.00
42	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	18.00	-	-	15.09	2.67
43	-	-	-	-	0.00	0.00	-	0.00	0.00	0.00	-	-	-	25.49	1.33
44	-	-	-	-	-	-	-	0.00	0.00	0.00	-	-	-	43.75	0.00
45	-	-	-	-	-	-	--	-	0.00	0.00	-	-	-	-	0.00
46	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	0.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar** Fruiting Body damage includes damage in squares, flowers and boll

Table: 63. Ent 2: Seasonal dynamics of key pests of cotton (Open Boll and Locule damage) under unprotected condition in North Zone during 2022-23. (RCH-650 BG-II, HS-6, GA & RS 2013)

At Harvest	Open Boll damage (%)					Open Locule damage (%)				
	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
RCH650	2.50	1.4	7.34	6.45	10.00	3.75	0.9	5.34	3.81	4.66
HS 6	3.75	3.8	14.08	13.79	20.00	2.5	2.3	4.30	5.97	10.99
RS 2013	2.43	2.2	16.81	15.24	16.00	3.65	1.6	6.94	6.64	8.11
GA	2.43	2.0	14.44	14.29	14.00	3.65	1.6	7.23	5.95	6.52

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar

Table 64. Ent 2: Seasonal dynamics of key pests of cotton in relation to climatic conditions in North Zone during 2022-23.

Variety/hybrid	Green Boll Damage (%) Due to PBW through 50 Green boll destructive sampling					PBW Larval recovery (%) through 50 Green boll destructive sampling				
	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
RCH 650 BG-II	-	0.5	5.00	11.25	8.00	-	0.0	2.50	0.50	4.50
HS-6	-	7.0	3.50	13.75	15.33	-	6.5	2.00	1.25	8.67
GA	-	4.0	2.50	5.00	11.33	-	5.5	2.00	0.25	6.67
RS 2013	-	4.5	3.00	16.25	12.00	-	6.5	2.00	1.50	6.67

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar

Table: 65.Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in North Zone during 2022-23 – Weekly Trap Catches

SMW	*Helicoverpaarmigera*					*Pectinophoragossypiella*					*Eariasinsulana*					*Spodoptera litura*				
	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
22	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00
23	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00
24	-	-	0.00	0.86	1.00	-	-	2.00	0.00	0.00	-	-	0.00	0.00	0.00	-	-	26.80	0.29	9.00
25	-	0.00	0.00	0.71	3.00	0.00	3.00	5.40	0.14	0.00	-	1.00	0.80	0.00	0.00	-	18.00	25.20	0.29	24.00
26	-	0.00	0.00	0.00	0.00	1.00	5.00	2.60	0.86	0.00	-	2.00	0.00	0.00	7.00	-	14.00	2.80	0.00	37.00
27	-	0.00	0.00	0.00	4.00	2.00	4.00	4.60	1.57	0.00	-	2.00	0.00	0.00	10.00	-	12.00	8.40	0.00	52.00
28	-	0.00	0.00	1.57	0.00	6.00	5.00	2.80	5.57	2.00	-	3.00	0.20	0.14	5.00	-	16.00	17.80	0.00	28.00
29	-	0.00	0.00	1.71	12.00	8.00	8.00	3.80	3.29	5.00	-	1.00	0.60	0.29	9.00	-	19.00	33.00	0.00	59.00
30	-	0.00	0.00	0.00	5.00	6.00	13.00	5.00	4.14	1.00	-	7.00	0.20	1.86	6.00	-	45.00	59.20	6.57	19.00
31	-	0.00	0.20	0.57	0.00	7.00	5.00	5.80	5.00	4.00	-	5.00	1.60	0.00	3.00	-	22.00	16.20	0.71	35.00
32	-	0.00	1.00	1.14	0.00	11.00	3.00	2.60	6.00	0.00	-	8.00	1.40	0.29	16.00	-	18.00	10.60	0.43	67.00
33	-	2.00	0.00	0.14	4.00	4.00	7.00	1.80	6.00	8.00	-	9.00	2.40	0.00	54.00	-	15.00	8.20	0.00	103.00
34	-	6.00	0.40	0.29	0.00	5.00	3.00	3.40	7.43	2.00	-	6.00	1.20	0.43	23.00	-	19.00	14.00	16.14	46.00
35	-	15.00	1.40	0.29	0.00	9.00	13.00	5.00	14.71	7.00	-	8.00	3.40	1.14	41.00	-	40.00	36.60	9.57	85.00
36	-	5.00	1.40	1.14	1.00	3.00	8.00	9.60	39.86	4.00	-	4.00	2.20	0.00	18.00	-	24.00	21.40	3.43	64.00
37	-	9.00	0.80	0.00	0.00	4.00	3.00	7.40	45.00	12.00	-	6.00	2.00	0.57	26.00	-	20.00	24.60	0.71	98.00
38	-	4.00	0.80	0.71	0.00	2.00	7.00	4.80	41.29	9.00	-	5.00	1.00	1.57	34.00	-	18.00	8.60	4.43	224.00
39	-	3.00	0.80	0.00	3.00	2.00	22.00	8.00	107.57	23.00	-	3.00	1.00	1.00	22.00	-	16.00	8.80	2.29	127.00
40	-	8.00	0.60	1.00	0.00	3.00	11.00	9.00	138.86	17.00	-	9.00	1.00	8.57	41.00	-	22.00	18.80	3.14	86.00
41	-	9.00	0.20	4.00	0.00	0.00	14.00	35.60	176.00	29.00	-	11.00	1.00	0.00	59.00	-	28.00	11.20	0.00	53.00
42	-	-	0.60	0.00	0.00	0.00	-	323.60	184.14	42.00	-	-	45.40	1.57	83.00	-	-	54.40	0.00	146.00
43	-	-	1.80	0.57	2.00	-	-	1307.60	165.71	38.00	-	-	23.60	0.29	97.00	-	-	43.40	0.00	62.00
44	-	-	-	0.28	0.00	-	-	-	227.43	57.00	-	-	-	0.14	54.00	-	-	-	0.00	84.00
45	-	-	-	-	0.00	-	-	-	-	142.00	-	-	-	-	46.00	-	-	-	-	187.00
46	-	-	-	-	0.00	-	-	-	-	164.00	-	-	-	-	86.00	-	-	-	-	204.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar

Table: 66. Ent 2: Seasonal dynamics of key pests of cotton (Abiotic factors) under unprotected condition in North Zone during 2022-23.

SMW	Temperature(^{O}C)										Relative Humidity (%)									
	BT		FA		HI		SR		SG		BT		FA		HI		SR		SG	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
22	-	-	-	-	-	-	-	-	43.16	24.11	-	-	-	-	-	-	-	-	68.29	44.43
23	-	-	-	-	-	-	-	-	44.76	25.44	-	-	-	-	-	-	-	-	50.71	44.71
24	24.60	40.10	-	-	27.90	43.20	28.30	44.29	44.84	28.29	52.70	32.40	-	-	55.00	41.00	54.57	36.86	46.71	29.43
25	21.30	35.10	22.90	31.40	22.90	33.10	24.50	33.41	36.07	22.30	69.90	46.00	81.40	57.40	84.00	50.00	84.43	56.14	58.00	50.00
26	25.70	39.10	27.80	37.50	28.60	39.80	27.00	40.11	41.04	24.53	64.60	37.10	73.00	46.70	68.00	43.00	57.29	43.00	55.14	50.29
27	25.60	36.50	29.10	35.70	28.50	36.50	28.14	37.57	37.57	25.56	68.40	47.00	80.30	59.60	82.00	56.00	71.86	55.29	76.86	61.43
28	24.70	34.70	27.60	34.30	27.00	35.60	26.43	35.23	37.99	26.76	74.90	53.40	83.70	70.70	84.00	66.00	77.14	71.00	71.57	61.43
29	25.20	34.10	26.10	33.40	26.60	35.20	26.29	33.29	35.84	25.57	73.00	55.10	85.10	66.30	90.00	73.00	83.00	77.29	73.00	69.71
30	25.10	33.40	26.80	33.70	27.00	33.00	26.29	32.93	33.77	26.03	77.60	56.40	85.60	66.70	90.00	77.00	90.29	76.71	63.57	59.14
31	24.00	32.80	25.70	32.50	26.40	32.30	26.21	32.01	33.70	25.40	77.00	62.30	89.40	75.60	95.00	83.00	89.00	80.71	83.71	72.71
32	25.40	36.20	27.30	34.40	27.60	33.70	26.71	35.50	35.01	27.70	71.90	50.70	83.60	66.40	86.00	65.00	86.71	67.57	70.29	69.86
33	24.10	33.70	26.80	34.10	26.10	33.50	25.79	33.86	33.43	27.03	72.60	56.90	81.90	61.40	88.00	64.00	86.57	68.43	79.57	64.14
34	24.90	35.20	26.90	35.00	26.10	34.30	26.40	34.89	34.37	27.09	72.30	52.60	81.00	56.10	90.00	64.00	89.14	62.29	82.71	62.57
35	24.40	36.70	26.60	35.50	25.60	35.50	25.79	36.11	37.03	26.87	68.30	47.10	80.40	54.60	86.00	53.00	85.71	58.29	79.29	51.57
36	23.50	36.00	25.50	35.10	25.30	36.70	25.97	35.86	38.20	27.19	69.30	48.70	80.60	54.00	84.00	48.00	86.14	55.00	69.43	46.29
37	23.60	35.30	25.40	34.70	27.90	35.30	25.71	35.04	35.31	27.47	71.70	53.60	81.60	59.10	85.00	59.00	84.00	62.00	75.86	58.86
38	23.00	33.00	25.20	33.80	24.70	34.60	24.57	33.34	36.09	26.56	75.60	56.10	84.40	58.90	89.00	65.00	87.57	68.00	73.57	51.00
39	20.30	32.70	22.90	30.80	24.00	30.30	23.04	32.54	33.71	24.44	81.70	51.30	89.70	64.40	93.00	69.00	83.14	66.14	79.71	58.86
40	19.90	34.10	21.70	33.80	23.40	33.50	22.04	34.57	36.21	25.14	73.70	44.90	83.60	47.30	84.00	52.00	79.14	48.57	80.57	47.29
41	17.10	31.00	19.60	30.30	20.50	27.00	19.51	29.36	32.77	23.37	78.10	49.70	87.10	51.30	94.00	72.00	86.86	64.14	85.14	55.29
42	15.30	33.40	-	-	18.20	32.90	17.66	33.93	33.69	20.06	76.10	34.60	-	-	84.00	41.00	75.29	37.43	86.43	58.86
43	13.00	32.70	-	-	15.50	31.50	16.00	31.93	32.47	18.99	72.10	30.30	-	-	90.00	49.00	91.43	38.29	92.14	67.43
44	14.10	32.40	-	-	-	-	15.85	32.78	32.83	18.36	78.70	34.10	-	-	-	-	84.14	38.57	93.00	60.43
45	-	-	-	-	-	-	-	-	31.73	17.54	-	-	-	-	-	-	-	-	84.00	55.29
46	-	-	-	-	-	-	-	-	29.06	15.77	-	-	-	-	-	-	-	-	88.57	62.00

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar, **AM**-Moring, **PM**-Evening

Table: 67. Ent 2: Seasonal dynamics of key pests of cotton (Abiotic factors) under unprotected condition in North Zone during 2022-23.

SMW	Rainfall in mm				
	BT	FA	HI	SR	SG
22	-	-	-	-	0.00
23	-	-	-	-	0.00
24	24.40	-	0.00	0.00	0.00
25	17.20	84.80	10.90	52.40	29.60
26	60.60	3.20	0.00	5.80	24.40
27	18.00	4.80	2.40	1.20	4.80
28	12.80	99.60	45.60	77.50	236.60
29	7.40	59.20	101.00	78.80	15.30
30	10.60	24.40	17.60	94.20	68.10
31	66.60	93.10	132.10	67.40	30.80
32	0.00	58.20	2.40	0.00	101.70
33	10.00	3.80	55.00	0.00	21.00
34	0.00	0.00	0.00	0.00	5.50
35	0.00	0.00	0.00	6.80	0.00
36	0.00	0.00	0.00	0.00	0.00
37	0.00	0.00	1.20	0.00	27.00
38	43.00	0.00	44.30	16.80	0.00
39	9.40	40.20	146.50	20.20	2.50
40	0.00	0.00	0.00	0.00	0.00
41	0.00	14.00	1.30	1.00	0.00
42	0.00	-	0.00	0.00	0.00
43	0.00	-	0.00	0.00	0.00
44	0.00	-	-	0.00	0.00
45	-	-	-	-	0.00
46	-	-	-	-	1.40

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar

Table:68 .Ent 2: Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition in Central Zone during 2022-23 in RCH 2 BG II / Ajeet -155 BGII*

SMW	Sucking Pests																	
	Aphids/ 3 leaves									Jassid/ 3 leaves								
	BA	JU	SU	BH	AK	NA*	RA	KH	BW	BA	JU	SU	BH	AK	NA*	RA	KH	BW
28	-	-	-		-	-	2.29	-	-	0.33	-	-	-	-	-	0.65	-	-
29	-	-	0.00	-	-	8.20	5.88	-	-	0.67	-	1.00	-	-	1.40	1.05	-	-
30	-	0.00	0.40	-	-	20.40	8.19	-	-	0.67	1.90	1.20	-	-	3.20	1.92	-	-
31	-	0.00	0.40	-	-	5.60	12.66	20.30	-	1.33	1.10	1.40	-	-	3.80	2.14	0.00	-
32	-	0.20	0.20	0.50	-	8.40	5.94	12.60	-	3.00	2.20	1.60	1.20	-	4.50	1.90	0.40	-
33	-	0.55	1.40	0.60	-	11.20	12.12	15.90	-	3.33	6.80	2.20	1.40	-	4.80	2.32	1.60	-
34	-	0.80	1.55	0.80	0.10	12.50	10.64	17.90	-	3.67	15.35	2.80	1.60	1.60	6.30	3.02	2.60	-
35	-	1.05	7.00	1.20	0.40	15.20	8.20	30.16	-	5.33	2.90	3.50	2.00	1.50	9.60	4.62	3.90	-
36	-	1.40	9.60	1.20	0.90	6.20	10.06	9.10	-	6.67	3.70	4.00	4.50	2.70	5.10	4.62	2.50	-
37	-	2.15	6.00	1.40	0.70	4.10	11.22	16.68	-	8.33	18.40	5.50	9.20	4.20	3.20	8.04	5.10	-
38	-	1.35	10.15	1.20	0.50	7.00	9.72	21.30	-	10.00	11.20	6.00	9.40	3.60	3.80	5.28	3.10	-
39	-	1.55	15.00	1.60	1.20	10.40	8.84	32.60	-	11.67	19.40	8.50	13.40	1.90	3.50	4.40	3.00	-
40	-	0.60	22.60	2.00	0.10	5.40	11.32	20.35	-	13.67	10.50	9.00	15.00	1.90	3.80	4.12	6.70	-
41	-	1.45	26.25	2.40	0.00	4.20	8.30	45.26	-	11.33	8.10	9.40	9.70	1.90	6.40	3.90	3.60	-
42	-	1.05	30.25	3.00	0.00	4.30	3.45	17.08	-	8.00	10.70	10.50	7.60	2.90	3.80	3.12	4.10	-
43	-	2.10	27.00	7.00	0.00	4.00	5.92	15.55	-	6.33	12.85	13.00	4.50	2.00	3.10	3.20	7.80	-
44	-	1.90	33.20	8.40	0.00	6.30	10.38	18.08	-	3.33	7.00	16.50	10.20	1.80	3.00	3.62	2.60	-
45	-	10.40	36.20	9.60	0.00	10.10	6.98	26.76	-	2.33	5.50	14.45	8.50	0.80	1.40	4.92	6.50	-
46	-	9.80	41.20	10.80	0.00	10.20	3.94	21.23	-	1.67	2.40	10.00	7.60	1.30	1.20	3.92	1.90	-
47	-	9.85	46.35	12.80	0.50	16.80	4.20	25.69	-	0.67	3.90	8.20	5.60	0.70	1.10	3.20	2.40	-
48	-	18.75	50.00	15.80	0.00	18.70	15.26	14.75	-	0.67	3.60	6.30	4.20	0.40	0.90	2.64	1.60	-
49	-	35.15	52.35	18.80	6.10	24.20	16.51	12.08	-	0.67	2.15	6.20	3.20	4.00	0.60	1.23	2.50	-
50	-	47.35	44.20	22.80	6.20	36.80	18.90	16.17	-	-	1.95	3.50	3.10	2.40	0.40	1.98	1.20	-
51	-	86.05	41.35	23.20	10.30	42.00	27.68	-	-	-	1.10	2.50	2.10	1.50	0.20	1.92	-	-
52	-	126.80	33.50	20.80	14.40	47.40	97.24	-	-	-	1.50	1.20	1.20	0.80	0.20	3.22	-	-
01	-	-	26.50	-	20.00	-	-	-	-	-	-	0.00	-	0.60	-	-	-	-
02	-	-	-	-	18.30	-	-	-	-	-	-	-	-	0.40	-	-	-	-
03	-	-	-	-	5.10	-	-	-	-	-	-	-	-	0.00	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna, * At Nanded Ajeet-155 BG II

Table: 69. Ent 2: Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition in Central Zone during 2022-23 in RCH 2 BG II/ Ajeet -155 BG II*

SMW	Sucking Pests																	
	Whitefly/ 3 leaves									Thrips/ 3 leaves								
	BA	JU	SU	BH	AK	NA*	RA	KH	BW	BA	JU	SU	BH	AK	NA*	RA	KH	BW
28	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	0.41	-	-
29	-		0.00	-	-	0.00	0.23	-	-	-	-	2.05	-	-	0.00	0.53	-	-
30	-	0.16	1.40	-	-	0.20	0.47	-	-	-	0.00	2.55	-	-	1.10	0.32	-	-
31	-	0.21	1.65	-	-	0.40	0.44	0.00	-	-	0.00	5.35	-	-	1.80	0.06	-	-
32	-	0.15	1.20	0.00	-	0.60	0.38	11.56	-	-	0.00	8.45	0.50	-	8.20	1.56	-	-
33	-	0.60	1.50	0.20	-	1.20	0.08	9.00	-	-	1.35	13.30	0.80	-	8.80	16.30	-	-
34	0.67	0.65	2.50	0.60	4.90	2.70	2.24	23.10	-	-	1.85	18.40	1.20	8.20	12.40	29.70	-	-
35	1.67	2.80	3.85	1.00	3.70	3.50	3.38	8.17	-	-	0.00	24.65	2.40	14.70	26.70	103.58	-	-
36	4.33	0.75	3.65	1.20	5.20	3.80	3.64	21.20	-	-	7.50	30.35	8.80	5.50	38.40	14.14	-	-
37	7.00	4.90	2.25	1.30	7.40	6.20	3.08	15.67	-	-	12.80	34.55	12.80	7.30	24.80	10.02	-	-
38	8.33	4.60	2.50	1.40	6.10	8.30	3.56	10.01	-	-	5.30	36.30	9.00	8.00	32.20	9.84	-	-
39	10.67	6.85	3.20	1.70	11.60	5.40	2.76	18.60	-	-	0.70	33.40	8.40	2.50	27.10	8.70	-	-
40	15.00	3.35	4.20	1.90	11.30	5.20	2.64	12.46	-	-	0.15	31.60	10.20	4.00	7.40	6.94	-	-
41	17.67	5.25	4.55	2.00	6.80	4.00	2.52	30.07	-	-	0.00	33.90	16.80	4.10	5.80	6.68	-	-
42	19.33	3.40	5.25	2.10	2.60	6.80	2.89	15.20	-	-	0.00	33.50	14.80	1.30	3.50	0.32	-	-
43	23.00	5.00	8.00	2.70	9.60	6.40	3.02	19.07	-	-	0.05	31.00	11.20	2.00	3.20	0.88	-	-
44	16.33	5.30	8.50	2.90	10.30	8.20	3.90	23.61	-	-	0.00	25.30	10.20	1.20	2.40	0.46	-	-
45	13.67	5.00	8.45	2.90	6.90	8.40	3.76	7.02	-	-	0.70	20.00	9.80	2.00	1.30	0.40	-	-
46	7.67	3.70	7.30	3.10	4.10	10.20	2.52	17.25	-	-	0.80	16.50	7.40	1.20	1.20	4.12	-	-
47	5.33	3.15	7.00	3.30	3.50	10.40	2.12	29.02	-	-	0.75	11.75	6.50	0.60	1.20	2.82	-	-
48	3.00	6.10	5.30	2.80	2.90	10.70	2.94	11.28	-	-	0.45	7.00	5.40	0.60	1.00	2.10	-	-
49	0.33	5.80	5.25	2.70	3.00	11.60	1.15	8.04	-	-	0.00	4.00	5.00	1.20	1.00	1.51	-	-
50	-	5.30	5.00	2.40	3.00	12.20	1.94	6.90	-	-	0.25	3.20	3.80	0.80	0.70	1.68	-	-
51	-	4.90	4.00	2.30	2.80	14.50	2.02	-	-	-	0.00	1.40	2.40	1.40	0.20	2.00	-	-
52	-	5.55	2.20	2.00	1.50	14.80	3.00	-	-	-	0.00	0.00	2.20	0.60	0.00	2.48	-	-
01	-	-	1.20	-	0.90	-	-	-	-	-	-	0.00	-	0.00	-	-	-	-
02	-	-	-	-	1.60	-	-	-	-	-	-	-	-	0.10	-	-	-	-
03	-	-	-	-	1.40	-	-	-	-	-	-	-	-	0.70	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna* At Nanded Ajeet-155 BG II

Table: 70. Ent 2: Seasonal dynamics of key pests of cotton (Natural Enemies &Bollworms) under unprotected condition in Central Zone during 2022-23 in RCH 2 BG II/ Ajeet -155 BG II*

SMW	Natural Enemies/plant**								No. of Larval Recovery/5plants															
									H.armigera															
	BA	JU	SU	BH	AK	NA*	RA	KH	BA		JU		SU		BH		AK		NA*		RA		KH	
									Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
28	-	-	-	-	-	-	0.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	0.15	-	-	0.00	1.06	-	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-
30	-	0.60	0.10	-	-	0.20	2.00	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-
31	-	0.50	0.20	-	-	0.20	2.52	0.00	-	-	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	-	-	0.00	0.00
32	-	0.40	0.20	0.00	-	0.70	1.76	0.00	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	0.00	0.00
33	-	0.70	0.20	0.00	-	1.00	3.44	1.20	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	0.00	0.00
34	0.20	0.70	0.40	0.20	0.00	1.70	3.84	0.40	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00
35	0.20	0.70	0.40	0.50	0.90	2.30	3.84	0.80	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00
36	0.30	0.65	0.60	0.60	0.90	2.40	4.76	1.20	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.20	0.00
37	0.30	0.70	1.00	0.80	0.80	2.50	4.72	0.60	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00
38	0.20	0.65	1.60	1.20	2.00	2.60	4.48	0.30	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	-	-	0.20	0.00
39	0.30	0.65	2.00	1.40	1.50	2.70	4.72	0.20	-	-	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.10	-	-	0.30	0.20
40	0.30	1.05	2.40	1.60	1.90	2.50	5.00	1.20	-	-	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	-	-	0.00	0.00
41	0.40	0.35	2.60	2.00	2.50	2.80	4.96	1.60	-	-	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00
42	0.50	0.50	3.00	2.00	1.80	2.50	0.82	1.40	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.20	0.20
43	0.40	0.85	3.15	2.20	0.00	2.00	1.16	0.90	-	-	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.40	0.00
44	0.30	0.35	3.20	1.80	0.80	2.30	0.80	0.80	-	-	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00
45	0.30	0.45	3.25	2.40	0.50	2.70	1.60	1.10	-	-	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.40
46	0.20	0.70	2.65	2.60	0.90	3.00	2.08	1.60	-	-	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.20	0.00
47	0.20	0.05	2.95	2.70	0.30	3.10	1.32	1.30	-	-	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.60	0.20
48	0.30	1.30	3.40	3.00	0.40	3.30	1.48	1.80	-	-	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.20	0.00
49	0.40	0.20	3.60	3.20	0.20	3.50	1.74	0.00	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	1.00	0.40
50	-	0.65	3.20	2.80	1.50	3.40	2.32	0.00	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00
51	-	0.35	2.40	2.40	3.10	3.60	3.08	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-
52	-	1.50	1.80	2.20	3.00	3.90	6.40	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-
1	-	-	1.40	-	0.30	-	-	-	-	-	-	-	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
2	-	-	-	-	0.20	-	-	-	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-
3	-	-	-	-	0.40	-	-	-	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-

BA- Banswara**, JU**- Junagadh**, SU**- Surat**, BH**- Bharuch**, AK**- Akola**, NA**- Nanded**, RA**- Rahuri, **KH**- Khandwa, **BW**- Bhawanipatna, * At Nanded Ajeet-155 BG II

**Natural Enemies include coccinellids, chrysopids, syrphids and spider.

Table: 71. Ent 2: Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in RCH 2 BG II/ Ajeet -155 BG II*

SMW	No. of Larvae/5plants																	
	Earias spp.																	
	BA		JU		SU		BH		AK		NA*		RA		KH		BW	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-	-	-
30	-	-	-	0.00	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-	-	-
31	-	-	-	0.00	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	0.00	-	-
32	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	0.00	-	-
33	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	0.00	-	-
34	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
35	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
36	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
37	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
38	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.20	-	-
39	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
40	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
41	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
42	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
43	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.20	-	-
44	-	-	-	0.25	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.20	-	-
45	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.20	0.00	0.00	-	-	-	0.00	-	-
46	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
47	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.10	0.00	0.00	-	-	-	0.00	-	-
48	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.60	-	-
49	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
50	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
51	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	-	-
52	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	-	-
01	-	-	-	-	0.00	0.00	-	-	-	0.00	-	-	-	-	-	-	-	-
02	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-
03	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

Table: 72. Ent 2: Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in RCH 2 BG II/ Ajeet -155 BG II*

SMW	No. of Larvae/5plants																	
	S. litura																	
	BA		JU		SU		BH		AK		NA*		RA		KH		BW	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-	-	-
30	-	-	-	0.00	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-	-	-
31	-	-	-	0.00	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-	-	-
32	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
33	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
34	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
35	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
36	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
37	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
38	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
39	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
40	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.20	0.10	-	-	-	-	-	-
41	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.20	-	-	-	-	-	-
42	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
43	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
44	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
45	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
46	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
47	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
48	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
49	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
50	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
51	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
52	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
01	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna, * At Nanded Ajeet-155 BG II

Table: 73. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in RCH 2 BG II/ Ajeet -155 BG II*.

SMW	Fruiting Body Damage (%) **									GBD (%) by ABW/ TC/SBW								
	BA	JU	SU	BH	AK	NA*	RA	KH	BW	BA	JU	SU	BH	AK	NA*	RA	KH	BW
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	0.00	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-
30	-	-	0.00	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-
31	-	--	0.00	-	-	-	-	0.00	-	-	-	0.00	-	-	-	-	-	-
32	-	-	0.00	0.00	-	-	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
33	-	-	0.00	0.00	-	-	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
34	-	-	0.00	0.00	0.00	0.00	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
35	-	-	0.00	0.00	0.00	0.00	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
36	-	-	0.00	0.00	0.00	0.00	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
37	-	-	0.00	2.94	0.00	0.00	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
38	-	-	0.00	3.61	0.00	0.53	0.00	0.00	-	-	-	0.00	0.00	-	-	-	-	-
39	-	-	2.65	3.45	1.61	0.75	0.00	0.00	-	-	-	0.00	0.00	-	-	-	-	-
40	-	-	3.00	3.66	2.13	0.00	0.00	40.00	-	-	-	0.00	0.00	-	-	-	-	-
41	-	-	4.60	4.12	0.00	0.00	0.00	45.00	-	-	-	0.00	0.00	-	-	-	-	-
42	-	-	6.00	4.49	0.00	0.00	0.00	50.00	-	-	-	0.00	0.00	-	-	-	-	-
43	-	-	6.25	4.60	0.00	0.00	2.23	55.00	-	-	-	0.00	0.00	-	-	-	-	-
44	-	-	5.45	4.55	0.00	0.00	3.45	55.00	-	-	-	0.00	0.00	-	-	-	-	-
45	-	-	7.69	3.85	1.23	0.00	5.12	60.00	-	-	-	0.00	0.00	-	-	-	-	-
46	-	-	8.25	2.47	1.49	0.00	18.58	60.00	-	-	-	0.00	0.00	-	-	-	-	-
47	-	-	7.60	0.00	0.76	0.00	30.74	65.00	-	-	-	0.00	0.00	-	-	-	-	-
48	-	-	6.20	0.00	0.00	0.00	25.32	70.00	-	-	-	0.00	0.00	-	-	-	-	-
49	-	-	3.00	0.00	0.00	0.00	32.69	75.00	-	-	-	0.00	0.00	-	-	-	-	-
50	-	-	1.00	0.00	0.00	0.00	35.26	80.00	-	-	-	0.00	0.00	-	-	-	-	-
51	-	-	1.15	0.00	0.00	0.00	41.84	-	-	-	-	0.00	0.00	-	-	-	-	-
52	-	-	0.00	0.00	0.00	0.00	48.91	-	-	-	-	0.00	0.00	-	-	-	-	-
01	-	-	0.00	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-
02	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
03	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna, * At Nanded Ajeet-155 BG II

** Fruiting Body damage includes damage in squares, flowers and boll

Table: 74. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in RCH 2 BG II/ Ajeet -155 BG II*.

SMW	Pink bollworm/20 green bolls																	
	GBD (%)									Number of Larvae								
	BA	JU	SU	BH	AK**	NA*	RA	KH	BW	BA	JU	SU	BH	AK**	NA	RA	KH	BW
28	-	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-
32	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-
33	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-
34	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	0.00	-	-	0.00	-
35	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	0.00	-	-	0.00	-
36	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	0.00	-	-	0.00	-
37	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	0.00	-	-	0.00	-
38	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	0.00	-	0.00	0.00	-
39	-	-	-	-	0.00	0.00	-	-	-	-	0.00	-	-	0.00	-	0.00	0.20	-
40	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	0.00	-	0.00	0.00	-
41	-	-	-	-	0.00	0.00	-	-	-	-	0.00	-	-	0.00	-	0.00	0.20	-
42	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	0.00	-	0.00	0.20	-
43	-	-	-	-	0.00	0.00	-	-	-	-	1.00	-	-	0.00	-	3.00	0.40	-
44	-	-	-	-	5.00	-	-	-	-	-	1.00	-	-	1.00	-	5.00	0.30	-
45	-	-	-	-	0.00	8.00	-	-	-	-	1.00	-	-	0.00	-	8.00	0.40	-
46	-	-	-	-	10.00	-	-	-	-	-	2.00	-	-	2.00	-	9.00	0.60	-
47	-	-	-	-	20.00	10.00	-	-	-	-	2.00	-	-	4.00	-	13.00	0.20	-
48	-	-	-	-	10.00	-	-	-	-	-	4.00	-	-	3.00	-	12.00	0.20	-
49	-	-	-	-	15.00	22.00	-	-	-	-	3.00	-	-	4.00	-	14.00	0.60	-
50	-	-	-	-	15.00	-	-	-	-	-	3.00	-	-	6.00	-	18.00	0.80	-
51	-	-	-	-	20.00	34.00	-	-	-	-	5.00	-	-	5.00	-	20.00	-	-
52	-	-	-	-	30.00	-	-	-	-	-	3.00	-	-	10.00	-	32.00	-	-
01	-	-	-	-	40.00	-	-	-	-	-	-	-	-	12.00	-	-	-	-
02	-	-	-	-	40.00	-	-	-	-	-	-	-	-	11.00	-	-	-	-
03	-	-	-	-	25.00	-	-	-	-	-	-	-	-	8.00	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna, * At Nanded Ajeet-155 BG II, ** Sampling per 20 green bolls

Table: 75. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in RCH 2 BG II/ Ajeet -155 BG II*.

SMW	PBW Rosette flowers (%)								
	BA	JU	SU	BH	AK	NA*	RA	KH	BW
28	-	-	-	-	-	-	-	-	-
29	-	-	0.00	-	-	-	-	-	-
30	-	-	0.00	-	-	-	-	-	-
31	-	-	0.00	-	-	-	-	-	-
32	-	-	0.00	0.00	-	-	-	-	-
33	-	-	0.00	0.00	-	-	-	-	-
34	-	-	0.00	0.00	-	-	-	-	-
35	-	-	0.00	0.00	-	0.00	-	-	-
36	-	-	0.00	0.00	-	-	-	-	-
37	-	-	1.00	0.65	-	7.40	-	-	-
38	-	-	1.25	1.20	-	-	-	-	-
39	-	-	1.65	0.95	-	0.00	-	-	-
40	-	-	1.89	1.25	-	-	-	-	-
41	-	-	2.63	1.00	-	0.00	-	-	-
42	-	-	3.58	1.05	-	-	-	-	-
43	-	-	4.25	1.65	-	0.00	-	-	-
44	-	-	3.56	2.00	-	-	-	-	-
45	-	-	4.65	1.00	-	-	-	-	-
46	-	-	4.00	1.00	-	-	-	-	-
47	-	-	3.22	0.00	-	-	-	-	-
48	-	-	3.55	0.00	-	-	-	-	-
49	-	-	0.58	0.00	-	-	-	-	-
50	-	-	0.00	0.00	-	-	-	-	-
51	-	-	0.00	0.00	-	-	-	-	-
52	-	-	0.00	0.00	-	-	-	-	-
1	-	-	0.00	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-
3	-	-	-		-	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna, * At Nanded Ajeet-155 BG II

Table: 76 .Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition in Central Zone during 2022-23 in DCH 32.

SMW	Sucking Pests																	
	Aphids/ 3 leaves									Jassids/ 3 leaves								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	2.12	-	-	0.33	-	-	-	-	-	0.50	-	-
29	-	-	0.00	-	-	5.40	4.98	-	-	0.33	-	1.70	-	-	4.10	1.52	-	-
30	-	0.00	0.00	-	-	15.80	8.03	-	2.13	0.67	0.00	1.85	-	-	4.30	3.89	-	-
31	-	0.00	0.00	-	-	4.60	9.72	25.10	5.31	1.67	0.20	2.65	-	-	5.40	4.02	0.00	-
32	-	0.00	0.95	0.60	-	6.40	4.32	30.60	18.27	3.67	2.50	4.35	2.20	-	6.70	2.92	0.60	-
33	-	0.00	2.75	0.80	-	7.20	21.24	12.70	28.61	4.00	7.50	6.05	2.40	-	7.10	5.34	2.60	0.28
34	-	0.00	3.00	1.40	0.00	8.40	20.48	38.34	34.89	4.33	12.15	7.25	2.80	2.40	8.30	5.18	1.70	0.88
35	-	0.00	3.15	1.80	0.20	11.60	19.20	37.70	36.51	5.67	4.45	5.75	3.40	1.80	13.40	9.88	4.00	1.02
36	-	0.05	3.50	2.00	0.10	4.00	10.20	10.20	20.33	7.33	7.75	4.25	5.70	3.10	9.80	7.54	3.40	2.43
37	-	0.70	4.65	2.30	0.10	3.20	10.28	15.72	17.21	9.67	19.6	6.85	11.30	6.80	7.20	10.12	6.20	5.64
38	-	0.80	7.00	2.70	0.00	4.60	10.16	28.79	7.64	10.67	15.35	7.15	10.00	8.60	7.10	9.48	3.10	8.56
39	-	7.10	11.85	3.40	0.10	7.40	9.96	32.60	4.51	12.00	19.40	11.45	10.10	2.60	6.60	5.48	2.50	9.21
40	-	0.10	15.25	3.50	0.00	3.20	10.12	36.50	3.27	14.33	12.80	12.85	20.20	5.00	6.20	5.36	7.00	9.68
41	-	1.25	21.55	4.00	0.10	3.00	8.06	47.60	1.49	11.67	11.60	16.00	24.10	13.80	9.90	3.58	4.60	11.32
42	-	3.40	25.45	5.70	0.00	2.60	5.18	72.08	2.72	8.33	14.80	18.65	15.70	19.30	8.40	1.69	4.20	14.22
43	-	3.90	32.75	8.20	0.10	2.80	6.48	10.45	1.34	6.67	13.80	22.90	9.80	2.00	7.30	2.94	9.00	15.41
44	-	2.30	34.85	9.20	0.00	3.80	10.18	55.23	1.56	4.00	11.50	23.45	12.70	4.30	6.60	4.86	3.70	10.36
45	-	10.70	41.25	9.90	0.00	6.20	20.38	23.68	4.57	3.33	11.50	25.25	11.20	2.90	4.70	7.58	8.30	7.45
46	-	8.90	46.75	11.20	0.00	6.00	23.38	41.45	5.44	2.67	4.90	21.35	10.70	3.70	3.20	3.74	5.90	3.24
47	-	9.60	55.35	11.80	0.10	8.40	22.80	38.98	2.31	1.33	1.90	22.90	8.00	5.20	3.00	2.66	2.50	2.84
48	-	24.65	56.95	14.70	0.00	10.20	27.04	24.45	2.56	1.33	3.95	19.65	4.70	8.80	2.70	2.00	6.00	1.14
49	-	46.55	60.05	17.90	0.70	14.80	32.28	39.30	1.28	0.67	4.25	16.30	3.20	10.60	2.00	2.51	2.50	0.83
50	-	90.25	62.75	27.20	1.40	23.40	49.42	32.09	0.24	-	2.35	12.00	2.70	7.70	1.80	2.76	1.20	0.21
51	-	143.4	58.50	31.70	1.60	27.60	68.86	-	-	-	2.50	9.25	2.20	2.60	1.40	1.52	-	-
52	-	186.75	49.00	38.20	9.70	34.40	98.60	-	-	-	1.30	5.25	1.80	1.30	0.30	2.22	-	-
01	-	-	41.45	-	0.90	-	-	-	-	-	-	3.00	-	0.80	-	-	-	-
02	-	-	-	-	6.60	-	-	-	-	-	-	-	-	1.00	-	-	-	-
03	-	-	-	-	6.90	-	-	-	-	-	-	-	-	1.00	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

Table: 77.Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition in Central Zone during 2022-23 in DCH 32.

SMW	Sucking Pests																	
	Whitefly/ 3 leaves									Thrips/ 3 leaves								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	0.25	-	-
29	-	-	0.00	-	-	0.00	0.26	-	-	-	-	1.65	-	-	0.00	0.38	-	-
30	-	0.00	0.25	-	-	0.00	0.71	-	-	-	0.00	3.70	-	-	0.60	0.36	-	-
31	-	0.10	0.20	-	-	0.20	0.24	0.00	-	-	0.00	6.25	-	-	1.20	0.89	-	-
32	-	0.00	0.50	0.00	-	0.40	0.05	0.00	-	-	0.20	12.95	0.70	-	6.40	3.94	-	-
33	-	0.45	1.20	0.40	-	0.60	1.46	0.00	0.28	-	0.55	16.75	0.90	-	6.80	16.76	-	0.12
34	1.67	0.45	2.50	0.80	1.70	1.70	1.92	10.23	0.89	-	2.35	22.45	2.00	9.10	8.30	19.04	-	0.78
35	2.33	1.80	2.00	1.30	2.40	2.20	2.64	9.29	1.26	-	0.65	25.00	5.70	5.30	18.40	79.50	-	2.57
36	5.67	1.40	2.90	2.00	5.80	2.50	2.96	25.00	2.33	-	12.65	30.65	9.90	2.70	21.50	43.08	-	6.23
37	8.33	8.05	3.00	1.40	4.40	4.10	1.60	17.00	3.12	-	9.35	31.65	16.80	4.20	14.80	11.50	-	9.51
38	10.67	7.25	3.25	1.40	2.20	6.20	1.34	10.01	1.52	-	7.15	35.00	17.20	2.20	8.20	9.54	-	10.87
39	12.00	7.15	3.85	1.80	4.70	3.60	1.76	19.90	1.22	-	0.90	38.40	21.20	2.70	5.40	4.00	-	8.63
40	16.67	4.10	4.25	2.20	3.00	3.20	2.26	16.34	2.67	-	0.10	33.50	15.80	1.90	5.70	3.34	-	5.48
41	20.33	9.70	5.45	2.60	4.10	3.00	2.46	32.36	3.29	-	0.00	32.50	12.80	1.60	4.80	3.62	-	3.22
42	22.33	3.80	6.55	3.40	2.80	4.40	3.38	12.45	1.32	-	0.00	33.90	14.80	0.90	2.90	0.55	-	1.61
43	25.67	5.20	4.50	3.00	7.40	4.20	3.66	16.98	1.21	-	0.10	27.00	13.20	2.60	2.10	0.80	-	1.03
44	19.67	4.85	5.90	3.40	8.80	5.40	3.70	25.25	1.88	-	0.00	24.75	11.80	2.10	1.50	0.36	-	0.54
45	15.67	5.80	6.25	3.60	4.00	6.90	4.20	7.05	2.77	-	0.00	23.25	10.20	0.80	1.20	1.48	-	0.41
46	10.33	4.10	6.80	3.50	3.30	8.20	5.58	18.34	3.47	-	2.05	20.00	8.40	0.10	1.00	0.94	-	0.22
47	6.67	4.25	6.50	3.10	2.80	7.60	5.20	30.69	3.89	-	0.90	11.50	7.20	0.10	0.40	1.46	-	0.12
48	3.33	5.60	5.50	2.80	1.00	7.40	4.08	10.00	2.14	-	0.00	7.50	5.70	0.60	0.20	2.12	-	-
49	1.00	5.70	3.50	2.70	2.40	7.80	3.61	9.17	1.12	-	0.00	4.60	4.80	0.00	0.40	2.29	-	-
50	-	6.30	2.25	2.60	2.50	8.70	4.85	7.26	0.51	-	0.00	6.25	3.90	1.30	0.20	2.38	-	-
51	-	5.60	1.00	2.20	1.60	9.20	3.88	-	0.24	-	0.00	4.00	3.00	0.70	0.00	2.16	-	-
52	-	5.80	0.85	2.00	1.00	9.70	2.26	-	-	-	0.00	1.50	3.10	0.40	0.00	2.58	-	-
01	-	-	0.30	-	2.50	-	-	-	-	-	-	0.00	-	0.30	-	-	-	-
02	-	-	-	-	1.80	-	-	-	-	-	-	-		0.10		-	-	-
03	-	-	-	-	1.60	-	-	-	-	-	-			0.00		-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

Table: 78 Ent 2. Seasonal dynamics of key pests of cotton (Natural Enemies) under unprotected condition in Central Zone during 2022-23 in DCH 32.

SMW	Natural Enemies/plant*								
	BA	JU	SU	BH	AK	NA	RA	KH	BW
28	-	-	-	-	-	-	0.26	-	-
29	-	-	0.20	-	-	0.00	0.46	-	-
30	-	0.75	0.15	-	-	0.20	0.76	-	0.15
31	-	0.85	0.40	-	-	0.30	0.96	0.00	0.30
32	-	0.45	0.20	0.00	-	0.80	1.08	0.00	1.15
33	-	0.55	0.10	0.00	-	1.10	4.64	1.30	1.45
34	-	0.75	0.00	0.00	0.30	1.50	3.68	0.60	3.15
35	-	0.50	0.10	0.20	0.50	2.10	3.24	0.80	3.55
36	-	0.50	0.20	0.50	1.00	2.30	1.52	0.60	3.05
37	-	0.80	0.25	0.80	1.10	2.20	2.24	0.20	2.10
38	-	0.65	0.50	0.80	1.10	2.40	1.32	0.30	2.35
39	-	0.90	0.50	1.00	0.20	2.60	1.48	0.20	1.75
40	-	0.90	0.80	1.40	1.50	2.70	2.08	1.20	2.10
41	-	1.05	0.80	1.60	1.00	2.50	1.80	1.60	2.70
42	-	1.00	1.00	1.80	1.30	2.40	1.10	2.20	2.45
43	-	0.90	1.40	1.60	0.00	2.10	1.32	1.60	1.20
44	-	0.95	1.60	2.00	1.10	2.10	1.86	0.80	0.90
45	-	0.90	1.80	2.40	1.70	2.50	2.20	1.10	1.05
46	-	0.75	2.00	3.00	1.00	2.80	1.72	1.60	1.30
47	-	0.75	2.20	3.60	1.10	2.90	1.84	1.30	0.80
48	-	1.08	3.00	3.00	0.10	3.20	1.72	1.60	0.35
49	-	0.35	2.80	4.20	0.10	3.40	2.02	1.20	0.20
50	-	0.70	2.40	4.60	0.70	3.40	2.32	0.00	-
51	-	0.75	2.60	4.80	1.00	3.50	2.92	-	-
52	-	1.10	2.20	3.60	1.40	3.80	8.16	-	-
01	-	-	1.80	-	0.70	-	-	-	-
02	-	-	-	-	0.50	-	-	-	
03	-	-	-	-	0.50	-	-	-	

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna
*Natural Enemies include coccinellids, chrysopids, syrphids and spider.

Table: 79 Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in DCH 32.

SMW	No. of Larval Recovery/5plants																	
	H.armigera																	
	BA		JU		SU		BH		AK		NA*		RA		KH		BW	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
28	-	-	-	-	-	-		-	-	-	-	-	0.00	0.00	-	-	-	-
29	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-
30	-	-	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.40	0.00	-	-	-	-
31	-	-	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.65	0.40	0.00	0.00	-	-
32	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	0.70	0.70	0.20	0.00	-	-
33	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	1.00	1.00	0.60	0.20	-	-
34	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	1.00	1.35	0.20	0.20	0.15	0.20
35	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.80	0.50	0.20	0.70	0.45
36	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.65	0.60	0.00	1.05	1.10
37	-	-	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.10	0.00	0.00	1.20	0.60	0.60	0.60	1.20	1.30
38	-	-	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.20	0.00	0.10	1.05	0.40	0.80	0.20	1.00	1.45
39	-	-	0.00	0.00	0.40	0.40	2.00	1.00	0.00	0.70	0.00	0.20	1.45	0.10	0.60	0.20	1.20	1.20
40	-	-	0.00	0.00	0.60	0.40	2.00	1.00	0.00	0.30	0.00	0.40	1.20	0.05	0.40	0.40	0.55	0.80
41	-	-	0.00	0.00	0.80	0.60	1.00	2.00	0.00	0.30	0.00	0.50	1.35	0.05	0.40	0.80	0.40	0.60
42	-	-	0.00	0.00	0.80	1.00	3.00	1.00	0.00	0.00	0.00	0.20	0.70	0.00	0.90	0.00	0.10	0.45
43	-	-	0.00	0.25	0.60	0.80	2.00	2.00	0.00	0.00	0.00	0.00	0.25	0.00	0.20	0.00	-	0.30
44	-	-	0.00	0.25	0.60	1.00	3.00	1.00	0.00	0.10	0.00	0.00	0.15	0.00	0.20	0.00	-	-
45	-	-	0.00	0.35	0.40	0.80	2.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	-	-
46	-	-	0.00	0.50	0.40	0.80	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.20	-	-
47	-	-	0.00	0.50	0.60	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	-	-
48	-	-	0.00	0.25	0.40	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	-	-
49	-	-	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	-	-
50	-	-	0.00	0.00	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
51	-	-	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-
52	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-
01	-	-	-	-	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-	-	-
02	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-
03	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna, , *NA- Larva/plant

Table: 80. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in DCH 32.

SMW	*Earias* spp.																	
	BA		JU		SU		BH		AK		NA*		RA		KH		BW	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
28			-	-	-	-	-	-	-	-	-	-	---	0.00	-	-	-	-
29	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	0.00	-	-	-	-
30	-	-	-	0.00	0.00	0.00	-	-	-	-	0.00	0.00	-	0.25	-	-	-	-
31	-	-	-	0.00	0.00	0.00	-	-	-	-	0.00	0.00	-	0.70	-	0.00	-	-
32	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	1.00	-	0.00	-	-
33	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.10	-	1.40	-	0.00	0.10	0.15
34	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	1.50	-	0.00	0.35	0.30
35	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	1.05	-	0.20	0.25	0.60
36	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.80	-	0.20	0.40	1.10
37	-	-	-	0.00	0.00	0.00	1.00	0.00	-	0.00	0.00	0.00	-	1.30	-	0.60	0.00	0.80
38	-	-	-	0.00	0.20	0.20	0.00	1.00	-	0.00	0.00	0.00	-	0.90	-	0.20	0.00	0.40
39	-	-	-	0.00	0.00	0.40	1.00	1.00	-	0.00	0.00	0.10	-	0.20	-	0.40	0.15	0.55
40	-	-	-	0.00	0.00	0.40	2.00	2.00	-	0.00	0.00	0.00	-	0.10	-	0.90	-	0.80
41	-	-	-	0.00	0.20	0.40	1.00	2.00	-	0.00	0.00	0.00	-	0.10	-	0.40	-	1.20
42	-	-	-	0.43	0.20	0.20	0.00	1.00	-	0.00	0.00	0.00	-	0.00	-	0.40	-	0.85
43	-	-	-	0.00	0.40	0.20	0.00	1.00	-	0.00	0.00	0.00	-	0.00	-	0.60	-	0.60
44	-	-	-	0.21	0.00	0.00	0.00	1.00	-	0.20	0.00	0.00	-	0.00	-	0.80	-	0.40
45	-	-	-	0.00	0.00	0.00	0.00	1.00	-	0.00	0.00	0.00	-	0.00	-	0.60	-	1.05
46	-	-	-	0.00	0.20	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	0.80	-	0.85
47	-	-	-	0.15	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	0.20	-	0.30
48	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	0.60	-	0.10
49	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.10	0.00	0.00	-	0.00	-	0.00	-	-
50	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.20	0.00	0.00	-	0.00	-	0.00	-	-
51	-	-	-	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	-	0.00	-	-	-	-
52	-	-	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	0.00	-	-	-	-
01	-	-	-	-	0.00	0.00	-	-	-	0.00	--	-	-	-	-	-	-	-
02	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-
03	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna, , *NA- Larva/plant

Table: 81. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in DCH 32.

SMW	*S. litura*																	
	BA		JU		SU		BH		AK		NA*		RA		KH		BW	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
28			-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-
29	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	0.00	-	-	-	-
30	-	-	-	0.00	0.00	0.00	-	-	-	-	0.00	0.00	-	0.00	-	-	-	-
31	-	-	-	0.00	0.00	0.00	-	-	-	-	0.00	0.00	-	0.00	-	-	-	-
32	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.70	-	-	-	0.10
33	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	1.35	-	-	-	0.40
34	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	1.60	-	-	-	0.40
35	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	1.50	-	-	-	0.80
36	-	-	-	0.00	0.00	0.20	1.00	0.00	-	-	0.00	0.00	-	1.35	-	-	-	1.20
37	-	-	-	0.00	0.20	0.60	0.00	1.00	-	-	0.00	0.00	-	1.25	-	-	-	1.40
38	-	-	-	0.00	0.00	0.40	0.00	1.00	-	-	0.00	0.00	-	1.40	-	-	-	0.60
39	-	-	-	0.00	0.00	0.60	1.00	1.00	-	-	0.00	0.00	-	0.30	-	-	-	1.20
40	-	-	-	0.00	0.00	0.60	0.00	2.00	-	-	0.10	0.00	-	0.25	-	-	-	0.80
41	-	-	-	0.00	0.20	0.40	1.00	1.00	-	-	0.00	0.20	-	0.10	-	-	-	0.60
42	-	-	--	0.00	0.00	0.40	1.00	1.00	-	-	0.00	0.00	-	0.00	-	-	-	0.30
43	-	-	-	0.00	0.20	0.60	2.00	2.00	-	-	0.00	0.00	-	0.05	-	-	-	0.00
44	-	-	-	0.00	0.00	0.60	0.00	1.00	-	-	0.00	0.00	-	0.10	-	-	-	0.00
45	-	-	-	0.00	0.20	0.40	1.00	1.00	-	-	0.00	0.00	-	0.00	-	-	-	0.20
46	-	-	-	0.00	0.00	0.40	0.00	0.00	-	-	0.00	0.00	-	0.00	-	-	-	0.10
47	-	-	-	0.00	0.00	0.20	0.00	0.00	-	-	0.00	0.00	-	0.00	-	-	-	0.00
48	-	-	-	0.00	0.20	0.20	0.00	0.00	-	-	0.00	0.00	-	0.10	-	-	-	0.05
49	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	-	-	-
50	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	-	-	-
51	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	-	-	-
52	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	0.00	-	-	-	-
1	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna , *NA- Larva/plant

Table: 82. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in DCH 32.

SMW	Fruiting Body Damage (%) **									GBD (%) due to ABW/ TC/SBW								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	0.00	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	-	-
30	-	-	0.00	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	-	-
31	-	-	0.00	-	-	-	0.00	0.00	-	-	-	0.00	-	-	-	-	-	-
32	-	-	0.00	0.00	-	-	0.00	0.00	-	-	-	0.00	0.00	-	-	-	-	-
33	-	-	0.00	0.00	-	-	1.00	0.00	-	-	-	0.00	0.00	-	-	-	-	-
34	-	-	0.00	0.00	2.74	0.00	1.65	0.00	4.26	-	-	0.00	0.00	-	-	-	-	-
35	-	-	0.00	0.00	0.00	0.00	3.60	0.00	5.88	-	-	0.00	0.00	-	-	-	-	-
36	-	-	2.35	1.45	0.00	0.00	4.85	0.00	6.52	-	-	0.00	0.00	-	-	-	-	0.00
37	-	-	3.55	4.29	0.50	0.00	5.45	0.00	9.84	-	-	0.00	0.00	-	-	-	-	11.11
38	-	-	5.50	5.33	4.35	1.63	5.30	0.00	12.56	-	-	0.00	0.00	-	-	-	-	14.71
39	-	-	7.25	9.30	3.39	2.53	6.80	40.00	12.55	-	-	2.56	0.00	-	-	-	-	13.64
40	-	-	8.50	10.71	0.70	4.41	2.45	45.00	12.17	-	-	4.65	0.00	-	-	-	-	11.72
41	-	-	12.30	13.41	2.56	5.85	4.80	45.00	15.32	-	-	3.95	0.00	-	-	-	-	14.79
42	-	-	14.20	9.18	2.41	3.29	5.25	50.00	10.98	-	-	3.25	0.00	-	-	-	-	15.38
43	-	-	25.50	9.20	0.00	0.46	5.80	55.00	8.78	-	-	6.65	11.54	-	-	-	-	13.79
44	-	-	29.65	6.41	1.85	0.00	7.35	55.00	6.39	-	-	8.75	11.86	-	-	-	-	9.34
45	-	-	17.40	7.69	0.00	0.00	9.50	55.00	6.50	-	-	10.33	8.33	-	-	-	-	8.29
46	-	-	13.50	4.88	0.00	0.00	26.40	60.00	7.56	-	-	16.75	6.35	-	-	-	-	8.33
47	-	-	8.00	3.85	0.00	0.00	37.15	70.00	8.13	-	-	19.30	4.23	-	-	-	-	8.53
48	-	-	7.20	2.67	0.00	0.00	30.45	80.00	8.31	-	-	22.25	0.00	-	-	-	-	8.56
49	-	-	3.00	0.00	0.41	0.00	46.55	90.00	8.13	-	-	14.45	0.00	-	-	-	-	8.71
50	-	-	0.65	0.00	1.48	0.00	45.40	95.00	4.91	-	-	7.45	0.00	-	-	-	-	4.33
51	-	-	0.00	0.00	2.56	0.00	49.65	-	3.41	-	-	6.35	0.00	-	-	-	-	3.40
52	-	-	0.00	0.00	0.00	0.00	58.35	-	0.86	-	-	0.00	0.00	-	-	-	-	0.35
1	-	-	0.00	0.00	0.00	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-
2	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

** Fruiting Body damage includes damage in squares, flowers and boll

Table: 83. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in DCH 32.

SMW	Pink bollworm/20 green bolls																	
	GBD (%)									Number of Larvae								
	BA	JU	SU*	BH*	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
28	-	-	-	-	-	-	--	-	-	-	-	-		-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-
32	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-
33	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-
34	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	0.00	-	-	0.00	-
35	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	0.00	-	-	0.00	-
36	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	0.00	-	-	0.00	-
37	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	0.00	-	-	0.20	-
38	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	0.00	-	0.00	0.40	-
39	-	-	-	-	0.00	0.00	-	-	-	-	0.00	-	-	0.00	-	0.00	0.40	-
40	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	0.00	-	1.00	0.20	-
41	-	-	-	-	0.00	0.00	-	-	-	-	0.00	-	-	0.00	-	2.00	0.00	-
42	-	-	-	-	0.00	-	-	-	-	-	1.00	-	-	0.00	-	2.00	0.00	-
43	-	-	-	-	5.00	0.00	-	-	-	-	1.00	-	-	1.00	-	3.00	0.60	-
44	-	-	-	-	5.00	-	-	-	-	-	3.00	-	-	1.00	-	3.00	0.80	-
45	-	-	-	-	10.00	6.00	-	-	-	-	2.00	-	-	2.00	-	7.00	0.90	-
46	-	-	-	-	10.00	-	-	-	-	-	4.00	-	-	2.00	-	10.00	0.60	-
47	-	-	-	-	15.00	8.00	-	-	-	-	6.00	-	-	0.00	-	11.00	0.20	-
48	-	-	-	-	10.00	-	-	-	-	-	8.00	-	-	3.00	-	12.00	0.40	-
49	-	-	-	-	20.00	20.00	-	-	-	-	10.00	-	-	4.00	-	11.00	0.60	-
50	-	-	-	-	20.00	-	-	-	-	-	9.00	-	-	6.00	-	12.00	0.80	-
51	-	-	-	-	25.00	32.00	-	-	-	-	8.00	-	-	6.00	-	14.00	-	-
52	-	-	-	-	35.00	-	-	-	-	-	10.00	-	-	8.00	-	20.00	-	-
01	-	-	-	-	45.00	-	-	-	-	-	-	-	-	11.00	-	-	-	-
02	-	-	-	-	50.00	-	-	-	-	-	-	-	-	15.00	-	-	-	-
03	-	-	-	-	40.00	-	-	-	-	-	-	-	-	9.00	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

Table: 84. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in DCH 32.

SMW	Rosette flowers (%) due to PBW								
	BA	JU	SU	BH	AK	NA	RA	KH	BW
28	-	-	-	-	-	-	-	-	-
29	-	-	0.00	-	-	-	-	-	-
30	-	-	0.00	-	-	-	-	-	-
31	-	-	0.00	-	-	-	-	-	-
32	-	-	0.00	0.00	-	-	-	-	-
33	-	-	0.00	0.00	-	-	-	-	-
34	-	-	0.00	0.00	-	-	-	-	-
35	-	-	0.00	0.00	-	0.00	-	-	-
36	-	-	2.60	0.32	-	-	-	-	-
37	-	-	1.23	1.35	-	6.45	-	-	-
38	-	-	2.00	2.05	-	-	-	-	-
39	-	-	0.00	3.65	-	0.00	-	-	-
40	-	-	2.80	5.65	-	-	-	-	-
41	-	-	3.26	6.25	-	0.00	-	-	-
42	-	-	5.80	3.55	-	-	-	-	-
43	-	-	6.40	2.66	-	0.00	-	-	-
44	-	-	10.60	3.85	-	-	-	-	-
45	-	-	13.40	4.25	-	-	-	-	-
46	-	-	7.40	3.05	-	-	-	-	-
47	-	-	3.60	0.85	-	-	-	-	-
48	-	-	4.00	0.80	-	-	-	-	-
49	-	-	3.00	0.00	-	-	-	-	-
50	-	-	2.40	0.00	-	-	-	-	-
51	-	-	0.00	0.00	-	-	-	-	-
52	-	-	0.00	0.00	-	-	-	-	-
1	-	-	0.00	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

Table:85 . Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition in Central Zone during 2022-23 in Suraj.

SMW	Sucking Pests																	
	Aphids/ 3 leaves									Jassids/ 3 leaves								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
28		-	-	-	-	-	2.88	-	-	-	-	-	-	-	-	0.23	-	-
29	-	-	0.00	-	-	7.60	8.52	-	-	-	-	0.00	-	-	1.00	0.94	-	-
30	-	-	0.00	-	-	18.60	10.23	-	-	-	-	0.30	-	-	2.80	1.46	-	-
31	-	-	0.55	-	-	5.20	13.66	21.83	-	-	-	0.50	-	-	3.00	1.82	0.00	-
32	-	-	0.85	0.40	-	8.00	4.66	15.67	-	-	-	1.30	0.50	-	3.30	1.48	0.20	-
33	-	-	1.65	0.50	-	10.40	10.00	15.89	-	-	-	1.50	0.60	-	3.60	2.70	1.20	-
34	-	-	2.90	0.70	0.00	11.60	11.60	10.80	-	-	-	2.80	0.70	1.60	5.70	2.38	1.90	-
35	-	-	3.25	0.80	0.30	14.70	9.48	31.06	-	-	-	2.95	0.90	2.70	9.10	7.34	3.20	-
36	-	-	4.25	1.00	0.70	5.80	10.96	10.20	-	-	-	3.25	5.20	5.20	5.80	4.44	4.60	-
37	-	-	6.30	1.20	0.90	4.10	12.58	13.71	-	-	-	4.00	7.70	4.90	3.50	7.58	2.70	-
38	-	-	7.95	1.30	1.00	6.40	9.82	26.80	-	-	-	5.00	8.80	6.50	3.40	3.40	2.60	-
39	-	-	7.00	1.50	0.00	8.80	9.74	21.60	-	-	-	7.25	10.20	1.50	3.00	4.40	4.80	-
40	-	-	6.50	1.70	0.50	4.60	9.46	40.81	-	-	-	6.35	9.40	3.50	3.50	3.36	8.90	-
41	-	-	11.30	2.80	0.00	4.20	8.62	50.26	-	-	-	7.20	7.20	7.10	5.70	3.14	5.60	-
42	-	-	18.60	3.80	0.20	4.00	5.12	61.11	-	-	-	8.00	6.80	9.50	3.70	1.48	5.30	-
43	-	-	24.60	6.80	0.00	4.10	7.30	10.45	-	-	-	7.10	5.40	3.20	2.80	2.56	9.10	-
44	-	-	31.00	7.80	0.20	5.40	12.12	39.98	-	-	-	8.60	4.70	3.90	2.60	3.86	11.00	-
45	-	-	35.25	8.60	0.00	8.70	3.20	37.34	-	-	-	10.95	4.10	3.50	1.30	4.34	8.30	-
46	-	-	40.45	9.80	0.00	8.20	3.48	30.12	-	-	-	9.65	3.20	2.90	1.00	2.80	7.60	-
47	-	-	35.00	10.80	0.20	14.60	5.86	29.71	-	-	-	7.20	2.80	3.20	0.80	3.26	7.00	-
48	-	-	41.20	12.80	0.00	15.80	7.40	23.34	-	-	-	5.25	2.60	1.80	0.80	2.24	6.00	-
49	-	-	44.00	13.80	4.50	21.60	12.89	40.56	-	-	-	3.40	2.10	5.50	0.70	1.15	1.40	-
50	-	-	50.10	15.50	9.00	32.30	16.70	21.50	-	-	-	2.00	1.80	2.70	0.30	1.94	3.40	-
51	-	-	46.55	16.80	6.90	36.50	28.86	-	-	-	-	1.50	1.20	1.60	0.20	1.64	-	-
52	-	-	40.50	17.80	10.40	40.20	97.68	-	-	-	-	0.00	1.20	0.90	0.20	2.20	-	-
01	-	-	31.25	-	13.20	-	-	-	-	-	-	0.00	-	0.50	-	-	-	-
02	-	-	-	-	17.30	-	-	-	-	-	-	-	-	0.20	-	-	-	-
03	-	-	-	-	4.70	-	-	-	-	-	-	-	-	0.80	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

Table: 86. Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition in Central Zone during 2022-23 in Suraj.

SMW	Sucking Pests																	
	Whitefly/ 3 leaves									Thrips/ 3 leaves								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
28		-					0.89				-					3.56		
29	-	-	0.00	-	-	0.00	1.11		-	-	-	0.85	-	-	0.00	6.29	-	-
30	-	-	0.20	-	-	0.20	1.42		-	-	-	1.20	-	-	1.00	10.61	-	-
31	-	-	0.40	-	-	0.30	1.56	0.00	-	-	-	2.80	-	-	1.70	12.96	-	-
32	-	-	0.60	0.00	-	0.40	1.32	0.00	-	-	-	7.10	0.60	-	7.80	5.44	-	-
33	-	-	0.60	0.20	-	1.00	1.62	0.00	-	-	-	7.90	0.90	-	8.50	13.68	-	-
34	-	-	1.40	0.30	2.30	2.20	2.18	11.00	-	-	-	7.20	1.50	9.20	11.00	35.22	-	-
35	-	-	0.80	0.50	3.40	3.10	2.66	12.34	-	-	-	12.50	3.90	6.30	24.20	110.28	-	-
36	-	-	1.20	0.70	4.90	3.00	3.16	21.60	-	-	-	15.80	9.00	4.80	35.60	69.06	-	-
37	-	-	1.40	0.90	6.50	5.80	2.86	18.90	-	-	-	21.65	18.20	5.90	21.60	11.02	-	-
38	-	-	1.20	1.00	4.00	8.00	3.36	10.01	-	-	-	31.25	11.20	6.20	9.20	9.40	-	-
39	-	-	2.50	1.20	6.10	5.40	3.84	27.89	-	-	-	36.50	12.20	2.40	6.70	5.86	-	-
40	-	-	3.40	1.20	5.30	5.10	2.58	15.78	-	-	-	23.00	13.80	5.50	7.00	5.42	-	-
41	-	-	5.00	1.40	5.10	4.30	3.06	34.23	-	-	-	22.20	19.20	3.60	5.50	3.26	-	-
42	-	-	5.50	1.70	3.60	6.20	2.56	12.31	-	-	-	23.00	17.20	2.10	3.40	0.13	--	-
43	-	-	6.85	1.90	11.00	5.90	3.06	16.67	-	-	-	36.00	14.20	2.80	3.10	0.24	-	-
44	-	-	8.00	2.00	12.10	7.60	3.72	24.25	-	-	-	29.65	11.20	2.10	2.10	0.34	-	-
45	-	-	8.25	2.10	8.70	8.10	3.00	8.91	-	-	-	25.25	9.20	1.00	1.50	1.46	-	-
46	-	-	7.50	2.10	4.20	9.40	2.36	18.34	-	-	-	17.35	8.20	1.30	1.20	3.50	-	-
47	-	-	6.75	2.30	3.10	9.00	2.08	31.11	-	-	-	13.60	7.20	2.00	0.80	2.32	-	-
48	-	-	5.30	2.40	2.20	9.20	2.42	11.47	-	-	-	8.25	6.20	0.40	0.60	1.80	-	-
49	-	-	3.80	2.00	2.90	10.20	1.86	10.37	-	-	-	3.00	4.20	1.40	0.90	1.26	-	-
50	-	-	2.60	1.80	2.40	11.10	2.02	9.29	-	-	-	2.50	3.20	0.20	0.40	1.74	-	-
51	-	-	1.20	1.70	1.30	12.50	2.76		-	-	-	2.00	2.20	0.70	0.20	2.08	-	-
52	-	-	0.75	1.00	1.90	12.80	2.64		-	-	-	0.00	1.80	0.40	0.00	2.78	-	-
1	-	-	0.00	-	2.00	-	-		-	-	-	0.00	-	0.60	-	-	-	-
2	-	-			1.70		-			-	-			0.00		-		
3	-	-			1.30		-			-	-			0.30		-		

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

Table: 87. Ent 2. Seasonal dynamics of key pests of cotton (Natural Enemies & Bollworms) under unprotected condition in Central Zone during 2022-23 in Suraj.

SMW	Natural Enemies/plant*									No. of Larvae /5plants *H.armigera*															
	BA	JU	SU	BH	AK	NA	RA	KH	BW	JU		SU		BH		AK		NA**		RA		KH		BW	
										Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
28		-					0.46			-	-									-	-				
29	-	-	0.15	-	-	0.00	1.04	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-	-	-
30	-	-	0.25	-	-	0.10	1.42	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-	-	-
31	-	-	0.35	-	-	0.20	1.60	0.00	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	-	0.00	0.00	-	-
32	-	-	0.25	0.00	-	0.50	1.36	0.00	-	-	-	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	0.00	0.00	-	-
33	-	-	0.50	0.30	-	1.00	2.68	1.20	-	-	-	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	0.20	0.00	-	-
34	-	-	0.60	0.40	0.00	1.30	3.60	0.40	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.20	0.00	-	-
35	-	-	0.65	0.40	0.90	2.00	2.68	0.60	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.40	0.20	-	-
36	-	-	0.85	0.20	0.70	2.10	1.64	0.60	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.40	0.00	-	-
37	-	-	1.40	0.50	0.80	2.00	1.84	0.20	-	-	-	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	-	-	0.20	0.00	-	-
38	-	-	1.40	0.70	2.00	2.20	2.52	0.40	-	-	-	0.00	0.00	1.00	0.00	0.00	0.30	0.00	0.10	-	-	0.60	0.40	-	-
39	-	-	1.60	0.80	0.30	2.30	2.20	0.20	-	-	-	0.20	0.20	1.00	1.00	0.00	0.00	0.00	0.20	-	-	0.00	0.20	-	-
40	-	-	2.20	1.00	1.30	2.50	2.36	1.40	-	-	-	0.20	0.20	1.00	1.00	0.00	0.30	0.00	0.50	-	-	0.40	0.60	-	-
41	-	-	2.40	1.20	1.40	2.40	1.68	0.60	-	-	-	0.20	0.20	0.00	2.00	0.00	0.50	0.00	0.60	-	-	0.80	0.40	-	-
42	-	-	3.00	1.20	1.80	2.10	1.14	2.10	-	-	-	0.40	0.60	2.00	2.00	0.00	0.10	0.00	0.30	-	-	0.20	0.00	-	-
43	-	-	2.65	1.50	0.00	2.00	1.68	1.60	-	-	-	0.40	0.40	2.00	1.00	0.00	0.00	0.00	0.10	-	-	0.20	0.20	-	-
44	-	-	3.00	1.60	1.30	1.90	1.44	0.70	-	-	-	0.60	0.40	1.00	2.00	0.00	0.00	0.00	0.00	-	-	0.20	0.00	-	-
45	-	-	3.20	1.80	1.30	2.20	1.84	0.80	-	-	-	0.40	0.40	0.00	1.00	0.00	0.00	0.00	0.00	-	-	0.00	0.40	-	-
46	-	-	2.50	2.00	1.10	2.50	2.56	0.80	-	-	-	0.60	0.60	0.00	1.00	0.00	0.00	0.00	0.00	-	-	0.60	0.30	-	-
47	-	-	3.80	2.10	0.80	2.60	1.56	1.10	-	-	-	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.40	0.20	-	-
48	-	-	3.65	3.20	0.30	3.00	1.68	1.40	-	-	-	0.20	0.20	0.00	1.00	0.00	0.00	0.00	0.00	-	-	0.20	0.60	-	-
49	-	-	3.75	2.20	0.00	3.10	1.44	0.00	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-
50	-	-	2.65	1.80	1.70	3.20	2.06	0.00	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-
51	-	-	2.30	1.20	1.10	3.10	3.52	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-
52	-	-	1.80	1.40	1.60	3.20	6.24	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-
01	-	-	1.50	-	0.60	-		-	-	-	-	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-	-	-
02	-	-			0.40	-	-			-	-					0.00	0.00			-	-				
03	-	-			0.30	-	-			-	-					0.00	0.00			-	-				

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna **NA-Larva/plant

* Natural Enemies include coccinellids, chrysopids, syrphids and spider.

Table:88. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in Suraj.

SMW	No. of Larvae/5plants																	
	Earias spp.																	
	BA		JU		SU		BH		AK		NA*		RA		KH		BW	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
28			-	-														
29	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-	-	-
30	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-	-	-
31	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	0.00	-	-
32	-	-	-	-	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	0.00	-	-
33	-	-	-	-	0.00	0.00	0.00	0.00	-	-	0.00	0.10	-	-	-	0.00	-	-
34	-	-	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.10	-	-	-	0.00	-	-
35	-	-	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
36	-	-	-	-	0.00	0.00	1.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
37	-	-	-	-	0.00	0.00	0.00	1.00	-	0.00	0.00	0.00	-	-	-	0.40	-	-
38	-	-	-	-	0.00	0.20	1.00	1.00	-	0.00	0.00	0.00	-	-	-	0.20	-	-
39	-	-	-	-	0.20	0.00	0.00	1.00	-	0.00	0.00	0.10	-	-	-	0.40	-	-
40	-	-	-	-	0.20	0.20	2.00	1.00	-	0.00	0.00	0.00	-	-	-	0.80	-	-
41	-	-	-	-	0.00	0.40	1.00	1.00	-	0.00	0.00	0.00	-	-	-	0.20	-	-
42	-	-	-	-	0.20	0.40	0.00	1.00	-	0.00	0.00	0.00	-	-	-	0.20	-	-
43	-	-	-	-	0.20	0.20	2.00	2.00	-	0.20	0.00	0.00	-	-	-	0.00	-	-
44	-	-	-	-	0.00	0.20	1.00	1.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
45	-	-	-	-	0.20	0.20	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.40	-	-
46	-	-	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.60	-	-
47	-	-	-	-	0.00	0.00	0.00	0.00	-	0.10	0.00	0.00	-	-	-	0.20	-	-
48	-	-	-	-	0.00	0.00	0.00	0.00	-	0.20	0.00	0.00	-	-	-	0.60	-	-
49	-	-	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	0.00	-	-
50	-	-	-	-	0.00	0.00	0.00	0.00	-	0.30	0.00	0.00	-	-	-	0.00	-	-
51	-	-	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	-	-
52	-	-	-	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	-	-	-	-
01	-	-	-	-	0.00	0.00	-	-	-	0.00	-	-	-	-	-	-	-	-
02	-	-	-	-					-	0.00			-	-				
03	-	-	-	-					-	0.00			-	-				

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna *NA-Larva/plant

Table:89. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in Suraj.

SMW	No. of Larvae/5plants																	
	S. litura																	
	BA		JU		SU		BH		AK		NA*		RA		KH		BW	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
28		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-	-	-
30	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-	-	-
31	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-	-	-
32	-	-	-	-	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
33	-	-	-	-	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
34	-	-	-	-	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
35	-	-	-	-	0.00	0.00	1.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
36	-	-	-	-	0.00	0.00	0.00	1.00	-	-	0.00	0.00	-	-	-	-	-	-
37	-	-	-	-	0.20	0.20	1.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
38	-	-	-	-	0.20	0.40	2.00	1.00	-	-	0.00	0.00	-	-	-	-	-	-
39	-	-	-	-	0.00	0.40	1.00	2.00	-	-	0.00	0.00	-	-	-	-	-	-
40	-	-	-	-	0.20	0.60	0.00	2.00	-	-	0.00	0.20	-	-	-	-	-	-
41	-	-	-	-	0.20	0.60	0.00	1.00	-	-	0.00	0.00	-	-	-	-	-	-
42	-	-	-	-	0.00	0.40	1.00	1.00	-	-	0.00	0.00	-	-	-	-	-	-
43	-	-	-	-	0.00	0.60	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
44	-	-	-	-	0.20	1.00	0.00	1.00	-	-	0.00	0.00	-	-	-	-	-	-
45	-	-	-	-	0.00	0.40	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
46	-	-	-	-	0.00	0.60	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
47	-	-	-	-	0.00	0.20	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
48	-	-	-	-	0.00	0.20	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
49	-	-	-	-	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
50	-	-	-	-	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
51	-	-	-	-	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
52	-	-	-	-	0.00	0.00	0.00	0.00	-	-	0.00	0.00	-	-	-	-	-	-
1	-	-	-	-	0.00	0.00	-	-	-	-			-	-	-	-	-	-
2	-	-	-	-					-	-			-	-				
3	-	-	-	-					-	-			-	-				

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna *NA-Larva/plant

Table: 90. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in Suraj.

SMW	Fruiting Body Damage (%) **									GBD (%) due to ABW/ TC/SBW								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
28		-					-				-					-		
29	-	-	0.00	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-
30	-	-	0.00	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-
31	-	-	0.00	-	-	-	-	0.00	-	-	-	0.00	-	-	-	-	-	-
32	-	-	0.00	0.00	-	-	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
33	-	-	0.00	0.00	-	-	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
34	-	-	0.00	0.00	0.00	0.00	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
35	-	-	0.00	0.00	0.00	0.00	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
36	-	-	0.00	2.78	0.00	0.00	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
37	-	-	1.35	5.63	0.00	0.00	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
38	-	-	2.05	7.04	1.85	2.37	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
39	-	-	3.62	13.79	5.76	3.44	0.00	0.00	-	-	-	1.25	0.00	-	-	-	-	-
40	-	-	6.44	14.52	3.70	6.16	1.68	45.00	-	-	-	1.48	0.00	-	-	-	-	-
41	-	-	9.26	14.86	1.87	7.95	2.35	50.00	-	-	-	2.85	0.00	-	-	-	-	-
42	-	-	12.13	11.76	0.78	4.37	2.80	50.00	-	-	-	4.44	0.00	-	-	-	-	-
43	-	-	18.56	12.16	2.27	1.07	3.12	50.00	-	-	-	5.63	6.56	-	-	-	-	-
44	-	-	22.63	11.76	0.83	0.00	5.11	60.00	-	-	-	8.44	9.68	-	-	-	-	-
45	-	-	17.33	8.70	0.00	0.00	6.32	70.00	-	-	-	12.35	10.94	-	-	-	-	-
46	-	-	14.21	5.63	0.00	0.00	6.75	75.00	-	-	-	18.65	12.07	-	-	-	-	-
47	-	-	11.26	4.00	0.37	0.00	7.56	75.00	-	-	-	17.00	10.45	-	-	-	-	-
48	-	-	6.20	2.82	1.42	0.00	11.68	80.00	-	-	-	13.23	9.23	-	-	-	-	-
49	-	-	4.00	0.00	0.00	0.00	13.71	80.00	-	-	-	11.85	7.04	-	-	-	-	-
50	-	-	3.20	0.00	2.53	0.00	30.45	90.00	-	-	-	8.66	5.88	-	-	-	-	-
51	-	-	0.00	0.00	0.00	0.00	41.25	-	-	-	-	3.56	4.35	-	-	-	-	-
52	-	-	0.00	0.00	0.00	0.00	52.85	-	-	-	-	0.00	4.29	-	-	-	-	-
1	-	-	0.00	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-
2	-	-			0.00		-			-	-			-		-		
3	-	-			0.00		-			-	-			-		-		

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

** Fruiting Body damage includes damage in squares, flowers and boll

Table: 91 . Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in Central Zone during 2022-23 in Suraj.

SMW	Pink bollworm/20 green bolls																		Rosette flowers (%) due to PBW								
	GBD (%)									Number of Larvae																	
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
28		-	-	-		-	-				-				-	-			-	-		-	-		-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	0.00	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
34	-	-	-	-	0.00	-	-	-	-	-	-	-	-	0.00	-	-	0.00	-	-	-	0.00	0.00	-	-	-	-	-
35	-	-	-	-	0.00	-	-	-	-	-	-	-	-	0.00	-	-	0.00	-	-	-	0.00	0.00	-	0.00	-	-	-
36	-	-	-	-	0.00	-	-	-	-	-	-	-	-	0.00	-	-	0.00	-	-	-	0.00	0.56	-	-	-	-	-
37	-	-	-	-	0.00	-	-	-	-	-	-	-	-	0.00	-	-	0.20	-	-	-	0.00	0.89	-	10.20	-	-	-
38	-	-	-	-	0.00	-	-	-	-	-	-	-	-	0.00	-	-	0.60	-	-	-	0.00	2.44	-	-	-	-	-
39	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	0.00	-	0.00	0.40	-	-	-	3.00	5.65	-	0.00	-	-	-
40	-	-	-	-	0.00	-	-	-	-	-	-	-	-	0.00	-	1.00	0.20	-	-	-	4.20	6.25	-	-	-	-	-
41	-	-	-	-	0.00	0.00	-	-	-	-	-	-	-	0.00	-	2.00	0.00	-	-	-	6.65	4.25	-	0.00	-	-	-
42	-	-	-	-	0.00	-	-	-	-	-	-	-	-	0.00	-	2.00	0.20	-	-	-	7.00	8.63	-	-	-	-	-
43	-	-	-	-	5.00	0.00	-	-	-	-	-	-	-	1.00	-	3.00	0.40	-	-	-	7.20	5.89	-	0.00	-	-	-
44	-	-	-	-	10.00	-	-	-	-	-	-	-	-	2.00	-	7.00	0.60	-	-	-	3.20	4.44	-	-	-	-	-
45	-	-	-	-	10.00	12.00	-	-	-	-	-	-	-	2.00	-	9.00	0.70	-	-	-	4.80	3.65	-	-	-	-	-
46	-	-	-	-	15.00	-	-	-	-	-	-	-	-	3.00	-	11.00	0.20	-	-	-	2.60	2.65	-	-	-	-	-
47	-	-	-	-	10.00	14.00	-	-	-	-	-	-	--	2.00	-	13.00	0.40	-	-	-	3.20	3.00	-	-	-	-	-
48	-	-	-	-	15.00	-	-	-	-	-	-	-	-	3.00	-	17.00	0.40	-	-	-	2.40	1.25	-	-	-	-	-
49	-	-	-	-	10.00	28.00	-	-	-	-	-	-	-	2.00	-	22.00	0.20	-	-	-	3.00	0.00	-	-	-	-	-
50	-	-	-	-	20.00	-	-	-	-	-	-	-	-	4.00	-	25.00	0.80	-	-	-	0.00	0.00	-	-	-	-	-
51	-	-	-	-	30.00	40.00	-	-	-	-	-	-	-	9.00	-	29.00	-	-	-	-	0.00	0.00	-	-	-	-	-
52	-	-	-	-	25.00	-	-	-	-	-	-	-	-	6.00	-	37.00	-	-	-	-	0.00	0.00	-	-	-	-	-
01	-	-	-	-	40.00	-	-	-	-	-	-	-	-	10.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-
02	-	-	-	-	35.00	-	-			-	-			8.00	-	-			-	-		-	-		-	-	-
03	-	-	-	-	45.00	-	-			-	-			13.00	-	-			-	-		-	-		-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

Table: 92 . Ent 2. Seasonal dynamics of key pests of cotton (Bollworm) under unprotected condition in Central Zone during 2022-23- Weekly Trap Catches

SMW	*Helicoverpaarmigera*									*Pectinophoragossypiella*								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
29	-	-	0.00	-	-	0.00	0.00	-	-	-	-	2.00	-	-	0.00	0.00	-	-
30	-	0.00	0.00	-	-	1.00	1.00	-	-	-	0.00	1.00	-	-	0.00	0.00	-	-
31	-	0.00	0.00	-	-	3.00	1.00	-	-	-	0.00	2.00	-	-	4.00	0.00	-	-
32	-	0.00	1.00	0.00	-	4.00	2.00	-	-	-	0.00	3.00	0.00	-	0.00	0.00	-	-
33	-	0.00	3.00	2.00	-	5.00	5.00	-	-	-	0.00	1.00	0.00	-	2.00	0.00	-	-
34	-	0.00	2.00	2.50	-	9.00	9.00	-	3.00	-	0.00	3.00	0.00	-	0.00	0.00	-	-
35	-	0.00	8.00	3.50	-	5.00	12.00	-	2.00	-	0.00	2.50	0.00	-	0.00	0.00	-	-
36	-	1.00	7.00	6.50	-	4.00	15.00	-	7.00	-	0.00	3.00	0.00	-	0.00	0.00	-	-
37	2.00	0.00	10.00	7.80	-	3.00	19.00	-	1.00	-	0.00	5.00	0.00	-	0.00	2.00	-	-
38	5.00	1.00	10.50	9.50	-	2.00	24.00	-	3.00	-	0.00	4.00	0.00	-	0.00	5.00	-	-
39	3.00	0.00	15.00	12.50	-	9.00	29.00	-	1.00	-	0.00	10.00	0.00	-	0.00	11.00	-	-
40	2.00	1.00	22.00	15.50	-	6.00	21.00	-	2.00	-	0.00	9.00	1.00	-	1.00	7.00	-	-
41	-	2.00	17.00	16.50	-	10.00	20.00	-	-	-	0.00	12.50	1.50	-	2.00	9.00	-	-
42	-	15.00	29.00	17.50	-	8.00	16.00	-	-	-	0.00	16.00	3.00	-	1.00	11.00	-	-
43	-	13.00	40.00	13.50	-	7.00	13.00	-	-	-	0.00	25.00	5.50	-	2.00	8.00	-	-
44	-	2.00	43.00	20.50	-	8.00	9.00	-	-	1.00	1.00	36.00	6.50	-	3.00	9.00	-	-
45	-	7.00	37.00	17.00	-	5.00	5.00	-	-	2.00	3.00	47.50	8.00	-	2.00	18.00	-	-
46	-	9.00	35.00	14.50	-	3.00	3.00	-	-	1.00	7.00	65.00	9.50	-	2.00	44.00	-	-
47	-	3.00	23.00	7.50	-	2.00	0.00	-	-	1.00	15.00	61.00	11.50	-	2.00	29.00	-	-
48	-	4.00	12.00	7.00	-	3.00	0.00	-	-	-	19.00	86.00	8.50	-	1.00	302.00	-	-
49	-	6.00	7.00	6.00	-	4.00	0.00	-	-	-	23.00	110.00	8.00	-	4.00	318.00	-	-
50	-	4.00	3.00	5.00	-	4.00	0.00	-	-	-	34.00	130.00	7.00	-	5.00	349.00	-	-
51	-	7.00	0.00	4.00	-	5.00	0.00	-	-	-	49.00	145.00	6.50	-	5.00	387.00	-	-
52	-	7.00	0.00	6.00	-	6.00	0.00	-	-	-	52.00	133.00	6.00	-	6.00	354.00	-	-
01	-	-	0.00	-	-	-	-	-	-	-	-	123.00	-	-	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

Table: 93. Ent 2. Seasonal dynamics of key pests of cotton (Bollworm) under unprotected condition in Central Zone during 2022-23 in Central Zone- Weekly Trap catches.

SMW	*Earias spp.*									*Spodoptera litura*								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	0.00			-	-	-	-	-	-	0.00		
29	-	-	0.00	-	-	0.00	0.00	-	-	-	-	0.00	-	-	2.00	0.00	-	-
30	2.00	0.00	0.00	-	-	0.00	0.00	-	-	3.00	0.00	0.00	-	-	6.00	0.00	-	-
31	2.00	0.00	1.00	-	-	1.00	0.00	-	-	9.00	0.00	1.50	-	-	14.00	0.00	-	-
32	1.00	0.00	1.00	0.00	-	1.00	6.00	-	-	12.00	0.00	2.00	0.00	-	10.00	3.00	-	-
33	2.00	0.00	2.00	0.00	-	0.00	8.00	-	-	16.00	0.00	2.50	0.00	-	17.00	4.00	-	-
34	-	0.00	2.00	1.00	-	0.00	8.00	-	5.00	25.00	8.00	8.00	4.00	-	21.00	9.00	-	6.00
35	-	0.00	3.00	2.50	-	0.00	11.00	-	4.00	29.00	4.00	16.50	5.20	-	12.00	15.00	-	6.00
36	-	0.00	6.00	3.00	-	0.00	17.00	-	3.00	18.00	12.00	26.00	7.00	-	14.00	21.00	-	3.00
37	-	0.00	9.00	4.50	-	0.00	23.00	-	6.00	14.00	9.00	55.50	6.50	-	18.00	33.00	-	10.00
38	-	0.00	15.00	4.00	-	0.00	20.00	-	3.00	18.00	19.00	75.50	10.00	-	9.00	29.00	-	4.00
39	-	0.00	14.00	5.00	-	0.00	16.00	-	3.00	24.00	24.00	103.00	12.50	-	11.00	17.00	-	2.00
40	-	0.00	10.00	5.50	-	0.00	11.00	-	2.00	27.00	25.00	135.00	17.50	-	19.00	6.00	-	4.00
41	-	1.00	8.00	7.50	-	0.00	7.00	-	2.00	28.00	23.00	166.00	19.00	-	25.00	3.00	-	3.00
42	-	0.00	6.00	8.50	-	0.00	4.00	-	3.00	35.00	34.00	145.00	20.50	-	20.00	4.00	-	0.00
43	-	1.00	8.00	9.00	-	0.00	2.00	-	1.00	37.00	20.00	160.00	20.50	-	17.00	7.00	-	2.00
44	-	0.00	7.00	10.50	-	0.00	1.00	-	-	28.00	31.00	125.00	22.50	-	12.00	10.00	-	3.00
45	-	0.00	5.00	14.50	-	0.00	1.00	-	-	13.00	42.00	122.00	27.00	-	10.00	14.00	-	1.00
46	-	0.00	2.00	15.00	-	0.00	0.00	-	-	6.00	29.00	89.00	26.50	-	8.00	6.00	-	-
47	-	5.00	4.00	11.00	-	0.00	0.00	-	-	-	0.00	70.00	17.00	-	7.00	5.00	-	-
48	-	2.00	3.00	8.00	-	0.00	0.00	-	-	-	15.00	55.00	11.50	-	8.00	2.00	-	-
49	-	3.00	3.00	4.00	-	0.00	0.00	-	-	-	21.00	30.00	10.50	-	9.00	5.00	-	-
50	-	4.00	0.00	2.50	-	0.00	0.00	-	-	-	20.00	25.00	7.00	-	6.00	6.00	-	-
51	-	3.00	0.00	2.00	-	0.00	0.00	-	-	-	22.00	18.00	4.00	-	6.00	0.00	-	-
52	-	2.00	0.00	2.00	-	0.00	0.00	-	-	-	26.00	11.00	3.00	-	5.00	0.00	-	-
01	-	-	0.00	-	-	-	-	-	-	-	-	5.00	-	-		-	-	-
02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

Table: 94. Ent 2. Seasonal dynamics of key pests of cotton (Abiotic factors) under unprotected condition in Central Zone during 2022-23.

SMW	Temperature(°C)																	
	BA		JU		SU		BH		AK		NA		RA		KH		BW	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max	Min.	Max	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
23	28.10	41.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	25.10	38.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	27.50	38.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	27.60	36.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	26.80	34.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	24.60	31.50	-	-	-	-	-	-	-	-	-	-	23.40	26.20	-	-	-	-
29	25.30	30.20	-	-	25.50	28.90	-	-	-	-	18.80	29.70	24.00	29.30	-	-	-	-
30	24.90	29.70	24.20	30.50	26.50	30.90	-	-	-	-	18.10	29.60	23.50	29.10	-	-	24.40	32.30
31	25.50	31.80	24.50	32.40	26.20	31.90	-	-	-	-	18.80	31.70	23.50	30.70	-	-	24.40	33.70
32	24.80	26.80	24.40	31.60	26.90	33.10	26.03	31.86	-	-	19.40	32.90	24.10	28.30	-	-	23.60	29.10
33	24.50	30.00	23.60	29.60	26.00	31.40	25.43	30.34	-	-	20.10	33.10	24.10	28.30	-	-	23.40	29.80
34	24.60	29.60	23.80	30.20	25.50	29.80	25.03	29.74	21.40	30.80	20.90	33.30	24.30	28.50	-	-	23.10	33.70
35	24.30	32.50	23.30	32.20	26.90	31.20	25.71	30.31	21.80	32.30	20.40	34.40	23.20	31.60	-	-	23.80	34.50
36	25.20	34.20	24.40	33.60	25.90	33.40	25.34	33.09	21.30	32.10	18.40	31.00	23.40	30.80	-	-	23.80	33.50
37	24.90	33.00	23.50	32.40	26.70	34.40	26.91	34.91	21.50	30.50	19.10	31.60	23.60	29.00	-	-	24.10	32.70
38	23.80	32.30	23.00	32.40	25.30	31.50	25.40	31.43	20.80	30.40	20.30	31.90	22.20	27.50	-	-	23.80	30.30
39	23.30	32.50	22.50	32.90	25.70	31.40	25.17	31.71	20.70	32.60	19.60	32.00	22.70	29.90	-	-	23.30	32.50
40	22.00	34.70	23.40	33.80	25.20	32.50	25.11	32.83	20.50	31.80	19.60	33.30	23.00	31.30	-	-	23.40	30.10
41	21.30	32.40	23.40	35.00	26.30	33.40	25.20	33.86	21.30	30.30	19.30	31.10	22.60	28.50	-	-	23.00	30.90
42	16.80	33.90	20.20	35.90	24.40	32.10	24.40	32.20	18.70	31.00	19.60	32.00	21.60	27.60	-	-	21.40	30.50
43	14.10	33.50	19.70	35.60	23.70	34.80	23.23	30.31	13.90	31.80	19.70	32.40	18.70	27.50	-	-	17.20	30.30
44	14.30	33.30	18.20	35.40	21.00	35.20	22.71	35.00	12.20	31.80	17.70	32.70	17.60	29.60	-	-	16.80	29.40
45	16.50	34.20	16.90	33.90	19.30	35.20	21.57	35.51	13.50	33.30	16.30	32.30	17.20	31.00	-	-	16.10	30.10
46	13.60	31.70	13.80	32.30	20.20	35.70	20.06	35.63	11.80	31.30	15.70	32.30	15.60	29.40	-	-	12.70	28.70
47	10.80	29.70	14.90	32.60	20.70	34.00	19.43	33.49	8.40	29.10	14.90	32.00	14.20	28.00	-	-	15.50	28.30
48	11.70	29.90	16.00	31.30	16.30	32.30	14.97	31.63	8.90	29.90	16.10	31.90	16.20	30.50	-	-	13.80	28.40
49	12.40	29.10	15.30	31.40	18.20	33.30	14.31	31.77	12.00	29.90	14.30	31.30	16.30	30.10	-	-	13.60	27.20
50	14.80	29.00	17.70	31.60	20.50	31.70	14.57	30.31	15.40	30.40	17.60	29.90	17.50	28.90	-	-	18.50	30.20
51	13.70	29.70	17.30	32.20	21.50	33.60	14.77	33.17	11.60	30.90	16.00	31.60	16.30	28.90	-	-	11.70	28.40
52	9.20	28.00	11.70	28.70	19.60	32.60	16.66	33.49	12.50	31.00	16.50	32.10	16.00	31.70	-	-	14.20	31.40
01	-	-	-	-	20.20	33.40	-	-	11.40	26.70	-	-	-	-	-	-	-	-
02	-	-	-	-	-	-	-	-	9.30	28.80	-	-	-	-	-	-	-	-
03	-	-	-	-	-	-	-	-	11.60	29.10	-	-	-	-	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

Table: 95 . Ent 2. Seasonal dynamics of key pests of cotton (Abiotic factors) under unprotected condition in Central Zone during 2022-23.

SMW	Relative Humidity (%)																	
	BA		JU		SU		BH		AK		NA		RA		KH		BW	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
23	50.00	21.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	66.00	39.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	69.00	42.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	78.00	48.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	81.00	61.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	88.00	71.00	-	-	-	-	-	-	-	-	-	-	89.40	79.90	-	-	-	-
29	86.00	77.00	-	-	100.00	88.00	-	-	-	-	82.70	70.00	84.70	63.00	-	-	-	-
30	89.00	75.00	94.00	78.00	95.00	77.00	-	-	-	-	81.10	74.90	86.70	65.10	-	-	79.00	80.10
31	86.00	69.00	92.00	74.00	95.00	68.00	-	-	-	-	80.40	67.50	88.90	62.40	-	-	87.60	74.00
32	89.00	73.00	92.00	83.00	90.00	63.00	81.00	70.57	-	-	78.40	64.70	81.60	70.90	-	-	87.80	88.80
33	88.00	71.00	94.00	88.00	90.00	60.00	91.14	84.14	-	-	74.70	61.90	81.30	70.00	-	-	93.00	83.10
34	89.00	73.00	90.00	73.00	88.00	60.00	79.14	76.14	82.00	60.00	68.30	61.00	78.40	64.10	-	-	74.90	81.00
35	84.00	59.00	85.00	64.00	80.00	60.00	78.57	71.00	88.00	54.00	73.60	55.90	84.00	53.90	-	-	85.40	76.60
36	84.00	53.00	86.00	59.00	85.00	65.00	79.00	59.14	91.00	58.00	82.00	73.10	91.00	65.00	-	-	87.40	77.40
37	88.00	63.00	91.00	77.00	84.00	61.00	85.57	58.57	88.00	72.00	77.60	71.40	91.40	74.40	-	-	87.60	71.30
38	83.00	61.00	84.00	57.00	87.00	74.00	88.43	73.57	88.00	62.00	74.40	66.40	90.10	70.40	-	-	89.60	84.10
39	81.00	53.00	83.00	58.00	81.00	76.00	77.57	59.71	86.00	55.00	76.30	66.70	91.60	62.70	-	-	90.00	74.40
40	78.00	50.00	81.00	49.00	81.00	67.00	80.57	60.00	86.00	53.00	72.70	58.00	86.60	58.00	-	-	92.90	83.60
41	81.00	54.00	85.00	47.00	77.00	62.00	72.86	54.14	90.00	62.00	80.30	69.80	92.90	68.70	-	-	93.10	84.30
42	76.00	40.00	62.00	25.00	83.00	75.00	83.29	68.14	88.00	57.00	73.70	65.30	92.30	70.90	-	-	91.70	79.30
43	74.00	38.00	67.00	27.00	63.00	50.00	70.00	70.14	88.00	39.00	71.40	60.60	84.90	42.60	-	-	88.40	66.30
44	71.00	30.00	61.00	28.00	64.00	39.00	49.43	37.43	87.00	41.00	77.00	61.30	83.00	36.30	-	-	73.40	66.00
45	73.00	26.00	72.00	27.00	56.00	39.00	47.43	30.29	83.00	37.00	63.40	44.00	76.90	27.30	-	-	74.00	66.10
46	73.00	31.00	68.00	28.00	63.00	49.00	60.14	27.14	82.00	38.00	67.70	40.90	84.60	33.70	-	-	69.30	59.70
47	72.00	31.00	69.00	32.00	55.00	42.00	59.14	28.43	80.00	34.00	73.40	43.70	77.86	31.86	-	-	76.90	62.90
48	72.00	34.00	65.00	33.00	54.00	33.00	53.71	22.00	86.00	35.00	69.10	43.00	81.40	36.30	-	-	73.00	62.60
49	70.00	39.00	68.00	32.00	58.00	45.00	47.29	22.71	83.00	38.00	73.60	44.30	87.90	38.70	-	-	81.70	62.90
50	70.00	37.00	73.00	34.00	64.00	49.00	50.14	33.86	85.00	45.00	59.00	50.10	87.10	44.00	-	-	77.70	63.00
51	72.00	36.00	63.00	26.00	68.00	49.00	60.43	46.29	84.00	40.00	64.70	45.40	83.00	34.00	-	-	65.60	50.40
52	72.00	35.00	70.00	30.00	65.00	48.00	70.71	61.14	85.00	42.00	63.60	42.10	80.60	30.50	-	-	64.10	55.70
1	-	-	-.	-	64.00	49.00	-	-	84.00	52.00	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	84.00	33.00	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	82.00	38.00	-	-	-	-	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna , **AM**-Morning, **PM**-Evening

Table: 96. Ent 2. Seasonal dynamics of key pests of cotton (Abiotic factors) under unprotected condition in Central Zone during 2022-23.

SMW	Rainfall in mm								
	BA	JU	SU	BH	AK	NA	RA	KH	BW
23	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-
25	14.60	-	-	-	-	-	-	-	-
26	25.20	-	-	-	-	-	-	-	-
27	32.20	-	-	-	-	-	-	-	-
28	92.50	-	-	-	-	-	-	-	-
29	123.50	-	221.50	-	-	74.00	7.40	-	-
30	50.00	27.70	30.50	-	-	80.20	68.40	-	57.80
31	13.50	61.20	37.50	-	-	182.80	120.00	-	37.80
32	184.30	108.60	84.00	4.69	-	34.00	56.20	-	261.80
33	106.10	203.90	100.50	9.63	-	7.20	2.60	-	238.20
34	76.50	3.30	218.00	2.14	5.90	7.60	1.60	-	6.60
35	4.70	7.30	4.50	1.10	25.00	2.40	29.80	-	9.40
36	-	14.00	23.50	0.00	36.60	75.40	150.00	-	1.80
37	61.00	100.70	16.50	2.91	102.00	67.60	75.80	-	14.60
38	9.20	0.00	130.50	13.29	77.50	43.40	98.00	-	87.20
39	-	2.40	8.00	1.06	24.00	50.60	32.60	-	4.40
40	5.90	0.00	27.00	2.14	55.70	69.20	30.80	-	42.80
41	33.00	51.20	19.50	0.00	20.00	34.80	65.80	-	26.00
42	-	0.00	60.00	8.29	40.90	8.40	58.00	-	43.00
43	0.00	0.00	0.00	0.00	0.00	0.00	4.60	-	0.00
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
50	1.50	0.00	0.00	0.00	2.80	1.40	0.00	-	0.00
51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
1	-	-	0.00	-	0.00	-	-	-	-

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

Table :97.Ent 2: Incidence of pink bollworm in green boll and open boll stage in different variety/hybrids (Unprotected) at Central Zone (2022-23)

Variety/ hybrids	Green boll damage (%) due to PBW through 50 green boll destructive sampling					PBW larval recovery through 50 green boll destructive sampling					Open Boll Damage (%)					Locule Damage (%)				
	SU	BH	JU	NA	BW	SU	BH	JU	NA	BW	SU	BH	JU	NA	BW	SU	BH	JU	NA	BW
DCH 32	16.00	16.00	18.15	2.80	-	6.25	6.25	-	1.60	-	22.37	25.30	20.48	12.5	-	11.40	12.60	14.66	6.93	-
Suraj	15.00	14.00	-	5.20	-	6.00	5.50	-	3.00	-	16.35	18.36	-	16.3	-	9.25	10.25	-	8.80	-
RCH 2/Ajeet 155 BG II	9.50	10.50	5.33	3.60	-	4.00	4.50	-	2.00	-	10.25	12.25	5.10	13.82	-	5.66	6.66	3.74	7.34	-
BS-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.10	-	-	-	-	8.77

BA- Banswara**, JU-** Junagadh**, SU-** Surat**, BH-** Bharuch**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **KH-** Khandwa, **BW-** Bhawanipatna

Table: 98.Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition in South Zone during 2022-23 in Jadoo BG/ Bahubali BG II

SMW	Sucking Pests													
	Aphids/ 3 leaves							Jassid/ 3 leaves						
	LG	ND	DW	RC	CN*	CBE	SVPR	LG	ND	DW	RC	CN*	CBE	SVPR
27	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-
28	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-
29	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-
30	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-
31	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-
32	-	0.00	0.00	5.23	25.6	-	-	-	8.00	0.90	0.00	1.23	-	-
33	-	0.00	0.40	3.92	23.6	-	-	-	7.00	1.20	3.92	1.85	-	-
34	-	0.00	1.20	7.90	15.63	-	-	-	9.00	2.60	7.90	0.92	-	-
35	-	0.00	2.00	3.85	10.52	-	-	-	10.00	3.80	3.85	0.75	-	-
36	-	0.00	3.60	2.67	8.60	-	-	-	7.00	4.90	2.67	0.21	-	-
37	-	0.00	4.70	0.00	30.56	-	-	-	6.00	5.40	8.53	3.52	-	-
38	-	2.00	6.80	0.00	35.40	-	-	-	4.00	6.20	9.10	3.60	-	-
39	-	0.00	8.20	0.00	40.60	-	-	-	5.00	7.40	10.12	4.25	-	-
40	-	4.00	9.90	5.91	26.30	-	-	-	6.00	9.60	5.91	2.60	-	-
41	-	6.00	12.40	1.54	14.26	-	-	-	7.00	10.80	5.54	2.42	-	-
42	-	8.00	15.70	0.55	12.45	-	-	-	8.00	11.60	6.51	2.50	-	-
43	-	5.00	22.00	0.00	16.30	-	-	-	9.00	12.80	6.49	1.60	-	-
44	-	5.00	25.70	0.00	24.60	-	-	-	7.00	13.90	7.41	2.30	-	-
45	-	8.00	30.40	0.00	22.40	-	-	-	8.00	14.40	10.31	1.60	-	-
46	-	9.00	32.80	0.00	18.25	-	-	-	10.00	12.75	12.34	2.30	-	-
47	-	10.00	39.20	0.00	26.50	-	-	-	9.00	10.20	5.25	3.20	-	-
48	-	8.00	42.60	0.00	28.90	-	-	-	8.00	9.70	4.33	4.15	-	-
49	-	6.00	31.20	0.00	17.52	-	-	-	7.00	7.40	4.41	3.50	-	-
50	-	5.00	25.50	0.00	16.32	-	-	-	6.00	6.20	2.49	3.33	-	-
51	-	6.00	14.80	0.00	10.26	-	-	-	7.00	5.80	3.00	1.56	-	-
52	-	8.00	10.40	0.00	16.25	-	-	-	8.00	3.20	2.49	0.80	-	-
01	-	-	-	-	11.30	-	-	-	-	-	-	0.78	-	-
02	-	-	-	-	9.80	-	-	-	-	-	-	0.53	-	-

LG-Lam Guntur**, ND-** Nandyal**, DW-**Dharwad**, RC-**Raichur**, CN-** Chamarajanagar**, CBE-** Coimbatore**, SVPR-**Srivilliputtur,
CN*- Bahubali BG-II Sown at Chamarajanagar

Table: 99.Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests & Natural enemies) under unprotected condition in South Zone during 2022-23 in Jadoo BG/ Bahubali BG II

SMW	Sucking Pests														Natural Enemies/plant#					
	Whitefly/ 3 leaves							Thrips/ 3 leaves												
	LG	ND	DW	RC	CN*	CBE	SVPR	LG	ND	DW	RC	CN*	CBE	SVPR	LG	ND	DW	RC	CN*	CBE
24	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
25	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
26	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
27	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
28	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
29	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
30	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
31	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
32	-	5.00	0.00	0.00	0.00	-	-	-	22.00	1.20	15.10	3.25	-	-	-	-	0.20	1.56	1.56	-
33	-	4.00	0.00	0.00	0.00	-	-	-	18.00	6.60	13.12	2.50	-	-	-	-	0.40	1.33	2.30	-
34	-	6.00	0.10	0.00	0.00	-	-	-	16.00	13.20	20.50	1.56	-	-	-	-	0.70	-	1.23	-
35	-	4.00	0.20	0.00	0.00	-	-	-	12.00	21.40	19.33	1.55	-	-	-	-	1.00	3.70	1.33	-
36	-	6.00	0.40	0.00	0.00	-	-	-	11.00	34.60	16.14	2.60	-	-	-	-	0.40	2.80	1.10	-
37	-	7.00	0.80	1.20	3.55	-	-	-	10.00	44.80	23.2	3.25	-	-	-	-	0.20	4.00	2.60	-
38	-	8.00	1.00	2.33	4.26	-	-	-	2.00	39.20	25.12	4.50	-	-	-	-	0.50	4.20	2.48	-
39	-	6.00	1.20	6.05	3.40	-	-	-	3.00	34.10	23.15	2.53	-	-	-	-	0.50	2.40	3.50	-
40	-	12.00	1.40	5.40	1.25	-	-	-	4.00	30.25	30.12	2.20	-	-	-	-	0.60	5.00	2.60	-
41	-	14.00	1.80	1.91	0.88	-	-	-	11.00	27.40	12.51	1.60	-	-	-	-	1.10	3.90	2.15	-
42	-	12.00	0.80	8.40	0.60	-	-	-	22.00	19.70	13.12	1.52	-	-	-	-	0.80	1.60	1.62	-
43	-	14.00	1.60	9.00	1.26	-	-	-	18.00	14.20	18.40	0.00	-	-	-	-	0.80	3.20	1.30	-
44	-	28.00	1.40	6.70	0.80	-	-	-	19.00	10.75	16.60	0.00	-	-	-	-	1.10	2.35	1.50	-
45	-	22.00	1.00	10.40	0.25	-	-	-	16.00	7.40	9.45	0.00	-	-	-	-	0.70	5.20	1.08	-
46	-	28.00	0.40	8.31	0.00	-	-	-	18.00	5.70	5.42	0.00	-	-	-	-	1.00	2.40	0.87	-
47	-	26.00	0.50	7.41	0.00	-	-	-	6.00	3.50	5.20	0.00	-	-	-	-	1.30	0.00	0.00	-
48	-	31.00	0.40	5.36	0.00	-	-	-	7.00	2.60	7.20	0.00	-	-	-	-	1.10	0.80	0.00	-
49	-	28.00	0.10	4.48	0.00	-	-	-	8.00	1.80	6.42	0.00	-	-	-	-	1.00	0.33	0.00	-
50	-	42.00	0.00	3.60	0.00	-	-	-	10.00	1.20	5.55	0.00	-	-	-	-	1.20	0.00	0.00	-
51	-	38.00	0.00	2.72	0.00	-	-	-	11.00	0.80	4.67	0.00	-	-	-	-	0.60	0.00	0.00	-
52	-	36.00	0.00	1.84	0.00	-	-	-	9.00	0.40	3.79	0.00	-	-	-	-	0.40	0.00	0.00	-
01	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-			0.00	-
02	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-			0.00	-

LG-Lam Guntur**, ND-** Nandyal**, DW-**Dharwad**, RC-**Raichur**, CN-** Chamarajanagar**, CBE**- Coimbatore**, SVPR-**Srivilliputtur,**CN*-** Bahubali BG-II Sown at Chamarajanagar
#Natural Enemies include coccinellids, chrysopids, syrphids and spider.

Table: 100. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in South Zone during 2022-23 in Jadoo BG/ Bahubali BG II

SMW	No. of Larval Recovery/5plants																				
	H.armigera							*Earias spp.*							*S.litura*						
	LG	ND	DW	RC	CN*	CBE	SVPR	LG	ND	DW	RC	CN*	CBE	SVPR	LG	ND	DW	RC	CN*	CBE	SVPR
24	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
25	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
26	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
27	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
28	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
29	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
30	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
31	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
32	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	0.00	-	-	-
33	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	0.00	-	-	-
34	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	3.33	-	-	-
35	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	0.00	-	-	-
36	-	-	0.00	0.00	-	-	-	-	-	0.10	0.00	-	-	-	-	-	-	0.00	-	-	-
37	-	-	0.10	0.00	-	-	-	-	-	0.10	0.00	-	-	-	-	-	-	2.67	-	-	-
38	-	-	0.20	0.00	-	-	-	-	-	0.10	0.00	-	-	-	-	-	-	0.00	-	-	-
39	-	-	0.20	0.00	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	2.33	-	-	-
40	-	-	0.00	0.00	-	-	-	-	-	0.10	0.00	-	-	-	-	-	-	3.33	-	-	-
41	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	1.67	-	-	-
42	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	0.00	-	-	-
43	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	0.00	-	-	-
44	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	0.00	-	-	-
45	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	0.00	-	-	-
46	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	0.00	-	-	-
47	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-	-	-	-	-	-	0.00	-	-	-
48	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-					-	0.00	-	-	-
49	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-					-	0.00	-	-	-
50	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-					-	2.33	-	-	-
51	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-					-	0.00	-	-	-
52	-	-	0.00	0.00	-	-	-	-	-	0.00	0.00	-					-	0.00	-	-	-
1	-	-			-	-	-	-	-			-					-		-	-	-
2	-	-			-	-	-	-	-			-					-		-	-	-

LG-Lam Guntur, **ND**- Nandyal, **DW**-Dharwad, **RC**-Raichur, **CN**- Chamarajanagar, **CBE**- Coimbatore, **SVPR**-Srivilliputtur,**CN*** - Bahubali BG-II Sown at Chamarajanagar

Table: 101. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in South Zone during 2022-23 in Jadoo BG/ Bahubali BG II*

SMW	Fruiting Body Damage (%) **						GBD (%) by ABW/ TC/SBW						Pink bollworm/20 green bolls												
													GBD (%)							Number of Larvae					
	LG	ND	DW	RC	CN	CBE	LG	ND	DW	RC	CN*	CBE	LG	ND	DW	RC	CN*	CBE	SVPR	LG	ND	DW*	RC	CN*	CBE
24	-	-	-	-	-	-	-	-	-	-	-		-	-	0.00	-	-			-	-	0.00	-	-	
25	-	-	-	-	-	-	-	-	-	-	-		-	-	0.00	-	-			-	-	0.00	-	-	
26	-	-	-	-	-	-	-	-	-	-	-		-	-	0.00	-	-			-	-	0.00	-	-	
27	-	-	-	-	-	-	-	-	-	-	-		-	-	0.00	-	-			-	-	0.00	-	-	
28	-	-	-	-	-	-	-	-	-	-	-		-	-	0.00	-	-			-	-	0.00	-	-	
29	-	-	-	-	-	-	-	-	-	-	-		-	-	0.00	-	-			-	-	0.00	-	-	
30	-	-	-	-	-	-	-	-	-	-	-		-	-	0.00	-	-			-	-	0.00	-	-	
31	-	-	-	-	-	-	-	-	-	-	-		-	-	0.00	-	-			-	-	0.00	-	-	
32	-	-	-	0.00	-	-	-	-	-	-	-		-	-	0.00	-	-			-	-	0.00	-	-	
33	-	-	-	0.00	-	-	-	-	-	-	-		-	-	0.00	-	-			-	-	0.00	-	-	
34	-	-	-	10.53	-	-	-	-	-	-	-		-	-	0.00	-	-			-	-	0.00	-	-	
35	-	-	-	30.00	-	-	-	-	-	0.00	-		-	-	0.00	-	-			-	-	0.00	-	-	
36	-	-	-	41.67	-	-	-	-	-	6.67	-		-	-	0.00	-	-			-	-	0.00	-	-	
37	-	-	-	8.33	-	-	-	-	-	5.33	-		-	-	0.00	-	-			-	-	0.00	-	-	
38	-	-	-	25.00	-	-	-	-	-	8.33	-		-	-	1.60	-	-			-	-	0.00	-	-	
39	-	-	-	34.48	-	-	-	-	-	6.67	-		-	-	5.10	-	-			-	-	0.00	-	-	
40	-	-	-	34.29	-	-	-	-	-	8.36	-		-	-	7.80	-	-			-	-	2.00	-	-	
41	-	-	-	31.91	-	-	-	-	-	0.00	-		-	-	10.60	-	-			-	-	4.00	-	-	
42	-	6.00	-	36.36	-	-	-	-	-	0.00	-		-	-	13.50	-	-			-	1.00	9.00	-	-	
43	-	10.00	-	37.50	-	-	-	-	-	0.00	-		-	-	14.40	-	-			-	2.00	12.00	-	-	
44	-	9.00	-	26.09	-	-	-	-	-	0.00	-		-	-	16.60	-	-			-	2.00	17.00	-	-	
45	-	10.00	-	21.51	-	-	-	-	-	0.00	-		-	-	19.80	-	-			-	4.00	22.00	-	-	
46	-	15.00	-	21.00	-	-	-	-	-	0.00	-		-	-	21.20	-	-			-	5.00	25.00	-	-	
47	-	20.00	-	0.00	-	-	-	-	-	0.00	-		-	-	23.50	-	-			-	8.00	30.00	-	-	
48	-	25.00	-	0.00	-	-	-	-	-	0.00	-		-	-	27.40	-	-			-	10.00	33.00	-	-	
49	-	20.00	-	0.00	-	-	-	-	-	0.00	-		-	-	24.60	-	-			-	5.00	22.00	-	-	
50	-	25.00	-	0.00	-	-	-	-	-	0.00	-		-	-	19.20	-	-			-	6.00	14.00	-	-	
51	-	20.00	-	0.00	-	-	-	-	-	0.00	-		-	-	9.40	-	-			-	10.00	9.00	-	-	
52	-	25.00	-	0.00	-	-	-	-	-	0.00	-		-	-	4.80	-	-			-	15.00	5.00	-	-	
1	-	20.00	-	-	-	-	-	-	-	-	-		-	-		-	-			-	16.00		-	-	
2			-	-	-	-			-	-	-					-	-						-	-	

LG-Lam Guntur**, ND**- Nandyal**, DW**-Dharwad**, RC**-Raichur**, CN**- Chamarajanagar**, CBE**- Coimbatore**, SVPR**-Srivilliputtur, *- Bahubali BG-II Sown at Chamarajanagar and Dharwad.
** Fruiting Body damage includes damage in squares, flowers and boll

Table: 102. Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition in South Zone during 2022-23 in DCH 32 NBt.

SMW	Sucking Pests												
	Aphids/ 3 leaves						Jassid/ 3 leaves						
	LG	ND	DW	RC	CN	CBE	LG	ND	DW	RC	CN	CBE	SVPR
24	-	-	0.00	-	-	-	-		0.00	-	-	-	-
25	-	-	0.00	-	-	-	-		0.00	-	-	-	-
26	-	-	0.00	-	-	-	-		0.00	-	-	-	-
27	-	-	0.00	-	-	-	-		0.00	-	-	-	-
28	-	-	0.00	-	-	-	-		0.00	-	-	-	-
29	-	-	0.00	-	-	-	-		0.00	-	-	-	-
30	-	-	0.00	-	-	-	-		0.00	-	-	-	-
31	-	-	0.00	-	-	-	-		0.20	-	-	-	-
32	3.76	0.00	0.00	9.55	-	-	0.04	13.00	1.60	0.00	-	-	-
33	-	0.00	0.80	6.23	-	0.00	-	14.00	2.40	0.51	-	0.00	-
34	1.08	0.00	1.80	11.51	-	0.00	5.16	12.00	3.10	8.14	-	1.50	-
35	0.68	0.00	3.20	7.33	-	0.00	1.92	21.00	4.60	6.54	-	1.30	-
36	1.32	0.00	4.40	5.21	-	0.00	7.04	14.00	5.70	7.85	-	1.70	-
37	2.52	0.00	6.20	1.23	-	0.00	20.28	12.00	6.60	10.49	-	1.60	-
38	2.64	2.00	7.40	3.42	-	0.00	5.20	6.00	7.90	15.13	-	2.80	-
39	3.08	0.00	9.70	0.00	-	6.80	30.48	7.00	8.80	11.30	-	0.85	-
40	-	5.00	11.40	9.51	-	4.92	-	8.00	10.20	16.10	-	2.32	-
41	-	10.00	14.60	5.13	-	5.60	-	9.00	12.40	9.15	-	3.68	-
42	0.40	10.00	17.20	2.03	-	0.59	7.56	14.00	13.70	10.15	-	4.31	-
43	1.72	12.00	26.90	1.03	-	7.02	11.88	12.00	14.60	12.55	-	7.02	-
44	0.72	13.00	30.40	0.00	-	2.16	10.2	14.00	15.20	10.45	-	8.70	-
45	2.76	12.00	33.80	1.22	-	2.61	13.88	14.00	15.80	12.35	-	9.58	-
46	2.80	14.00	36.70	0.00	-	2.71	12.52	26.00	13.10	16.50	-	3.94	-
47	2.08	25.00	41.50	0.00	-	2.45	12.84	32.00	11.70	15.36	-	3.42	-
48	5.96	20.00	45.80	0.00	-	1.24	13.76	28.00	10.50	9.35	-	3.22	-
49	4.40	15.00	34.20	0.00	-	1.22	12.80	24.00	8.20	8.03	-	2.54	
50	1.68	15.00	27.60	0.00	-	0.54	13.56	22.00	6.70	7.62	-	2.35	
51	4.68	10.00	21.50	0.00	-	1.82	7.04	18.00	5.20	5.26	-	2.11	
52	1.08	15.00	16.20	0.00	-	2.33	3.52	22.00	4.00	4.66	-	1.49	
1	1.44	-	-	-	-	2.45	5.24	-	-	-	-	1.24	
2	3.44	-	-	-	-	3.21	8.48	-	-	-	-	0.88	
3	3.40	-	-	-	-	1.47	6.68	-	-	-	-	1.74	
4		-	-	-	-	2.22		-	-	-	-	1.22	

LG-Lam Guntur**, ND**- Nandyal**, DW**-Dharwad**, RC**-Raichur**, CN**- Chamarajanagar**, CBE**- Coimbatore**, SVPR**-Srivilliputtur,

Table: 103. Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition in South Zone during 2022-23 in DCH 32 NBt.

SMW	Sucking Pests														Natural Enemies#					
	Whitefly/ 3 leaves							Thrips/ 3 leaves												
	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE
24	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
25	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
26	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
27	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
28	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
29	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
30	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
31	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
32	0.24	7.00	0.00	0.00	-	-	-	2.32	32.00	2.50	11.53	-	-	-	0.04	-	0.40	2.20	-	-
33	-	6.00	0.10	0.00	-	0.00	-	-	36.00	8.90	12.40	-	0.00	-	-	-	0.70	1.60	-	0.00
34	1.56	8.00	0.20	0.00	-	0.00	-	19.56	41.00	15.80	19.31	-	0.00	-	0.20	-	0.90	4.60	-	0.00
35	1.88	7.00	0.40	0.00	-	0.00	-	11.44	28.00	30.40	22.15	-	0.00	-	0.00	-	1.10	2.20	-	0.00
36	1.24	8.00	0.60	0.00	-	0.00	-	15.64	32.00	41.25	17.15	-	0.67	-	0.24	-	1.00	1.60	-	0.1
37	3.08	9.00	1.20	0.00	-	0.50	-	2.28	36.00	50.60	27.10	-	1.20	-	0.04	-	0.80	3.00	-	0.05
38	3.12	9.00	1.40	0.00	-	0.54	-	7.44	4.00	44.40	27.80	-	1.40	-	0.16	-	0.70	4.60	-	0.04
39	8.36	10.00	1.60	0.00	-	0.63	-	4.08	1.00	39.40	22.33	-	8.48	-	0.48	-	0.90	0.60	-	0.07
40	-	16.00	1.90	0.00	-	0.41	-	-	2.00	31.75	30.10	-	9.31	-	-	-	0.90	3.60	-	0.09
41	-	20.00	2.40	1.03	-	0.45	-	-	28.00	28.90	7.96	-	8.44	-	-	-	1.50	3.10	--	0.11
42	3.24	18.00	1.60	4.33	-	1.49	-	0.52	42.00	22.90	11.33	-	8.47	-	0.36	-	1.40	1.20	-	0.12
43	5.52	21.00	1.20	4.23	-	0.18	-	0.28	33.00	16.60	16.10	-	11.94	-	0.40	-	1.60	4.60	-	0.32
44	4.52	32.00	1.00	5.20	-	1.57	-	1.84	42.00	12.80	15.20	-	8.72	-	0.36	-	1.40	3.60	-	0.15
45	3.36	32.00	1.40	3.32	-	1.49	-	2.60	30.00	10.90	5.45	-	7.69	-	0.32	-	1.90	3.20	-	0.2
46	6.20	31.00	1.00	4.67	-	1.57	-	2.16	31.00	9.50	6.41	-	6.31	-	0.28	-	2.00	0.00	-	0.27
47	3.76	28.00	1.60	3.32	-	1.66	-	0.68	20.00	7.00	4.23	-	5.57	-	0.28	-	1.90	0.60	-	0.12
48	2.00	38.00	0.80	5.35	-	1.23	-	3.08	20.00	5.20	7.31	-	4.21	-	0.60	-	1.70	0.00	-	0.00
49	5.52	30.00	0.60	5.20	-	1.14	-	2.40	18.00	4.60	5.85	-	3.84	-	0.84	-	1.10	0.00	-	0.00
50	1.04	40.00	0.40	3.95	-	0.89	-	1.96	26.00	3.40	5.53	-	1.25	-	0.44	-	1.50	0.00	-	0.33
51	4.12	42.00	0.00	1.88	-	0.47	-	2.64	18.00	2.20	2.93	-	1.47	-	0.36	-	0.90	0.00	-	0.11
52	3.92	41.00	0.00	1.60	-	0.00	-	0.76	21.00	1.60	2.66	-	0.54	-	0.40	-	0.60	0.00	-	0.21
1	5.72	-	-	-	-	0.00	-	1.88	-	-	-	-	0.00	-	0.56	-	-	-	-	0.18
2	4.08	-	-	-	-	0.00	-	3.12	-	-	-	-	0.00	-	0.28	-	-	-	-	0.00
3	3.56	-	-	-	-	0.00	-	2.72	-	-	-	-	0.00	-	0.32	-	-	-	-	0.00
4		-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00

LG-Lam Guntur**, ND**- Nandyal**, DW**-Dharwad**, RC**-Raichur**, CN**- Chamarajanagar**, CBE**- Coimbatore**, SVPR**-Srivilliputtur,#Natural Enemies include coccinellids, chrysopids, syrphids and spider.

Table: 104. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in South Zone during 2022-23 in DCH 32 NBt.

SMW	No. of Larval Recovery/5plants																				
	H.armigera							*Earias* spp.							S.*litura*						
	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR
24	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
25	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
26	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
27	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
28	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
29	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
30	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
31	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
32	-	-	0.00	1.60	0.00	-	-	-	-	0.00	0.00	0.00	-	-	-	-	-	1.00	0.00	-	-
33	-	-	0.00	-	0.00	-	-	-	-	0.00	0.00	0.00	-	-	-	-	-	2.00	0.00	-	-
34	-	-	0.20	2.60	0.00	-	-	-	-	0.20	0.00	0.00	-	-	-	-	-	1.00	0.00	-	-
35	-	-	0.80	3.00	0.00	-	-	-	-	0.40	0.00	0.00	-	-	-	-	-	0.00	0.00	-	-
36	-	-	1.40	2.20	0.00	-	-	-	-	1.20	0.00	0.00	-	-	0.12	-	-	0.00	0.00	-	-
37	-	-	1.80	2.40	0.00	-	-	-	-	1.80	0.00	0.00	-	-	0.72	-	-	0.00	0.00	-	-
38	-	-	2.70	1.20	0.00	-	-	-	-	2.40	0.00	0.00	-	-	0.28	-	-	0.00	0.00	-	-
39	-	-	3.80	1.00	0.00	-	-	-	-	0.80	0.00	0.00	-	-	0.24	-	-	3.67	0.00	-	-
40	-	-	5.00	2.20	0.00	-	-	-	-	0.60	0.00	0.00	-	-		-	-	2.20	0.00	-	-
41	-	-	5.60	2.00	0.00	-	-	-	-	0.10	0.00	0.00	-	-		-	-	0.00	0.00	-	-
42	-	-	3.80	2.60	0.00	-	-	-	-	0.00	0.00	0.00	-	-	0.04	0.00	-	2.33	0.00	-	-
43	-	-	3.00	0.80	0.00	-	-	-	-	0.00	0.00	0.00	-	-	-	0.00	-	2.40	0.00	-	-
44	-	-	1.60	0.00	0.00	-	-	-	-	0.00	0.00	0.00	-	-	-	0.00	-	2.33	0.00	-	-
45	-	-	1.40	0.00	0.00	-	-	-	-	0.00	0.00	0.00	-	-	-	0.00	-	2.68	0.00	-	-
46	-	-	2.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	-	-	-	0.00	-	0.00	0.00	-	-
47	-	-	1.40	0.00	0.00	-	-	-	-	0.00	0.00	0.00	-	-	-	0.00	-	2.25	0.00	-	-
48	-	-	0.60	0.00	0.00	-	-	-	-	0.00	0.00	0.00	-	-	-	0.00	-	0.00	0.00	-	-
49	-	-	0.20	0.00	0.00	-	-	-	-	0.00	0.00	0.00	-	-	-	0.00	-	0.00	0.00	-	-
50	-	-	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	-	-	-	0.00	-	3.22	0.00	-	-
51	-	-	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	-	-	-	0.00	-	1.22	0.00	-	-
52	-	-	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	-	-	-	0.00	-	1.22	0.00	-	-
1	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-	0.00	-	-	0.00	-	-
2	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	0.12	-	-	-	0.00	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.16	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LG-Lam Guntur**, ND**- Nandyal**, DW**-Dharwad**, RC**-Raichur**, CN**- Chamarajanagar**, CBE**- Coimbatore**, SVPR**-Srivilliputtur,

Table: 105.Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in South Zone during 2022-23 in DCH 32 N-Bt.

SMW	Fruiting Body Damage (%) **						GBD (%) by ABW/ TC/SBW						Pink bollworm/20 green bolls												
													GBD (%)							Number of Larvae					
	LG	ND	DW	RC	CN	CBE	LG	ND	DW	RC	CN	CBE	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW*	RC	CN	CBE
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
32	-	-	-	45.45	0.00	-	-	-	-	-	0.00	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
33	-	-	-	40.00	0.00	-	-	-	-	-	0.00	-	-	-	0.00	-	-	0.00	-	-	-	0.00	-	-	-
34	-	-	-	42.11	0.00	-	-	-	-	-	0.00	-	-	-	0.00	-	-	0.00	-	-	-	0.00	-	-	-
35	-	-	-	37.50	0.00	-	-	-	-	15.43	0.00	-	-	-	0.00	-	-	0.00	-	-	-	0.00	-	-	-
36	-	-	-	45.95	0.00	-	-	-	-	16.47	0.00	-	-	-	0.00	-	-	0.00	-	-	-	0.00	-	-	-
37	-	-	-	30.77	0.00	-	-	-	-	12.13	0.00	-	-	-	0.00	-	-	0.00	-	-	-	0.00	-	-	-
38	-	-	-	37.50	0.00	-	-	-	-	10.15	0.00	-	-	-	0.00	-	-	0.00	-	-	-	0.00	-	-	-
39	-	-	-	34.69	0.00	-	-	-	-	24.46	0.00	-	-	-	0.00	-	-	0.00	-	-	-	0.00	-	-	-
40	-	-	-	27.08	0.00	-	-	-	-	5.16	0.00	-	-	-	3.40	-	-	0.00	-	-	-	5.00	-	-	-
41	-	-	-	25.00	0.00	-	-	-	-	4.33	0.00	-	-	-	8.20	-	-	2.25	-	-	-	8.00	-	-	-
42	-	8.00	-	37.21	0.00	-	-	-	-	6.12	0.00	-	-	-	11.70	-	-	4.36	-	-	2.00	13.00	-	-	-
43	-	15.00	-	48.65	0.00	-	-	-	-	0.00	0.00	-	-	-	13.40	-	-	5.68	-	-	3.00	18.00	-	-	-
44	-	14.00	-	35.90	0.00	-	-	-	-	0.00	0.00	-	-	-	15.40	-	-	10.25	-	-	5.00	21.00	-	-	-
45	-	20.00	-	29.63	0.00	-	-	-	-	0.00	0.00	-	-	-	16.20	-	-	12.35	-	-	10.00	27.00	-	-	-
46	-	25.00	-	26.53	0.00	-	-	-	-	0.00	0.00	-	-	-	19.80	-	-	18.35	-	-	12.00	33.00	-	-	-
47	-	20.00	-	32.65	0.00	-	-	-	-	0.00	0.00	-	-	-	21.40	-	-	20.50	-	-	12.00	36.00	-	-	-
48	-	40.00	-	33.33	0.00	-	-	-	-	0.00	0.00	-	-	-	23.60	-	-	24.10	-	-	15.00	39.00	-	-	-
49	-	35.00	-	58.62	0.00	-	-	-	-	0.00	0.00	-	-	-	25.80	-	-	18.36	-	-	10.00	29.00	-	-	-
50	-	30.00	-	50.00	0.00	-	-	-	-	0.00	0.00	-	-	-	29.20	-	-	14.68	-	-	12.00	20.00	-	-	-
51		35.00	-	64.29	0.00	-	-	-	-	0.00	0.00	-	-	-	27.80	-	-	12.35	-	-	16.00	13.00	-	-	-
52	-	40.00	-	50.00	0.00	-	-	-	-	0.00	0.00	-	-	-	21.40	-	-	8.57	-	-	18.00	9.00	-	-	-
1	-	25.00	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	-	-	5.69	-	-	20.00	-	-	-	-
2	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	-	-	2.54	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-			-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-

LG-Lam Guntur**, ND-** Nandyal**, DW-**Dharwad**, RC-**Raichur**, CN-** Chamarajanagar**, CBE**- Coimbatore**, SVPR-**Srivilliputtur,*PBW larvae/50 green bolls

** Fruiting Body damage includes damage in squares, flowers and boll

Table :106. Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition in South Zone during 2022-23 in BGDS-1063 Non-Bt.

SMW	Sucking Pests																							
	Aphids/ 3 leaves						Jassid/ 3 leaves						Whitefly/ 3 leaves						Thrips/ 3 leaves					
	LG	ND	DW	RC	CN	CBE	LG	ND	DW	RC	CN	CBE	LG	ND	DW	RC	CN	CBE	LG	ND	DW	RC	CN	CBE
32	-	-	-	6.73	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	-	6.59	-	-
33	-	-	-	4.71	-	-	-	-	-	2.64	-	-	-	-	-	0.00	-	-	-	-	-	8.35	-	-
34	-	-	-	8.71	-	-	-	-	-	7.74	-	-	-	-	-	0.00	-	-	-	-	-	15.10	-	-
35	-	-	-	4.64	-	-	-	-	-	5.13	-	-	-	-	-	0.00	-	-	-	-	-	12.13	-	-
36	-	-	-	4.41	-	-	-	-	-	7.45	-	-	-	-	-	0.21	-	-	-	-	-	13.14	-	-
37	-	-	-	1.63	-	-	-	-	-	11.19	-	-	-	-	-	1.11	-	-	-	-	-	20.23	-	-
38	-	-	-	0.00	-	-	-	-	-	16.75	-	-	-	-	-	4.54	-	-	-	-	-	25.33	-	-
39	-	-	-	0.00	-	-	-	-	-	11.00	-	-	-	-	-	4.23	-	-	-	-	-	19.10	-	-
40	-	-	-	7.71	-	-	-	-	-	10.71	-	-	-	-	-	5.20	-	-	-	-	-	15.12	-	-
41	-	-	-	3.34	-	-	-	-	-	6.74	-	-	-	-	-	1.71	-	-	-	-	-	8.53	-	-
42	-	-	-	1.34	-	-	-	-	-	7.75	-	-	-	-	-	4.22	-	-	-	-	-	7.10	-	-
43	-	-	-	0.00	-	-	-	-	-	9.15	-	-	-	-	-	5.33	-	-	-	-	-	11.43	-	-
44	-	-	-	0.00	-	-	-	-	-	10.05	-	-	-	-	-	4.05	-	-	-	-	-	11.43	-	-
45	-	-	-	0.00	-	-	-	-	-	11.05	-	-	-	-	-	7.73	-	-	-	-	-	12.45	-	-
46	-	-	-	0.00	-	-	-	-	-	15.10	-	-	-	-	-	7.13	-	-	-	-	-	5.41	-	-
47	-	-	-	0.00	-	-	-	-	-	13.14	-	-	-	-	-	5.25	-	-	-	-	-	6.55	-	-
48	-	-	-	0.00	-	-	-	-	-	7.94	-	-	-	-	-	4.16	-	-	-	-	-	5.46	-	-
49	-	-	-	0.00	-	-	-	-	-	6.99	-	-	-	-	-	3.25	-	-	-	-	-	2.35	-	-
50	-	-	-	0.00	-	-	-	-	-	5.04	-	-	-	-	-	2.26	-	-	-	-	-	2.20	-	-
51	-	-	-	0.00	-	-	-	-	-	4.08	-	-	-	-	-	1.31	-	-	-	-	-	0.46	-	-
52	-	-	-	0.00	-	-	-	-	-	3.15	-	-	-	-	-	1.80	-	-	-	-	-	0.31	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LG-Lam Guntur**, ND-** Nandyal**, DW**-Dharwad**, RC**-Raichur**, CN-** Chamarajanagar**, CBE**- Coimbatore**, SVPR-**Srivilliputtur,

Table :107 .Ent 2. Seasonal dynamics of key pests of cotton (Natural Enemies&Bollworms) under unprotected condition in South Zone during 2022-23 in BGDS-1063 Non-Bt .

SMW	Natural Enemies/plant#						No. of Larval Recovery/5plants																	
							H.armigera						*Earias spp.*						*S.litura*					
	LG	ND	DW	RC	CN	CBE	LG	ND	DW	RC	CN	CBE	LG	ND	DW	RC	CN	CBE	LG	ND	DW	RC	CN	CBE
32	-	-	-	2.33	-	-	-	-	-	1.00	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-
33	-	-	-	3.70	-	-	-	-	-	1.20	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-
34	-	-	-	10.32	-	-	-	-	-	1.80	-	-	-	-	-	0.00	-	-	-	-	-	3.00	-	-
35	-	-	-	1.60	-	-	-	-	-	2.20	-	-	-	-	-	0.00	-	-	-	-	-	5.00	-	-
36	-	-	-	3.00	-	-	-	-	-	3.00	-	-	-	-	-	0.00	-	-	-	-	-	1.22	-	-
37	-	-	-	3.40	-	-	-	-	-	2.20	-	-	-	-	-	0.00	-	-	-	-	-	1.00	-	-
38	-	-	-	2.80	-	-	-	-	-	3.00	-	-	-	-	-	0.00	-	-	-	-	-	1.20	-	-
39	-	-	-	2.50	-	-	-	-	-	3.00	-	-	-	-	-	0.00	-	-	-	-	-	2.67	-	-
40	-	-	-	4.00	-	-	-	-	-	2.20	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-
41	-	-	-	4.20	-	-	-	-	-	2.40	-	-	-	-	-	0.00	-	-	-	-	-	2.33	-	-
42	-	-	-	3.40	-	-	-	-	-	2.60	-	-	-	-	-	0.00	-	-	-	-	-	2.00	-	-
43	-	-	-	4.00	-	-	-	-	-	1.00	-	-	-	-	-	0.00	-	-	-	-	-	1.33	-	-
44	-	-	-	3.20	-	-	-	-	-	1.00	-	-	-	-	-	0.00	-	-	-	-	-	2.67	-	-
45	-	-	-	5.00	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	-	2.33	-	-
46	-	-	-	3.20	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	-	3.00	-	-
47	-	-	-	0.80	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	-	1.22	-	-
48	-	-	-	2.20	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-
49	-	-	-	0.10	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-
50	-	-	-	2.00	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	-	3.22	-	-
51	-	-	-	3.00	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	-	1.00	-	-
52	-	-	-	4.00	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	-	0.00	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LG-Lam Guntur**, ND-** Nandyal**, DW**-Dharwad**, RC-**Raichur**, CN-** Chamarajanagar**, CBE**- Coimbatore**, SVPR-**Srivilliputtur,
#Natural Enemies include coccinellids, chrysopids, syrphids and spider.

Table :108. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition in South Zone during 2022-23 in BGDS-1063 Non-Bt.

SMW	Fruiting Body Damage (%) **							GBD (%) by ABW/ TC/SBW						
	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR
32	-	-	-	68.75	-	-	-	-	-	-	-	-	-	-
33	-	-	-	76.92	-	-	-	-	-	-	-	-	-	-
34	-	-	-	81.25	-	-	-	-	-	-	-	-	-	-
35	-	-	-	50.00	-	-	-	-	-	-	10.67	-	-	-
36	-	-	-	54.76	-	-	-	-	-	-	13.33	-	-	-
37	-	-	-	55.56	-	-	-	-	-	-	15.56	-	-	-
38	-	-	-	40.00	-	-	-	-	-	-	33.33	-	-	-
39	-	-	-	48.08	-	-	-	-	-	-	47.56	-	-	-
40	-	-	-	44.26	-	-	-	-	-	-	44.44	-	-	-
41	-	-	-	40.00	-	-	-	-	-	-	33.36	-	-	-
42	-	-	-	45.45	-	-	-	-	-	-	46.76	-	-	-
43	-	-	-	54.17	-	-	-	-	-	-	55.70	-	-	-
44	-	-	-	38.71	-	-	-	-	-	-	24.50	-	-	-
45	-	-	-	42.19	-	-	-	-	-	-	33.33	-	-	-
46	-	-	-	38.46	-	-	-	-	-	-	24.46	-	-	-
47	-	-	-	32.73	-	-	-	-	-	-	20.00	-	-	-
48	-	-	-	29.17	-	-	-	-	-	-	22.33	-	-	-
49	-	-	-	28.85	-	-	-	-	-	-	28.30	-	-	-
50	-	-	-	15.15	-	-	-	-	-	-	23.50	-	-	-
51	-	-	-	12.50	-	-	-	-	-	-	15.80	-	-	-
52	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
01	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LG-Lam Guntur**, ND**- Nandyal**, DW**-Dharwad**, RC**-Raichur**, CN**- Chamarajanagar**, CBE**- Coimbatore**, SVPR**-Srivilliputtur, ** Fruiting Body damage includes damage in squares, flowers and boll

Table :109. Ent 2. Seasonal dynamics of key pests of cotton (Trap catches) under unprotected condition in South Zone during 2022-23.

SMW	Trap Catches/Weekly																							
	H. armigera						*Pectinophoragossypiella*					*E.insulana / E. vittella*							*S.litura*					
	LG	ND	DW	RC	CN	CBE	LG	ND	DW	RC	CN	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE
24	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
25	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
26	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
27	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
28	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
29	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
30	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
31	-	-	0.00	-	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-	-
32	-	-	0.00	0.00	0.00	-	-	-	0.00	0.00	-	-	-	0.00	0.00	0.00	-	-	-	-	0.00	-	0.00	-
33	-	-	5.60	0.00	0.00	-	-	-	0.00	0.00	-	-	-	0.00	0.00	0.00	-	-	-	-	0.00	-	0.00	-
34	-	-	7.80	8.75	0.00	-	-	-	0.00	4.50	-	-	-	0.40	0.00	0.00	-	-	-	-	3.20	77.50	0.00	-
35	-	-	9.20	30.00	0.00	-	-	-	0.00	3.25	-	-	-	0.80	0.00	0.00	-	-	-	-	9.40	75.00	0.00	-
36	0.00	-	16.80	8.25	0.00	-	0.00	-	0.00	5.25	-	-	-	1.20	0.00	0.00	-	-	10.00	-	21.60	1.25	0.00	-
37	9.00	-	15.40	2.25	0.00	-	12.00	-	0.00	4.25	-	-	-	1.80	0.00	0.00	-	-	18.00	-	34.70	0.25	0.00	-
38	2.00	-	9.40	0.25	-	-	19.00	-	0.00	1.50	-	-	-	2.40	0.00	-	-	-	17.00	-	47.90	21.25	-	-
39	4.00	-	6.60	0.75	0.00	-	5.00	-	1.60	2.00	-	-	-	4.80	0.00	0.00	-	-	4.00	-	68.40	43.75	0.00	-
40	-	1.00	4.40	0.50	0.00	-	-	20.00	3.20	29.00	2.18	-	-	3.70	0.00	0.00	-	-	-	2.00	71.70	4.00	0.00	-
41	-	2.00	8.80	20.50	0.00	-	-	18.00	4.80	0.50	3.12	-	-	3.00	0.00	0.00	-	-	-	0.00	81.20	0.25	0.00	-
42	1.00	0.00	14.60	0.00	0.00	-	1.00	26.00	8.40	17.00	5.12	-	-	1.80	0.00	0.00	-	-	1.00	0.00	34.80	18.75	0.00	-
43	1.00	1.00	9.40	0.25	-	-	6.00	32.00	9.80	15.00	7.80	-	-	1.00	0.00	-	-	-	2.00	6.00	23.60	21.25	-	-
44	0.00	1.00	8.60	1.00	0.00	-	64.00	6.00	17.80	15.00	10.6	-	-	0.40	0.00	0.00	-	-	15.00	0.00	11.80	20.00	0.00	-
45	1.00	0.00	5.70	4.00	0.00	-	43.00	28.00	33.60	17.50	12.4	-	-	0.00	0.00	0.00	-	-	4.00	6.00	10.00	9.25	0.00	-
46	0.00	0.00	4.40	3.75	0.00	-	54.00	20.00	44.80	15.00	16.25	-	-	0.00	0.00	0.00	-	-	5.00	2.00	6.80	9.75	0.00	-
47	0.00	0.00	3.20	7.75	0.00	-	58.00	31.00	49.20	24.50	14.30	-	-	0.00	0.00	0.00	-	-	13.00	0.00	5.50	14.50	0.00	-
48	0.00	0.00	2.40	0.25	0.00	-	87.00	30.00	51.20	93.75	9.15	-	-	0.00	0.00	0.00	-	-	9.00	0.00	3.40	11.25	0.00	-
49	3.00	0.00	0.80	0.00	0.00	-	126.00	24.00	47.60	33.75	8.15	-	-	0.00	0.00	0.00	-	-	15.00	0.00	1.60	0.00	0.00	-
50	0.00	0.00	0.00	5.75	0.00	-	92.00	20.00	25.30	35.75	6.25	-	-	0.00	0.00	0.00	-	-	4.00	0.00	0.60	26.25	0.00	-
51	0.00	1.00	0.00	0.75	0.00	-	80.00	22.00	13.80	21.25	4.62	-	-	0.00	0.00	0.00	-	-	0.00	0.00	0.00	3.75	0.00	-
52	0.00	0.00	0.00	0.25	0.00	-	127.00	28.00	10.40	19.75	5.23	-	-	0.00	0.00	0.00	-	-	6.00	0.00	0.00	2.25	0.00	-
1	0.00	1.00	-	-	-	-	214.00	32.00	-	-	-	-	-	-	-	-	-	-	6.00	0.00	-	-	-	-
2	0.00	0.00	-	-	-	-	259.00	28.00	-	-	-	-	-	-	-	-	-	-	3.00	0.00	-	-	-	-
3	0.00	-	-	-	-	-	251.00	-	-	-	-	-	-	-	-	-	-	-	4.00	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LG-Lam Guntur**, ND**- Nandyal**, DW**-Dharwad**, RC**-Raichur**, CN**- Chamarajanagar**, CBE**- Coimbatore**, SVPR**-Srivilliputtur,

Table :110. Ent 2. Seasonal dynamics of key pests of cotton (Abiotic factors) under unprotected condition in South Zone during 2022-23.

SMW	Temperature (°C)														Relative Humidity (%)									
	LG		ND		DW		RC		CN		CBE		SVPR		ND		DW		RC		CN		CBE	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
24	-	-	-	-	21.13	29.04	-	-	-	-	-	-	-	-			87.29	76.43	-	-	-	-	-	-
25	-	-	-	-	20.91	29.33	-	-	-	-	-	-	-	-			87.86	76.43	-	-	-	-	-	-
26	-	-	-	-	20.79	27.47	-	-	-	-	-	-	-	-			89.86	80.14	-	-	-	-	-	-
27	-	-	-	-	20.84	26.44	-	-	-	-	-	-	-	-			93.00	86.00	-	-	-	-	-	-
28	-	-	-	-	20.24	23.77	-	-	-	-	-	-	-	-			94.14	93.00	-	-	-	-	-	-
29	-	-	-	-	20.34	26.87	-	-	-	-	-	-	-	-			90.00	81.14	-	-	-	-	-	-
30	-	-	-	-	20.37	27.84	-	-	-	-	-	-	-	-			91.71	74.00	-	-	-	-	-	-
31	-	-	-	-	20.86	29.69	-	-	-	-	-	-	-	-			85.29	77.43	-	-	-	-	-	-
32	-	-	24.13	32.07	20.23	25.29	20.50	29.70	-	-	-	-	-	-	82.00	65.29	92.14	86.29	87.00	65.00	-	-	-	-
33	-	-	25.21	33.80	19.90	26.81	20.10	30.70	20.70	30.84	29.00	22.70	-	-	75.57	49.14	92.86	86.00	85.00	62.00	96.86	53.14	82.00	66.00
34	-	-	25.30	35.09	20.17	27.74	20.10	31.90	21.07	30.04	30.80	23.40	-	-	75.57	59.43	90.86	78.29	85.00	56.00	99.29	61.86	84.00	58.00
35	-	-	25.01	33.33	20.40	29.57	20.70	31.50	20.94	30.33	32.30	23.30	-	-	80.88	62.00	91.14	74.00	88.00	62.00	100.00	60.14	88.00	55.00
36	26.4	31.9	24.77	32.49	21.04	29.30	21.00	31.60	20.87	30.41	27.80	23.00	-	-	89.57	67.86	90.14	77.43	90.00	65.00	99.57	66.29	82.00	69.00
37	26.6	30.9	24.17	32.32	20.46	26.60	20.00	29.70	19.04	29.93	30.70	22.90	-	-	80.33	60.00	95.00	89.14	89.00	69.00	100.00	51.71	81.00	54.00
38	26.4	31.9	24.49	33.20	19.01	28.29	19.40	30.40	18.39	31.59	32.30	23.20	-	-	73.57	46.71	88.14	67.43	84.00	56.00	99.57	46.86	85.00	56.00
39	25.6	31.9	24.46	32.71	19.30	30.00	19.60	30.80	19.00	30.87	30.30	22.80	-	-	86.71	65.29	85.14	66.14	91.00	64.00	99.00	55.86	87.00	63.00
40	25.1	30.0	23.84	29.89	19.61	29.03	16.90	29.40	19.86	29.70	31.10	23.20	-	-	89.14	69.86	91.29	76.00	91.00	66.00	100.00	57.86	84.00	60.00
41	25.4	29.6	23.91	31.89	20.54	28.06	20.00	30.10	20.57	30.17	29.60	22.90	-	-	85.00	67.14	93.43	81.86	91.00	6800	100.00	62.57	82.00	60.00
42	24.9	31.3	24.26	32.33	20.33	29.51	20.40	31.70	20.79	30.54	31.90	22.20	-	-	79.43	63.43	91.29	75.71	89.00	65.00	100.00	62.29	83.00	49.00
43	22.1	31.9	20.46	32.91	15.43	29.11	17.30	30.40	17.13	29.99	32.00	22.10	-	-	71.57	41.29	74.14	46.86	86.00	45.00	100.00	45.43	84.00	50.00
44	22.4	30.5	22.60	31.00	16.09	29.31	19.20	30.20	29.09	20.16	31.50	22.40	-	-	76.86	59.14	72.57	45.14	80.00	44.00	100.00	59.00	83.00	50.00
45	21.9	31.1	22.74	32.40	15.60	30.20	19.90	31.00	29.39	17.93	30.20	22.40	-	-	76.57	50.57	68.71	40.86	84.00	38.00	100.00	53.00	85.00	57.00
46	20.9	31.1	22.69	31.43	16.10	29.66	17.40	30.60	18.34	28.33	30.70	22.20	-	-	79.29	50.43	69.29	44.86	78.00	40.00	100.00	64.14	85.00	60.00
47	20.0	29.6	22.71	30.00	15.83	28.43	17.60	29.20	16.19	29.23	30.50	19.70	-	-	76.00	59.14	71.57	43.29	78.00	47.00	100.00	51.14	86.00	49.70
48	20.1	31.2	22.68	32.37	17.71	30.03	17.80	31.00	17.44	29.57	29.00	22.00	-	-	79.57	53.86	78.86	50.00	73.00	47.00	100.00	55.86	84.00	57.00
49	20.8	31.4	20.69	32.21	15.07	29.93	17.10	30.70	16.73	28.73	29.10	21.10	-	-	73.29	48.43	77.71	44.43	71.00	38.00	100.00	50.71	85.00	59.00
50	21.9	29.9	20.51	28.03	17.43	27.31	18.90	28.70	17.61	28.76	27.60	20.70	-	-	93.71	69.14	81.29	57.29	85.00	59.00	100.00	58.86	86.00	58.00
51	19.1	29.6	18.06	31.01	14.11	29.97	15.20	31.00	13.74	29.83	29.30	19.60	-	-	87.57	51.43	71.86	39.14	85.00	36.00	100.00	40.57	84.00	59.00
52	21.3	31.1	20.34	31.81	16.60	30.90	18.20	31.60	16.60	29.39	29.50	21.10	-	-	84.75	54.88	78.43	40.71	83.60	41.80	100.00	51.86	84.00	52.00
1	20.9	30.1	20.00	31.89	-	-	-	-	-	-	30.20	22.20	-	-	85.86	45.43	-	-	-	-	-	-	83.00	54.00
2	16.3	30.5	15.57	31.51	-	-	-	-	-	-	29.60	17.80	-	-	79.57	40.86	-	-	-	-	-	-	82.00	52.00
3	16.3	30.3	-	-	-	-	-	-	-	-	32.80	23.00	-	-	-	-	-	-	-	-	-	-	81.00	50.00
4	17.3	31.6	-	-	-	-	-	-	-	-	34.20	20.50	-	-	-	-	-	-	-	-	-	-	82.00	53.00

LG-Lam Guntur, **ND**- Nandyal, **DW**-Dharwad, **RC**-Raichur, **CN**- Chamarajanagar, **CBE**- Coimbatore, **SVPR**-Srivilliputtur, **AM –** Morning **PM**- Evening

Table:111. Ent 2. Seasonal dynamics of key pests of cotton (Abiotic factors) under unprotected condition in South Zone during 2022-23.

SMW	Rainfall in mm						
	LG	ND	DW	RC	CN	CBE	SVPR
24	-	-	51.80	-	-	-	-
25	-	-	5.80	-	-	-	-
26	-	-	17.40	-	-	-	-
27	-	-	12.20	-	-	-	-
28	-	-	58.2	-	-	-	-
29	-	-	62.40	-	-	-	-
30	-	-	43.00	-	-	-	-
31	-	-	12.20	-	-	-	-
32	-	17.10	53.80	23.20	-	-	-
33	-	2.00	9.20	40.00	0.00	28.50	-
34	-	27.70	3.20	2.20	42.50	0.50	-
35	-	45.30	127.20	37.40	192.70	40.30	-
36	35.60	40.00	48.80	147.60	100.30	15.10	-
37	35.20	0.08	48.20	8.20	0.00	1.00	-
38	14.80	0.00	0.00	0.60	0.00	0.60	-
39	44.60	84.20	6.20	500.00	0.00	91.50	-
40	149.40	98.50	69.40	106.20	53.30	25.00	-
41	44.80	117.60	72.20	23.60	217.50	7.00	-
42	86.80	1.00	56.20	43.60	71.00	0.00	-
43	5.60	0.00	0.00	0.00	2.80	1.50	-
44	26.60	6.00	0.00	0.00	5.20	16.50	-
45	1.10	0.00	0.00	0.00	28.20	30.00	-
46	0.00	0.70	0.00	0.00	10.80	26.00	-
47	1.10	0.80	2.80	0.40	0.00	0.00	-
48	1.60	0.00	0.00	0.00	0.00	3.00	-
49	0.00	0.00	0.00	0.00	0.00	8.50	-
50	46.20	54.80	3.20	13.40	21.20	77.50	-
51	0.00	0.00	0.00	0.00	0.00	0.00	-
52	0.00	0.90	0.00	0.00	10.10	0.00	-
1	0.00	0.00	-	-	-	0.00	-
2	0.00	0.00	-	-	-	0.00	-
3	0.00	-	-	-	-	0.00	-
4	0.00	-	-	-	-	0.00	-

LG-Lam Guntur**, ND**- Nandyal**, DW**-Dharwad**, RC**-Raichur**, CN**- Chamarajanagar**, CBE**- Coimbatore**, SVPR**-Srivilliputtur,

Table :112. Ent 2: Seasonal dynamics of key pests of cotton (Bollworms & Open boll damage) under unprotected condition in South Zone during 2022-23.

Variety/hybrid	Green Boll Damage (%) Due to PBW through 50 Green boll destructive sampling					PBW larval recovery from 50 green bolls					Open boll damage (%)					Locule boll damage (%)			
	DW	RC	CN	LG	CBE	DW	RC	CN	LG	CBE	DW	RC	CN	LG	CBE	RC	CN	LG	CBE
DCH-32	29.20	65.83	19.23	25.00	33.64	39.00	71.67	13.12	22.00	27.23	35.60	92.00	30.23	35.45	21.35	94.53	32.50	17.34	75.36
BGDS-1063	-	61.66	-	-	26.83	-	62.50	-	-	17.03	-	90.25	-	-	14.35	87.73	-	-	42.65
Jaddo/Bahubali	27.40	50.83	10.90	-	22.76	33.00	51.67	8.63	-	16.08	33.60	88.85	12.30	-	8.69	89.23	15.20	-	38.65

RC-Raichur, **CN**-Chamarajnagar, **LG**-Guntur, **CBE**-Coimbetore

Table :113. Ent 3. Survey for key and emerging pests in cotton in Farmers Field for weekly advisory at North Zone during 2022 – 23

Zone	Centre	Duration Of Survey	Total no. of locations surveyed	No. of location crossed ETL									
				Whitefly	Leaf hopper	Thrips	Aphids	Mirid bug	*H. armigera*	*E. vitella*	*P. gossypiella*	*S. litura*	Shoot weevil
North Zone	Bathinda	May-October	159	66	10	-	-	-	-	-	27	-	-
	Faridkot	June- October	354	200	12	16	-	-	-	-	19	-	-
	Hisar	June- October	238	48	16	8	0	0	0	0	96	0	0
	Sirsa	June- Nov	229	100	35	10	-	-	-	-	105	-	-
	Sriganganagar	June-Oct.	799	294	193	15	0	0	0	0	146	0	0
		Total	**1779**	**708**	**266**	**49**	**0**	**0**	**0**	**0**	**393**	**0**	**0**
Central Zone	Banswara	Jan.-Dec.	177	0	80	-	-	-	-	-	-	-	-
	Junagadh	Jan.-Dec.	177	1	-	20	62	-	-	-	37	-	-
	Surat & Bharuch	June-Dec	783	0	42	31	59	-	-	-	29	-	-
	Akola	Jan-Jan	81	9	12	6	-	-	-	-	12	-	-
	Nanded	July-Dec	625	28	63	32	54	0	0	0	31	0	0
	Rahuri	Jan- Dec	248	0	24	49	107	0	0	0	22	2	0
	Khandwa	-	-	-	-	-	-	-	-	-	-	-	-
	Bhawanipatna	Aug.-Dec.	660	0	79	0	0	0	0	0	0	0	0
		Total	**2751**	**38**	**300**	**138**	**282**	**0**	**0**	**0**	**131**	**2**	**0**
South Zone	Lam Guntur	July- Dec.	191	4	32	5	1	0	0	0	95	2	0
	Nandyal	-	114	40	86	67	-	-	-	-	77	-	-
	Dharwad	July-Dec	224	0	115	78	52	56	0	0	89	0	31
	Raichur	July-Dec	1581	8	209	118	140	0	0	0	152	0	-
	Chamarajanagar	June-Oct	1256	-	93	-	43	-	-	-	13	-	-
	Coimbatore	-	76	-	16	15	4	-	-	-	6	-	-
	Srivilliputhur	-	-	-	-	-	-	-	-	-	-	-	-
		Total	**3442**	**52**	**551**	**283**	**240**	**56**	**0**	**0**	**432**	**2**	**31**

Table :114. ENT 4: Incidence of sucking pests and natural enemies in cotton crop managed under IPM and Farmer practice during 2022-23 (North zone)

Centre	Sucking pest										Natural Enemies/plant**		Other Non-target pests/3 leaves	
	JIG*		Jassid/3leaves		Whitefly/3leaves		Thrips/3leaves		Aphids/3leaves					
	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP
Bathinda	I	I	1.10	1.70	14.33	22.26	6.00	11.70	0.00	0.00	2.36	1.42	-	-
Faridkot	II	II	1.50	2.20	-	-	9.30	12.80	17.50	27.70	3.10	3.10	-	-
Hisar	I	I	2.69	2.95	14.12	16.21	12.02	10.19	0.00	0.00	0.90	0.76	-	-
Sirsa	I	II	3.03	3.31	20.90	65.07	5.97	6.70	0.22	0.23	1.52	1.69	2.47	4.03
Sriganganagar	I	I	0.38	0.65	18.08	35.00	7.71	8.84	-	-	0.61	0.40	-	-

***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave, **IPM-** Integrated pest management **FP-** Farmer practice **,** **Natural Enemies include coccinellids, chrysopids, syrphids and spider mites.

Table :115 . ENT 4: Incidence of bollworms in cotton crop managed under IPM and Farmer practice during 2022-23 (North zone)

Centre	Bollworms/plant						Rosette Flowers /Flower damage#	
	ABW		SBW		TC			
	IPM	FP	IPM	FP	IPM	FP	IPM	FP
Bathinda	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.50
Faridkot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hisar	0.00	0.00	0.00	0.00	0.00	0.00	-	-
Sirsa	0.00	0.00	0.07	0.15	0.09	0.00	-	-
Sri Ganganagar	-	-	-	-	-	-	1.72	1.91

IPM- Integrated pest management **FP-** Farmer practice **,** #Rosette flower percent based on 50 randomly observed flower/entry

Table :116. ENT 4: PBW larval recovery and green boll damage in cotton crop managed under IPM and Farmer practice during 2022-23 (North zone)

Centre	No. of Bolls to be examined	Green Boll damage (%)*		PBW (Larval recovery)*		Open Boll Damage (%) / Plant		Locule Damage (%) /Plant	
		IPM	FP	IPM	FP	IPM	FP	IPM	FP
Bathinda	20	-	-	0.50	1.50	-	-	-	-
Faridkot	20	-	-	0.25	0.50	-	-	-	-
Hisar	20	7.50	6.25	3.75	3.75	-	-	-	-
Sirsa	20	31.67	30.00	0.13	0.20	15.02	16.46	10.26	14.86
Sri Ganganagar	20	6.25	7.75	1.25	1.50	-	-	-	-

IPM- Integrated pest management **FP-** Farmer practice, *Through destructive sampling per plot 50 bolls.

Table :117.ENT 4 : Number of times the sucking pest and bollworms crossed ETL in cotton crop managed under IPM and farmer practice during 2022-23 (North zone)

Centre	Number of times crossed ETL for pest																	
	Sucking Pests/3 leaves								GBD (%) due to PBW*		Number of Bolloworms/Plant							
	Whitefly		Leafhopper		Thrips		Aphids				*E.vittela*		*H. amrigera*		PBW*		*S.litura*	
	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP
Bathinda	06	15	02	07	00	00	00	00	-	-	00	00	00	00	02	07	00	00
Faridkot	03	05	00	00	01	02	00	00	-	-	00	00	00	00	00	00	00	00
Hisar	02	03	02	02	02	03	00	00	-	-	00	00	00	00	02	02	00	00
Sirsa	05	07	01	02	01	01	00	00	02	03	00	00	00	00	0	0	00	00
Sri Ganganagar	04	08	01	02	01	01	-	-	-	-	-	-	-	-	-	-	-	-

IPM- Integrated pest management **FP-** Farmer practice,*Through destructive sampling per plot 50 bolls.

Table : 118. ENT 4 : Integrated Pest Management in Cotton during 2022-23 (North zone)

Centre	No. of Sprays		Cost of Protection (Rs.) / ha.		Yield(Q/ha)		Gross Income (Rs. Based on MSP)		Net Income		ICBR*
	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	
Bathinda	04	06	2090	7652	30.50	19.80	-	-	-	-	-
Faridkot	05	08	7950	10725	11.41	8.62	-	-	-	-	-
Hisar	06	08	16169	24634	20.46	19.28	-	-	-	-	-
Sirsa	06	06	5650	10135	27.09	23.09	1,64,707/-	1,40,387/-	1,59,057/-	1,30,252/-	1:4.30
Sri Ganganagar	05	08	13406	21481	25.68	20.57	-	-	-	-	-

IPM- Integrated pest management **FP-** Farmer practice, * ICBR-Incrimentle cost benefit ratio

Table : 119. ENT 4 : Incidence of sucking pests and natural enemies in cotton crop managed under IPM and Farmer practice during 2022-23 (Central zone)

Centre	Sucking pest										Natural Enemies/plant**		Other Non-target pests/3 leaves	
	JIG*		Jassid/3leaves		Whitefly/3leaves		Thrips/3leaves		Aphids/3leaves					
	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP
Akola	-	-	4.03	3.91	6.85	5.68	3.81	2.83	0.37	0.26	2.17	0.89	-	-
Nanded	II	II	2.06	2.68	4.11	6.20	6.29	9.64	9.08	11.15	1.89	0.63	-	-
Banswara	-	-	4.26	4.88	8.92	9.75	-	-	-	-	0.30	0.24	-	-
Bhawanipatna	I	II	0.91	1.44	0.43	0.29	0.18	0.34	1.21	0.68	0.82	0.23	-	-
Junagadh	-	-	2.37	6.64	2.97	10.13	2.60	8.66	2.72	6.90	-	-	-	-
Rahuri	-	-	2.56	2.14	2.17	1.69	4.24	3.65	4.98	3.38	1.44	0.68	-	-
Surat	I	II	2.99	4.86	1.50	2.98	7.78	16.26	9.12	16.20	1.16	0.37	0.44	0.77

***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV-extreme curling, bronzing and drying of leave, **IPM-** Integrated pest management **FP-** Farmer practice, ** Natural Enemies include coccinellids, chrysopids, syrphids and spider mites.

Table : 120. ENT 4 : Incidence of bollworms in cotton crop managed under IPM and Farmer practice during 2022-23 (Central zone)

Centre	Bollworms/plant						Rosette Flowers /Flower damage#	
	ABW		SBW		TC			
	IPM	FP	IPM	FP	IPM	FP	IPM	FP
Akola	0.03	0.02	0.04	0.02	-	-	-	-
Nanded	0.01	0.01	0.00	0.00	0.01	0.03	1.79	2.59
Banswara	-	-	-	-	-	-	-	-
Bhawanipatna	0.33	0.16	0.18	0.11	0.46	0.39	-	-
Junagadh	-	-	-	-	-	-	1.56	5.98
Rahuri	0.04	0.03	0.02	0.01	-	-	-	-
Surat	0.00	0.00	0.00	0.00	0.00	0.00	1.87	2.76

IPM- Integrated pest management, **FP-** Farmer practice, #Rosette flower percent based on 50 randomly observed flower/entry

Table : 121. ENT 4 : PBW larval recovery in cotton crop managed under IPM and Farmer practice during 2022-23 (Central zone)

Centre	No. of Bolls to be examined	Green Boll damage (%)*		PBW (Larval recovery)*		Open Boll Damage (%) / Plant		Locule Damage (%) /Plant	
		IPM	FP	IPM	FP	IPM	FP	IPM	FP
Akola	20	8.75	7.50	2.00	1.75	-	-	-	-
Nanded	20	-	-	1.25	1.25	-	-	-	-
Banswara	20	-	-	-	-	-	-	-	-
Bhawanipatna	20	-	-	-	-	-	-	-	-
Junagadh	20	2.38	13.32	2.07	11.35	3.14	18.72	2.81	16.15
Rahuri	20	8.5	5.5	2.00	1.50	-	-	-	-
Surat	20	7.50	17.50	1.50	3.00	-	-	-	-

IPM- Integrated pest management **FP-** Farmer practice, *Through destructive sampling per plot 50 bolls.

Table : 122. ENT 4 : Number of times the sucking pest and bollworms crossed ETL in cotton crop managed under IPM and farmer practice(Central zone)

Centre	Number of times crossed ETL for pest																	
	Sucking Pests/3 leaves								GBD (%) due to PBW*		Number of Bolloworms/Plant							
	Whitefly		Leafhopper		Thrips		Aphids				*E.vittela*		*H. amrigera*		PBW*		*S.litura*	
	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP
Akola	2	1	3	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-
Nanded	0	2	1	3	1	3	0	1	-	-	0	0	0	0	1	2	0	0
Banswara	1	1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bhawanipatna	0	0	0	0	0	0	0	0	-	-	1	0	1	0	0	0	0	0
Junagadh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rahuri	2	1	3	2	2	2	-	-	-	-	-	-	-	-	2	2	-	-
Surat	0	0	2	5	1	3	1	3	-	-	0	0	0	0	1	1	0	0

IPM- Integrated pest management **FP-** Farmer practice, *Through destructive sampling per plot 50 bolls.

Table : 123. ENT 4: Integrated Pest Management in Cotton during 2022-23 (Central zone)

Centre	No. of Sprays		Cost of Protection (Rs.) / ha.		Yield(Q/ha)		Gross Income (Rs. based on MSP)		Net Income		ICBR*
	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	
Akola	04	07	9811	18743	19.23	20.90	-	-	-	-	-
Nanded	04	06	12100	15240	26.50	24.75	-	-	-	-	-
Banswara	02	04	4000	5000	24.15	22.50	-	-	-	-	-
Bhawanipatna	05	06	4400	5199	18.50	18.25	-	-	-	-	-
Junagadh	-	-	-	-	33.21	17.78	-	-	-	-	-
Rahuri	05	07	9363	15126	19.75	17.40	120080	105792	55717	35666	01:1.9(IPM) & 01:1.5 (FP)
Surat	05	07	8820	13072	24.44	20.37	207740	173145	198920	160073	01:4.40

IPM- Integrated pest management **FP-** Farmer practice, * ICBR-Incrimentle cost benefit ratio

Table : 124. ENT 4 : Incidence of sucking pests and natural enemies in cotton crop managed under IPM and Farmer practice during 2022-23 (South zone)

Centre	Sucking pest/ 3 leaves										Natural Enemies/plant**		Other Non- target pests/3 leaves	
	JIG		Jassid		Whitefly		Thrips		Aphids					
	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP
Coimbatore	I	II	2.59	3.47	-	-	1.37	3.40	2.17	2.63	0.10	0.08	-	-
Chamrajnagar	II	III	1.75	3.18	-	-	1.08	1.81	19.20	30.16	1.69	0.93	-	-
Raichur	I	I	5.35	3.89	1.83	0.25	5.10	3.20	1.70	0.52	2.26	1.40	-	-
Dharwad	III	IV	4.45	5.78	-	-	14.70	17.77	5.20	7.08	-	-	-	-
LamGuntur	-	-	1.92	3.42	1.95	3.09	3.95	4.31	1.52	2.14	0.33	0.29	-	-
Nandyal#	-	-	6.00	13.00	14.50	26.50	15.00	34.50	2.00	7.00	12.50	1.50	-	-

IPM- Integrated pest management, **FP-** Farmer practice , ***JIG-** Jassid Injury Grade (I-entire foliage free of curling and yellowing, II- curling of few leaves in lower portion of plant + marginal yellowing , III- curling of leaves almost all over the plant, IV- extreme curling, bronzing and drying of leave ** Natural Enemies include coccinellids, chrysopids, syrphids and spider mites, #Natural Enemies/ 20 plants

Table: 125.ENT 4: Incidence of bollworms in cotton crop managed under IPM and Farmer practice during 2022-23 (South zone)

Centre	Bollworms/plant						Rosette Flowers /Flower damage#	
	ABW		SBW		TC			
	IPM	FP	IPM	FP	IPM	FP	IPM	FP
Coimbatore	-	-	-	-	-	-	1.15	1.50
Chamrajnagar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Raichur	0.00	0.00	0.00	0.00	0.00	0.00	3.87	4.10
Dharwad	0.00	0.00	0.00	0.00	0.00	0.00	-	-
LamGuntur	-	-	-	-	-	-	1.42	1.67
Nandyal	-	-	-	-	-	-	-	-

IPM- Integrated pest management, **FP-** Farmer practice **,** #Rosette flower percent based on 50 randomly observed flower/entry

Table: 126.ENT 4: PBW larval recovery in cotton crop managed under IPM and Farmer practice during 2022-23 (South zone)

Centre	No. of Bolls to be examined	Green Boll damage (%)*		PBW (Larval recovery)*		Open Boll Damage (%) / Plant		Locule Damage (%) /Plant	
		IPM	FP	IPM	FP	IPM	FP	IPM	FP
Coimbatore	20	-	-	17.86	28.89	-	-	-	-
Chamrajnagar	20	-	-	2.57	7.64	-	-	-	-
Raichur	50	16.67	20.42	11.70	8.30	18.09	20.13	20.15	22.18
Dharwad	20	-	-	5.00	8.00	-	-	-	-
LamGuntur	20	-	-	8.00	12.00	-	-	-	-
Nandyal	20	8.00	31.50	-	-	8.00	35.00	4.00	15.00

IPM- Integrated pest management, **FP-** Farmer practice, *Through destructive sampling per plot 50 bolls.

Table: 127.ENT 4: Number of times the sucking pest and bollworms crossed ETL in cotton crop managed under IPM and farmer practice during 2022-23 (South zone)

Centre	Number of times crossed ETL for pest																	
	Sucking Pests/3 leaves								GBD (%) due to PBW*		Number of Bolloworms/Plant							
	Whitefly		Leafhopper		Thrips		Aphids				*E.vittela*		*H. amrigera*		PBW*		*S.litura*	
	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP
Coimbatore	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chamrajnagar	0	0	3	5	0	1	2	4	0	0	0	0	0	0	2	3	0	0
Raichur	0	0	5	3	0	0	0	0	0	0	0	0	0	0	2	2	0	0
Dharwad	0	0	2	3	2	2	0	1	0	0	0	0	0	0	1	2	0	0
LamGuntur	-	-	0	3	-	-	-	-	-	-	-	-	-	-	3	3	-	-
Nandyal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

IPM- Integrated pest management, **FP-** Farmer practice, *Through destructive sampling per plot 50 bolls.

Table: 128. ENT 4: In tegrated Pest Management in Cotton during 2022-23 (South zone)

Centre	No. of Sprays		Cost of Protection (Rs.) / ha.		Yield(Q/ha)		Gross Income (Rs. Based on MSP)		Net Income		ICBR*
	IPM	FP	IPM	FP	IPM	FP	IPM	FP	IPM	FP	
Coimbatore	01	04	-	-	18.06	17.12	-	-	-	-	-
Chamrajnagar	04	07	8125	15800	16.25	14.10	-	-	-	-	-
Raichur	06	08	3254	3803	19.57	22.37	-	-	-	-	-
Dharwad	05	07	10282	12368	17.59	13.73	-	-	-	-	-
LamGuntur	08	13	4519	14811	9.56	8.51	-	-	-	-	-
Nandyal	03	07	3500	7500	13.50	9.5	-	-	-	-	-

IPM- Integrated pest management, **FP-** Farmer practice, * ICBR-Incrimentle cost benefit ratio

Table: 129 .Ent 5. Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2022-23) - North Zone.

Treatment	No. of larvae per plant (American Bollworm)																			
	BT				FA				HI				SR				SG			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	-	-	0.00	-	-	-	0.00	0.00	0.00	0.00
T2	0.00	-	0.00	-	0.00	-	0.00	-	-	-	0.00	-	-	-	0.10	1.01	0.00	0.00	0.00	0.00
T3	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.02	1.01	0.00	0.00	0.00	0.00
T4	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.01	1.02	0.00	0.00	0.00	0.00
T5	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.01	1.05	0.00	0.00	0.00	0.00
T6	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.01	1.01	0.00	0.00	0.00	0.00
CD (5%)		-		-		-		-		-		-		-		N/A		-		-
SE (m)		-		-		-		-		-		-		-		0.01		-		-
SE (d)		-		-		-		-		-		-		-		0.02		-		-
CV (%)		-		-		-		-		-		-		-		2.34		-		-

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar **, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 130. Ent 5: Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2022-23)- North Zone.

Treatment	No. of larvae per plant (Spotted Bollworm)																			
	BT				FA				HI				SR				SG			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	0.00	-	0.00	-	0.00	-	0	-	0.00	-	-	-	0.00	0.00	-	-	0.00	0.00	-	-
T2	0.00	-	0.00	-	0.00	-	0.1	-	-	-	0.56	1.25	-	-	0.43	1.19	0.00	0.00	4.75	6.85
T3	0.00	-	0.00	-	0.00	-	0.05	-	0.00	-	0.47	1.21	0.00	0.00	0.30	1.14	0.00	0.00	3.85	4.70
T4	0.00	-	0.00	-	0.00	-	0	-	0.00	-	0.34	1.16	0.00	0.00	0.23	1.12	0.00	0.00	3.35	3.75
T5	0.00	-	0.00	-	0.00	-	0	-	0.00	-	0.31	1.15	0.00	0.00	0.26	1.03	0.00	0.00	3.10	3.35
T6	0.00	-	0.00	-	0.00	-	0	-	0.00	-	0.41	1.19	0.00	0.00	0.41	1.19	0.00	0.00	4.10	4.30
CD (5%)		-		-		-		NS		-		0.05		-		0.09		-	0.95	1.15
SE (m)		-		-		-		0.028		-		0.02		-		0.03		-	-	-
SE (d)		-		-		-				-		0.02		-		0.04		-	0.31	0.37
CV (%)		-		-		-		147.41		-		2.72		-		5.60		-	11.41	11.15

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar **, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 131. Ent 5: Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2022-23)- North Zone.

Treatment	No. of larvae per plant (Tobacco caterpillar)																			
	BT				FA				HI				SR				SG			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	-	-	0.00	0.00	-	-	0.00	0.00	0.00	0.00
T2	0.00	-	0.00	-	0.00	-	0.00	-	-	-	0.00	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00
T3	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T4	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T5	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T6	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CD (5%)		-		-		-		-		-		-		-		-		-		-
SE (m)		-		-		-		-		-		-		-		-		-		-
SE (d)		-		-		-		-		-		-		-		-		-		-
CV (%)		-		-		-		-		-		-		-		-		-		-

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar **, O.V**-Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 132. Ent 5: Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2022-23)- North Zone.

Treatment	No. of larvae per plant (Pink Bollworm)																			
	BT				FA				HI				SR				SG*			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	1.25	1.50	-	-	0.00	-	0.00	-	0.42	1.19	-	-	0.00	0.00	-	-	0.81	1.14	-	-
T2	-	-	4.83	2.38	0.00	-	0.00	-	-	-	0.88	1.37	-	-	0.00	0.00	-	-	3.65	2.04
T3	0.61	1.26	3.09	2.01	0.00	-	0.00	-	0.32	1.15	0.78	1.34	0.00	0.00	0.00	0.00	0.27	0.88	2.20	1.64
T4	0.91	1.38	2.50	1.86	0.00	-	0.00	-	0.38	1.17	0.59	1.26	0.00	0.00	0.00	0.00	0.36	0.93	1.92	1.55
T5	0.88	1.36	1.96	1.71	0.00	-	0.00	-	0.38	1.17	0.63	1.28	0.00	0.00	0.00	0.00	0.46	0.98	1.73	1.49
T6	0.71	1.30	2.76	1.92	0.00	-	0.00	-	0.30	1.14	0.69	1.30	0.00	0.00	0.00	0.00	0.29	0.89	2.82	1.82
CD (5%)	-	0.10	-	0.39	-	-	-	-		N/A		0.06	-	-	-	-	0.16	0.08	0.83	0.24
SE (m)	-	0.03	-	0.12	-	-	-	-		0.01		0.02	-	-	-	-	-	-	-	-
SE (d)	-	0.05	-	0.18	-	-	-	-		0.02		0.03	-	-	-	-	0.05	0.03	0.27	0.08
CV (%)	-	5.12	-	12.98	-	-	-	-		2.09		2.82	-	-	-	-	16.58	3.75	15.5	6.41

*PBW in flowers only**BT-** Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar **, O.V**-Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants

Table: 133. Ent 5: Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2022-23)- North Zone.

Treatment	Green Boll Damage (%) due to SBW/ABW/TC																			
	BT				FA				HI				SR				SG			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	0.00	-	0.00	-	0.00	-	-	-	0.00	-	-	-	0.00	1.00	-	-	0.00	0.00	-	-
T2	-	-	-	-	-	-	1.01	-	-	-	6.25	14.29	-	-	0.15	1.07	-	-	17.96	25.05
T3	0.00	-	0.00	-	0.00	-	0.29	-	0.00	-	4.38	11.96	0.00	1.00	0.10	1.05	0.00	0.00	13.62	21.64
T4	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	2.50	9.09	0.00	1.00	0.04	1.02	0.00	0.00	12.50	20.67
T5	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	3.13	10.05	0.00	1.00	0.05	1.03	0.00	0.00	11.22	19.55
T6	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	4.38	11.96	0.00	1.00	0.10	1.05	0.00	0.00	14.90	22.68
CD (5%)		-		-		-		NS		-		3.08		N/A		N/A		-	3.17	2.65
SE (m)		-		-		-		0.48		-		0.99		0.00		0.03		-	-	-
SE (d)		-		-		-		-		-		1.40		0.00		0.04		-	1.03	0.86
CV (%)		-		-		-		294.73		-		17.22		0.29		4.33		-	10.37	5.56

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar **, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 134. Ent 5: Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2022-23)- North Zone.

Treatment	Rosette Flower (%) due to PBW																			
	BT				FA				HI				SR				SG			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	4.44	11.85	-	-	0.00	-	-	-	-	-	-	-	0.00	0.00	-	-	6.36	14.59	-	-
T2	-	-	10.69	18.97	-	-	0.00	-	-	-	-	-	-	-	0.00	0.00	-	-	11.07	19.41
T3	0.74	4.75	7.61	15.98	0.00	-	0.00	-	-	-	-	-	0.00	0.00	0.00	0.00	2.33	8.75	8.80	17.23
T4	1.10	5.66	4.08	11.52	0.00	-	0.00	-	-	-	-	-	0.00	0.00	0.00	0.00	2.86	9.71	5.52	13.57
T5	3.30	10.20	2.33	8.06	0.00	-	0.00	-	-	-	-	-	0.00	0.00	0.00	0.00	4.08	11.65	4.32	11.99
T6	0.51	3.79	6.48	14.68	0.00	-	0.00	-	-	-	-	-	0.00	0.00	0.00	0.00	2.23	8.58	8.55	16.94
CD (5%)		3.02		3.16		-		-		-		-					0.98	1.44	2.29	2.35
SE (m)		0.98		1.03		-		-		-		-					-	-	-	-
SE (d)		1.39		1.45		-		-		-		-					0.32	0.47	0.74	0.76
CV (%)		27.07		14.83				-		-		-					12.64	6.22	13.74	6.82

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar **, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 135 . Ent 5: Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2022-23)- North Zone.

Treatment	Green Boll Damage (%) due to PBW																			
	BT				FA				HI				SR				SG			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	13.26	21.26	-	-	0.00	-	-	-	4.38	11.96	-		4.73	12.26	-	-	13.75	21.75	-	-
T2	-	-	29.91	32.92	-	-	0.00	-	-	-	10.00	18.36	-	-	20.27	26.25	-	-	17.19	24.47
T3	3.61	10.83	23.10	28.66	0.00	-	0.10	-	3.75	11.01	8.13	16.52	6.95	14.57	13.73	21.56	7.50	15.82	13.13	21.23
T4	7.58	14.36	16.58	23.73	0.00	-	0.00	-	3.75	11.01	5.00	12.49	3.73	12.41	8.13	16.69	9.58	18.01	12.81	20.96
T5	8.13	16.11	9.84	18.07	0.00	-	0.00	-	4.38	11.99	5.63	13.45	3.85	12.83	8.75	16.73	11.67	19.94	9.69	18.12
T6	3.43	9.76	18.05	25.07	0.00	-	0.00	-	2.50	9.09	6.88	15.15	6.63	14.20	10.30	20.72	5.42	13.34	14.38	22.25
CD (5%)	-	NS	-	6.82	-	-	-	NS		N/A		3.70	-	N/A	-	N/A	2.63	2.83	2.40	1.99
SE (m)	-	2.66	-	2.21	-	-	-	0.05		0.81		1.19	-	2.64	-	2.01	-	-	-	-
SE (d)	-	3.76	-	3.13	-	-	-	-		1.15		1.68	-	0.79	-	0.67	0.85	0.92	0.78	0.64
CV (%)	-	36.79	-	17.22	-	-	-	400.00		14.74		15.65	-	7.48	-	10.68	12.60	7.32	8.19	4.26

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar **, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 136. Ent 5: Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2022-23)- North Zone.

Treatment	Open Boll Damage (%)																			
	BT				FA				HI				SR				SG			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	20.20	26.65	-	-	1.80	-	-		9.65	18.06	-		12.73	20.68	-	-	16.50	23.93	-	-
T2	-	-	24.95	29.88	-	-	5.99		-	-	15.29	22.90	-	-	35.52	36.57	-	-	23.50	28.94
T3	4.95	12.16	18.95	25.68	1.31	-	3.88		8.62	17.05	13.69	21.69	17.21	24.48	33.10	35.10	9.50	17.88	20.50	26.89
T4	14.95	22.62	9.95	18.28	0.45	-	0.45		9.11	17.51	12.23	20.45	16.50	26.85	32.15	34.96	11.50	19.80	16.00	23.55
T5	14.95	22.55	7.95	16.34	1.57	-	4.18		9.26	17.69	12.12	20.35	17.81	24.88	33.85	35.56	13.00	21.11	13.50	21.48
T6	9.95	18.34	15.95	23.41	0.43	-	2.56		8.04	16.42	13.28	21.24	18.12	25.16	34.89	36.16	8.00	16.36	22.00	27.94
CD (5%)		5.42		4.23		NS		NS		N/A		N/A	-	2.27	-	N/A	3.79	3.49	5.41	6.61
SE (m)		1.76		1.37		0.66		1.20		0.60		0.82	-	0.73	-	0.78	-	-	-	-
SE (d)		2.49		1.94						0.85		1.16	-	1.03	-	1.10	1.23	1.13	1.76	2.14
CV (%)		17.17		12.07		102.85		60.69		6.95		7.66	-	5.98	-	4.35	14.89	8.08	13.00	11.28

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar **, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 137. Ent 5: Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2022-23)- North Zone.

Treatment	Locule Damage (%)																			
	BT				FA				HI				SR				SG			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	7.33	15.63	-	-	0.97	-		-	5.39	13.40	-	-	7.88	16.28	-	-	7.11	15.43	-	-
T2	-	-	12.08	20.24	-	-	3.61	-	-	-	8.64	17.05	-	-	31.25	33.69	-	-	12.37	20.54
T3	4.63	12.34	9.88	18.26	0.77	-	1.32	-	4.83	12.67	8.31	16.74	10.60	18.97	17.85	20.43	4.14	11.67	10.94	19.28
T4	5.28	13.23	5.55	13.58	0.19	-	0.19	-	5.14	13.08	7.66	16.04	9.92	20.42	16.95	20.22	5.51	13.56	8.21	16.62
T5	6.00	14.16	1.75	7.53	0.66	-	1.20	-	5.06	12.96	7.57	15.95	13.48	21.52	19.23	22.63	6.04	14.20	6.01	14.17
T6	4.78	12.55	7.13	15.39	0.20	-	1.02	-	4.34	11.97	8.15	16.57	13.87	21.84	21.33	31.80	3.68	11.03	12.23	20.46
CD (5%)		2.04		2.06		NS		NS		N/A		N/A	-	1.91	-	4.84	1.78	2.35	2.66	2.40
SE (m)		0.66		0.67		0.33		0.71		0.43		0.56	-	0.61	-	1.49	-	-	-	-
SE (d)		0.93		0.95		-		-		0.61		0.79	-	0.87	-	2.11	0.58	0.76	0.86	0.78
CV (%)		9.73		8.91		103.61		83.42		6.72		6.76	-	6.21	-	11.00	15.45	8.18	12.27	6.05

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar **, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 138. Ent 5:Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2022-23) - North Zone.

Treatment	Yield (q.)/ha.				
	BT	FA	HI	SR	SG
T1	22.15	9.67	14.55	24.11	24.47
T2	18.26	8.31	10.77	20.18	18.95
T3	23.33	9.22	13.54	20.66	24.14
T4	23.19	11.34	14.00	23.48	23.69
T5	22.99	7.71	13.96	22.89	22.97
T6	24.34	11.49	14.19	21.36	24.39

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar **, T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table:139 .Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23. (Central Zone)

Treatment	No. of larvae per plant (American Bollworm)																			
	JU				SU				AK				NA				RA			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	0.00	-	0.00	-	0.00	0.71	-	-	0.02	0.72	0.00	0.71	0.08	1.04	-	-	0.02	0.72		
T2	0.00	-	0.08	-	-	-	0.77	1.13	0.00	0.71	0.80	1.14	-	-	0.53	1.24	-	-	0.19	0.83
T3	0.00	-	0.03	-	0.00	0.71	0.21	0.85	0.04	0.73	0.41	0.95	0.08	1.04	0.50	1.21	0.02	0.72	0.27	0.88
T4	0.00	-	0.02	-	0.00	0.71	0.11	0.78	0.01	0.71	0.18	0.82	0.05	1.02	0.38	1.17	0.02	0.72	0.25	0.86
T5	0.00	-	0.02	-	0.00	0.71	0.08	0.76	0.02	0.72	0.24	0.86	0.05	1.02	0.38	1.16	0.01	0.72	0.32	0.91
T6	0.00	-	0.05	-	0.00	0.71	0.19	0.83	0.05	0.74	0.31	0.90	0.06	1.03	0.38	1.17	0.02	0.72	0.24	0.86
CD (5%)	-	0.00	-	0.00	-	-	-	0.18	-	-	-	0.04	-	NS	-	NS	-	N/A		N/A
SE (m)	-	0.00	-	0.00	-	-	-	0.06	-	0.008	-	0.02	-	0.02	-	0.04	-	0.01		0.05
SE (d)	-	-	-	-	-	-	-		-	-	-	-	-	0.03	-	0.06	-	-		
CV (%)	-	0.00	-	0.00	-	-	-	6.03	-	2.27	-	3.47	-	3.39	-	7.31	-	2.80		11.09

JU- Junagadh**, SU**- Surat**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri**, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commercial Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 140 Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23. (Central Zone)

Treatment	No. of larvae per plant (Spotted Bollworm)																			
	JU				SU				AK				NA				RA			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	0.00	-	0.00	-	0.00	0.71	-	-	0.00	0.00	0.00	0.71	0.00	0.00	-	-	0.01	0.71	-	-
T2	0.00	-	0.63	-	-	-	0.05	0.74	0.00	0.00	0.12	0.79	-	-	0.00	0.00	-	-	0.04	0.74
T3	0.00	-	0.00	-	0.00	0.71	0.00	0.71	0.00	0.00	0.05	0.74	0.00	0.00	0.00	0.00	0.01	0.71	0.02	0.72
T4	0.00	-	0.00	-	0.00	0.71	0.00	0.71	0.00	0.00	0.01	0.71	0.00	0.00	0.00	0.00	0.01	0.71	0.01	0.71
T5	0.00	-	0.00	-	0.00	0.71	0.00	0.71	0.00	0.00	0.03	0.72	0.00	0.00	0.00	0.00	0.01	0.71	0.04	0.73
T6	0.00	-	0.00	-	0.00	0.71	0.00	0.71	0.00	0.00	0.04	0.73	0.00	0.00	0.00	0.00	0.01	0.71	0.04	0.74
CD (5%)	-	0.00	-	0.00	-	-	-	NS	-	-	-	0.02	-	-	-	-	-	0.00	-	0.01
SE (m)	-	0.00	-	0.00	-	-	-	0.01	-	-	-	0.00	-	-	-	-	-	N/A	-	N/A
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
CV (%)	-	0.00	-	0.00	-	-	-	1.28	-	-	-	2.47	-	-	-	-	-	1.40	-	3.34

JU- Junagadh**, SU**- Surat**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri**, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commercial Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 141.Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23. (Central Zone) (Larval Recovery)

Treatment	No. of larvae per plant (Tobacco Caterpillar)																			
	JU				SU				AK				NA				RA			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	O.V	T.V	O.V	T.V	O.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	-	-	-	-	0.02	0.72	-	-	-	-	-	-	0.00	-	-	-	0.00	0.71	-	-
T2	-	-	-	-	-	-	0.34	0.91	-	-	-	-	-	-	0.40	-	-	-	0.00	0.71
T3	-	-	-	-	0.02	0.72	0.17	0.82	-	-	-	-	0.10	-	0.10	-	0.00	0.71	0.00	0.71
T4	-	-	-	-	0.00	0.71	0.03	0.73	-	-	-	-	0.00	-	0.00	-	0.00	0.71	0.00	0.71
T5	-	-	-	-	0.00	0.71	0.05	0.74	-	-	-	-	0.00	-	0.00	-	0.00	0.71	0.00	0.71
T6	-	-	-	-	0.02	0.72	0.06	0.75	-	-	-	-	0.00	-	0.00	-	0.00	0.71	0.00	0.71
CD (5%)		-		-		NS		0.10	-	-	-	-					-	-	-	-
SE (m)		-		-		0.01		0.03	-	-	-	-					-	-	-	-
SE (d)		-		-					-	-	-	-					-	-	-	-
CV (%)		-		-		2.62		7.52	-	-	-	-					-	-	-	-

JU- Junagadh**, SU**- Surat**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri**, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commercial Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 142.Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23. (Central Zone) (Larval Recovery)

Treatment	No. of larvae per plant (Pink bollworm)																			
	JU				SU				AK*				NA				RA*			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	T.V	O.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	2.43	1.56	0.00	0.00	0.42	0.96	-	-	2.48	1.71	0.00	0.71	0.13	1.06	-	-	8.80	3.05	-	-
T2	0.00	0.00	10.19	3.19	-	-	0.71	1.10	0.00	0.71	7.26	2.78	-	-	0.22	1.11	-	-	13.80	3.78
T3	3.08	1.76	8.15	2.86	0.35	0.92	0.47	0.98	4.45	2.22	5.74	2.49	0.11	1.05	0.19	1.09	7.40	2.81	11.20	3.42
T4	2.57	1.6	7.04	2.65	0.24	0.86	0.33	0.91	2.18	1.63	3.06	1.88	0.08	1.04	0.13	1.06	7.20	2.77	10.60	3.33
T5	2.69	1.64	7.43	2.73	0.27	0.88	0.38	0.94	2.88	1.82	4.15	2.15	0.08	1.04	0.14	1.07	6.80	2.70	10.20	3.27
T6	3.53	1.88	8.02	2.83	0.31	0.90	0.52	1.01	4.13	2.14	5.43	2.42	0.08	1.04	0.20	1.10	7.00	2.74	9.40	3.15
CD (5%)		0.07		0.12		NS		NS		0.266		0.308		NS		NS		N/A		N/A
SE (m)		0.2		0.37		0.05		0.04		0.088		0.102		0.01		0.02		0.065		0.103
SE (d)		-		-						-		-		0.01		0.03				
CV (%)		9.4		10.26		11.71		11.02		10.33		9.86		1.80		3.32		6.142		9.117

*No.of larvae/50 green bolls **, JU-** Junagadh**, SU**- Surat**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri**, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commercial Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 143. Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23.(Central Zone) Green Boll Damage (%) due SBW/ABW/TC*

Treatment	Green Boll Damage (%) due SBW/ABW/TC*																			
	JU				SU				AK				NA				RA			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	0.00	0.00	0.00	0.00	0.29	3.10	-	-	0.06	1.20	0.00	0.00	1.63	7.26	-	-	0.00	0.00	-	-
T2	0.00	0.00	25.44	30.29	-	-	13.82	21.82	0.00	0.00	12.82	20.97	-	-	8.06	16.36	-	-	10.14	18.57
T3	2.21	8.54	21.73	27.79	0.27	2.99	7.79	16.21	0.12	1.92	8.06	16.37	1.64	7.27	7.69	16.06	0.00	0.00	7.91	16.34
T4	1.52	7.09	18.54	25.51	0.24	2.82	4.40	12.12	0.03	0.51	4.21	11.83	1.56	7.14	6.15	14.31	0.00	0.00	5.33	13.35
T5	2.59	9.27	18.84	25.73	0.24	2.83	4.54	12.30	0.07	1.08	6.02	14.17	1.53	7.06	6.34	14.57	0.00	0.00	5.46	13.51
T6	2.72	9.5	19.39	26.12	0.00	2.87	5.35	13.37	0.16	1.97	7.13	15.44	1.59	7.14	6.45	14.73	0.00	0.00	6.29	14.52
CD (5%)		0.32		0.93		NS		3.67		-		1.871		NS		NS	-	-		2.25
SE (m)		0.98		2.8		0.10		1.23		0.499		0.621		0.52		0.72	-	-		0.74
SE (d)		-		-						-		-		0.74		1.01	-	-		
CV (%)		11.32		8.24		9.63		17.09		89.59		9.46		14.51		9.43	-	-		12.35

JU- Junagadh**, SU**- Surat**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri**, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commercial Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 144. Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23.(Central Zone) (Rosette Flower)

Treatment	Rosette Flower (%) due to PBW																			
	JU				SU				AK				NA				RA			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	2.84	9.71	0.00	0.00	5.07	13.01	-	-	1.28	1.33	0.00	0.71	2.06	8.22	-	-	3.40	2.77	-	-
T2	0.00	0.00	10.16	18.59	-	-	8.75	17.20	0.00	0.71	4.08	2.11	-	-	4.03	11.56	-	-	7.20	15.56
T3	3.44	10.69	7.08	15.43	4.44	12.17	5.91	14.07	2.09	1.61	2.88	1.83	2.19	8.47	3.20	10.27	2.80	2.95	7.80	16.22
T4	3.20	10.30	5.93	14.09	3.72	11.12	4.12	11.71	1.22	1.31	2.02	1.57	1.09	5.92	3.03	9.99	2.80	3.02	7.00	15.34
T5	3.70	11.09	6.86	15.18	3.91	11.41	4.39	12.09	1.77	1.50	2.69	1.78	1.19	6.24	2.89	9.73	3.20	2.77	8.20	16.64
T6	3.65	11.01	7.81	16.22	4.13	11.72	5.39	13.42	2.33	1.67	3.56	2.00	1.92	7.94	3.89	11.36	2.80	2.85	5.80	13.94
CD (5%)		0.39		0.65		NS		NS		0.204		0.401		0.91		1.27		N/A		N/A
SE (m)		1.18		1.95		0.57		1.08		0.068		0.133		0.29		0.41		0.256		0.461
SE (d)		-		-						-		-		0.41		0.58				
CV (%)		8.92		9.76		13.49		12.79		10.01		15.95		7.95		7.73		9.135		10.307

JU- Junagadh**, SU**- Surat**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri**, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commercial Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 145. Ent 5:Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23.(Central Zone) (Green Boll dissection Sampling)

Treatment	Green Boll Damage (%) due to PBW																			
	JU				SU				AK*				NA				RA			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	2.96	9.91	0.00	0.00	11.08	19.44	-	-	7.67	16.02	0.00	0.00	6.25	13.86	-	-	11.75	20.05	-	-
T2	0.00	0.00	17.42	24.67	-	-	18.59	25.54	0.00	0.00	23.17	28.75	-	-	10.00	18.04	-	-	19.50	26.21
T3	2.73	9.51	14.73	22.57	8.39	16.84	12.69	20.87	12.17	20.40	16.67	24.06	6.25	14.29	8.13	16.19	12.75	20.92	18.75	25.66
T4	2.40	8.92	9.68	18.13	4.09	11.66	6.78	15.09	6.25	14.47	9.67	18.07	3.75	10.96	5.63	13.45	12.00	20.27	17.25	24.54
T5	2.81	9.66	10.40	18.82	5.91	14.07	8.04	16.47	7.50	15.84	10.42	18.78	3.75	10.72	6.25	14.24	12.50	20.70	19.25	26.02
T6	3.17	10.26	10.91	19.29	7.65	16.06	10.63	19.03	12.33	20.53	17.75	24.84	5.00	12.65	7.50	15.63	12.25	20.49	18.25	25.29
CD (5%)		0.36		0.62		4.66		4.40		1.481		2.770		1.97		1.82		N/A		N/A
SE (m)		1.08		1.88		1.65		1.55		0.491		0.919		0.63		0.59		0.50		0.64
SE (d)		-		-						-		-		0.89		0.83				
CV (%)		8.94		7.24		40.10		31.96		6.76		9.63		10.10		7.54		9.46		9.48

*GBD (%) / 50 green bolls , **JU-** Junagadh**, SU**- Surat**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri**, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commercial Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 146.Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23.(Central Zone) (Open Boll Damage)

Treatment	Open Boll Damage (%)																			
	JU				SU				AK				NA				RA			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	3.06	10.07	0	0	8.19	16.63	-	-	5.82	13.94	0.00	0.00	10.50	18.83	-	-	29.40	32.83	-	29.40
T2	0.00	0.00	17.74	24.91	-	-	22.32	28.19	0.00	0.00	21.55	27.55	-	-	17.38	24.59	-	-	31.74	-
T3	3.74	11.15	9.92	18.36	6.26	14.50	9.59	18.04	10.27	18.66	14.76	22.54	10.13	18.46	16.69	24.07	15.65	23.30	32.14	15.65
T4	2.42	8.95	8.32	16.77	3.71	11.11	6.85	15.17	4.94	12.65	8.48	16.86	9.50	17.86	14.19	22.10	19.35	26.10	33.92	19.35
T5	3.43	10.68	9.89	18.33	4.11	11.70	6.42	14.68	5.67	13.58	9.69	17.67	9.31	17.67	14.06	22.00	26.85	31.21	24.78	26.85
T6	4.45	12.18	10.25	18.67	6.03	14.21	7.64	16.05	10.92	19.13	16.16	23.39	10.25	18.60	16.44	23.88	24.48	29.65	28.66	24.48
CD (5%)		0.52		0.80		1.85		1.72		3.457		5.420		NS		NS		3.06		
SE (m)		1.55		2.35		0.60		0.56		1.147		1.798		0.28		0.74		1.01		
SE (d)		-		-						-		-		0.39		1.05				
CV (%)		11.67		9.64		8.83		6.07		17.65		19.98		3.03		6.38		8.47		

JU- Junagadh**, SU**- Surat**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri**, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commercial Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 147. Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23. (Central Zone) (Open Locule Damage)

Treatment	Open Locule Damage (%)																			
	JU				SU				AK				NA				RA			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	1.92	7.96	0.00	0.00	4.63	12.43	-	-	1.84	7.78	0.00	0.00	4.69	12.43	-	-	20.42	26.86	-	-
T2	0.00	0.00	10.89	19.27	-	-	9.63	18.08	0.00	0.00	6.64	14.91	-	-	8.25	16.61	-	-	22.79	28.51
T3	1.71	7.52	8.70	17.15	3.45	10.70	5.56	13.63	3.54	10.79	4.40	11.80	4.38	11.98	8.00	16.35	9.52	17.97	17.35	24.62
T4	0.75	4.98	7.99	16.42	1.64	7.37	2.63	9.34	1.73	7.47	2.62	9.27	3.88	11.22	6.88	15.14	12.2	20.44	15.40	23.11
T5	1.88	7.89	9.50	17.95	2.04	8.21	2.50	9.09	1.92	7.82	3.21	10.25	3.81	10.98	6.50	14.71	13.5	21.56	16.85	24.24
T6	2.27	8.66	9.79	18.24	3.17	10.25	3.91	11.40	3.19	10.16	4.99	12.78	4.19	11.75	7.78	16.17	14.1	22.06	19.09	25.91
CD (5%)	-	0.36	-	0.58	-	1.46	-	1.52	-	2.19	-	2.48	-	NS	-	0.76	-	1.96	-	3.81
SE (m)	-	1.09	-	1.74	-	0.57	-	0.49	-	0.72	-	0.82	-	0.77	-	0.24	-	0.64	-	1.25
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	1.08	-	0.35	-	-	-	
CV (%)	-	11.74	-	7.78	-	11.64	-	8.01	-	19.81	-	16.77	-	13.11	-	3.09	-	7.11	-	11.92

JU- Junagadh**, SU**- Surat**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri**, O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commercial Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 148. . Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23.(Central Zone) (Yield)

Treatment	Yield (q/ha)				
	JU	SU	AK	NA	RA
T1	39.68	24.53	18.19	18.46	17.72
T2	19.07	13.79	12.42	14.21	11.17
T3	43.87	22.67	20.21	32.59	17.17
T4	45.53	23.95	23.66	31.15	16.82
T5	46.18	25.77	22.46	30.86	16.62
T6	46.07	22.43	19.70	30.45	16.08

JU- Junagadh**, SU**- Surat**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri**, T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commercial Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 149. Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23. (South Zone) (Larval Recovery)

Treatment	No. of larva per plant (American Bollworm)																			
	LG				ND				DW				RC				CN			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	-	-	-	-	0.00	0.00	0.00	0.00	0.04	0.73			0.00	0.71			-	-	-	-
T2	-	-	-	-	0.00	0.00	0.00	0.00			1.50	1.41	-	-	2.66	1.78	-	-	-	-
T3	-	-	-	-	0.00	0.00	0.00	0.00	0.15	0.80	1.02	1.23	0.00	0.71	2.00	1.58	-	-	-	-
T4	-	-	-	-	0.00	0.00	0.00	0.00	0.08	0.76	0.67	1.08	0.00	0.71	0.00	0.71	-	-	-	-
T5	-	-	-	-	0.00	0.00	0.00	0.00	0.10	0.77	0.62	1.06	0.00	0.71	0.76	1.26	-	-	-	-
T6	-	-	-	-	0.00	0.00	0.00	0.00	0.12	0.78	0.85	1.16	0.00	0.71	1.88	1.12	-	-	-	-
CD (5%)	-	-	-	-						0.02		0.07		0.00		0.15	-	-	-	-
SE (m)	-	-	-	-						0.07		0.03		0.00		0.47	-	-	-	-
SE (d)	-	-	-	-						-		-		-		-	-	-	-	-
CV (%)	-	-	-	-						1.76		4.12		0.00		12.17	-	-	-	-

LG-Lam Guntur**, ND-** Nandyal, **DW-**Dharwad, **RC-**Raichur, **CN-** Chamarajanagar,**O.V-**Original Value **; T.V-**Transformed value,**T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 150. Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23. (South Zone) (Larval Recovery)

Treatment	No. of larva per plant (Spotted Bollworm)																			
	LG				ND				DW				RC				CN			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-
T2	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
T3	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-
T4	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-
T5	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-
T6	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-
CD (5%)	-	-	-	-	-	-	-	-	-	-	-	-		0.00		0.00	-	-	-	-
SE (m)	-	-	-	-	-	-	-	-	-	-	-	-		0.00		0.00	-	-	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-		-		-	-	-	-	-
CV (%)	-	-	-	-	-	-	-	-	-	-	-	-		0.00		0.00	-	-	-	-

LG-Lam Guntur**, ND-** Nandyal, **DW-**Dharwad, **RC-**Raichur, **CN-** Chamarajanagar,**O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 151. Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23.(South Zone) (Larval Recovery)

Treatment	No. of larva per plant (Tobacco caterpillar)																			
	LG				ND				DW				RC				CN			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	-	-	-	-	-	-	-	-	-	-	-	-	0.33	0.91	-	-	-	-	-	-
T2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.33	1.96	-	-	-	-
T3	-	-	-	-	-	-	-	-	-	-	-	-	1.00	1.22	2.00	1.58	-	-	-	-
T4	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.71	0.00	0.71	-	-	-	-
T5	-	-	-	-	-	-	-	-	-	-	-	-	0.67	1.08	1.00	1.22	-	-	-	-
T6	-	-	-	-	-	-	-	-	-	-	-	-	0.67	1.08	1.33	1.35	-	-	-	-
CD (5%)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.25	-	0.12	-	-	-	-
SE (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.76	-	0.45	-	-	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	15.12	-	16.15	-	-	-	-

LG-Lam Guntur**, ND-** Nandyal, **DW-**Dharwad, **RC-**Raichur, **CN-** Chamarajanagar,**O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 152. Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23.(South Zone) (Larval Recovery)

Treatment	No. of larva per plant (Pink Bollworm)																			
	LG				ND				DW*				RC				CN			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	21.25	27.33	0.00	0.00	35.00	36.26	0.00	0.00	10.03	3.20			1.33	1.35	-	-	-	-	-	-
T2	0.00	0.00	21.25	27.33	0.00	0.00	38.33	38.21			21.81	4.72	-	-	3.67	2.04	-	-	-	-
T3	17.50	26.27	20.63	26.27	35.00	36.26	35.00	36.26	12.22	3.57	15.65	3.97	1.86	1.54	2.67	1.78	-	-	-	-
T4	20.63	24.63	22.50	24.63	30.00	33.18	33.33	35.19	9.57	3.17	12.05	3.54	0.88	1.17	1.00	1.22	-	-	-	-
T5	18.75	27.10	17.50	27.10	23.33	28.68	31.67	34.20	10.01	3.24	12.00	3.53	1.33	1.35	1.67	1.47	-	-	-	-
T6	15.63	25.36	15.63	25.36	40.00	39.23	41.67	40.22	10.84	3.37	15.58	4.01	2.33	1.68	1.67	1.47	-	-	-	-
CD (5%)	-	N/A	-	N/A	5.57		5.96			0.45		0.50		0.31		0.07	-	-	-	-
SE (m)	-	1.35	-	1.35	1.77		1.89			0.15		0.16		1.07		0.25	-	-	-	-
SE (d)	-	1.91	-	1.91	2.50		2.67			-		-		-		-	-	-	-	-
CV (%)	-	10.31	-	10.31	10.58		10.67			8.80		8.27		13.1		14.67	-	-	-	-

*PBW-larval recovery (%), **LG-**Lam Guntur**, ND-** Nandyal, **DW-**Dharwad, **RC-**Raichur, **CN-** Chamarajanagar,**O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 153. Ent 5:Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23.(South Zone) (Fruiting Body Damage)

Treatment	Green Boll Damage (%) due to SBW/ABW/TC																			
	LG				ND				DW				RC				CN			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	-	-	-	-	28.33	32.03	0.00	0.00	0.00	0.71	-	-	0.00	0.00	-	-	-	-	-	-
T2	-	-	-	-	0.00	0.00	40.00	39.14	-	-	12.00	19.95	-	-	36.76	37.32	-	-	-	-
T3	-	-	-	-	36.67	37.22	35.00	36.26	0.00	0.71	9.50	17.94	0.00	0.00	33.50	35.37	-	-	-	-
T4	-	-	-	-	41.67	40.22	38.33	38.26	0.00	0.71	6.00	14.17	0.00	0.00	0.00	0.00	-	-	-	-
T5	-	-	-	-	21.67	27.53	26.67	30.96	0.00	0.71	7.00	15.34	0.00	0.00	20.35	26.81	-	-	-	-
T6	-	-	-	-	25.00	29.94	25.00	29.94	0.00	0.71	8.50	16.94	0.00	0.00	25.30	30.20	-	-	-	-
CD (5%)	-	-	-	-	6.85		6.45					3.08		0.00		1.05	-	-	-	-
SE (m)	-	-	-	-	2.17		2.05					1.00		0.00		4.12	-	-	-	-
SE (d)	-	-	-	-	3.07		2.89					-		-		-	-	-	-	-
CV (%)	-	-	-	-	13.53		12.19					11.86		0.00		16.1	-	-	-	-

LG-Lam Guntur**, ND-** Nandyal, **DW-**Dharwad, **RC-**Raichur, **CN-** Chamarajanagar,**O.V-**Original Value **; T.V-**Transformed value,**T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 154. Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2022-23. (South Zone) (Rosette Flower)

Treatment	Rosette Flower (%) due to PBW																			
	LG				ND				DW				RC				CN			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	6.67	14.96	_	_	0.00	0.71	0.00	0.71	1.72	7.54			13.33	21.41	-	-	-	-	-	-
T2	-	-	6.67	14.39	0.67	1.05	0.00	0.71			5.43	13.46	-	-	36.70	37.29	-	-	-	-
T3	5.83	13.64	5.42	13.19	0.00	0.71	0.00	0.71	3.46	10.71	4.19	11.80	18.60	25.55	12.67	20.85	-	-	-	-
T4	5.83	13.60	5.58	13.21	0.33	0.88	0.00	0.71	2.61	9.29	3.44	10.68	1.88	7.88	10.00	18.43	-	-	-	-
T5	5.00	12.83	5.42	13.28	0.00	0.71	0.00	0.71	2.62	9.31	3.51	10.79	13.33	21.41	16.70	24.12	-	-	-	-
T6	5.00	12.74	5.42	12.83	0.00	0.71	0.00	0.71	2.73	9.51	3.49	10.76	23.33	28.88	16.70	24.12	-	-	-	-
CD (5%)	-	NA	-	NA	0.34					1.55		2.56		0.81		2.01	-	-	-	-
SE (m)	-	1.50	-	1.38	0.11					0.50		0.82		2.41		6.05	-	-	-	-
SE (d)	-		-		0.15					-		-		-		-	-	-	-	-
CV (%)	-	22.81	-	20.9	23.82					10.94		14.91		17.31		18.35	-	-	-	-

LG-Lam Guntur**, ND-** Nandyal, **DW-**Dharwad, **RC-**Raichur, **CN-** Chamarajanagar, **O.V-**Original Value **; T.V-**Transformed value,**T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 155 .Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton. (South Zone) (Green Boll dissection Sampling)

Treatment	Green Boll Damage (%) due to PBW																			
	LG				ND				DW				RC				CN			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	16.88	24.03			28.33	32.03	0.00	0.00	19.57	26.11	-	-	46.63	-	-	-	-	-	-	-
T2			18.75	25.59	0.00	0.00	40.00	39.14	-	-	30.87	33.67	-	-	52.04	-	-	-	-	-
T3	18.13	25.03	21.25	27.21	36.67	37.22	35.00	36.26	20.22	26.71	23.66	29.09	39.38	-	54.58	-	-	-	-	-
T4	20.63	26.91	22.63	27.74	41.67	40.22	38.33	38.26	16.10	23.65	19.41	26.12	44.41	-	46.28	-	-	-	-	-
T5	19.38	25.97	20.00	26.45	21.67	27.53	26.67	30.96	15.07	22.83	16.78	24.16	38.67	-	49.31	-	-	-	-	-
T6	16.25	23.61	20.00	26.53	25.00	29.94	25.00	29.94	18.18	25.23	21.49	27.59	36.25	-	52.50		-	-	-	-
CD (5%)		NA		NA		6.85		6.45		2.47		2.79		-			-	-	-	-
SE (m)		1.9		1.72		2.17		2.05		0.80		0.90		-			-	-	-	-
SE (d)						3.07		2.89		-		-		-			-	-	-	-
CV (%)		15.4		12.88		13.53		12.19		6.42		6.43		-			-	-	-	-

LG-Lam Guntur**, ND-** Nandyal, **DW-**Dharwad, **RC**-Raichur, **CN-** Chamarajanagar,**O.V-**Original Value **; T.V-**Transformed value,**T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 156. Ent 5:Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton. (South Zone) (Open Boll Damage)

Treatment	Open Boll Damage (%)																			
	LG				ND				DW				RC				CN			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	34.80	36.09			21.67	27.53	0.00	0.00	18.27	25.19			80.66	63.91	-	-	-	-	-	-
T2			42.37	40.33	0.00	0.00	25.00	29.94			32.84	34.85	-	-	85.33	67.48	-	-	-	-
T3	30.05	33.88	35.91	36.58	26.67	31.09	28.33	32.11	23.17	28.75	26.76	31.10	73.55	59.05	86.13	68.13	-	-	-	-
T4	31.99	33.31	37.31	37.54	28.33	32.03	26.67	31.09	18.65	25.52	20.38	26.82	65.37	53.95	70.13	56.87	-	-	-	-
T5	34.80	34.20	37.76	37.65	30.00	33.18	25.00	29.94	18.33	25.29	20.15	26.57	78.45	62.34	86.54	68.48	-	-	-	-
T6	39.98	37.25	45.08	42.07	26.67	30.96	28.33	32.03	20.06	26.55	24.92	29.90	80.17	63.56	88.33	70.02	-	-	-	-
CD (5%)		NA		NA	6.24		6.08			2.18		3.7		1.56		1.35	-	-	-	-
SE (m)		1.4		1.69	1.98		1.93			0.71		1.20		4.69		3.98	-	-	-	-
SE (d)		-		-	2.80		2.72			-		-		-		-	-	-	-	-
CV (%)		7.98		8.7	13.30		12.92			6.87		8.04		13.69		16.68	-	-	-	-

LG-Lam Guntur**, ND-** Nandyal, **DW-**Dharwad, **RC**-Raichur, **CN-** Chamarajanagar,**O.V-**Original Value **; T.V-**Transformed value,**T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants.

Table: 157. Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton. (South Zone) (Open Locule Damage)

Treatment	Open Locule damage (%)																			
	LG				ND				DW				RC				CN			
	Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt		Bt		N-Bt	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	20.31	26.37			7.00	15.32	0.00	0.00	17.50	24.67			75.33	60.22	-	0.00	-	-	-	-
T2			22.02	27.79	0.00	0.00	8.67	17.11			43.75	41.39	-	0.00	83.25	65.84	-	-	-	-
T3	17.54	24.47	17.54	24.29	7.33	15.67	8.00	16.42	33.75	35.43	37.50	37.74	71.46	57.71	84.99	67.21	-	-	-	-
T4	17.96	24.80	19.58	25.97	7.00	15.32	8.00	16.42	23.75	29.07	26.25	30.73	66.23	54.47	69.23	56.30	-	-	-	-
T5	19.81	26.13	21.30	27.22	6.67	14.86	7.00	15.32	23.00	28.78	27.50	31.50	75.46	60.31	85.13	67.32	-	-	-	-
T6	21.27	27.19	22.51	28.10	6.00	14.15	5.67	13.69	27.50	31.54	31.25	33.81	72.92	58.64	86.96	68.83	-	-	-	-
CD (5%)		NA		NA	2.65		2.25			5.48		5.10		1.89		2.07	-	-	-	-
SE (m)		1.93		1.47	0.84		0.72			1.78		1.66		5.69		6.25	-	-	-	-
SE (d)		-		-	1.18		1.01			-		-		-		-	-	-	-	-
CV (%)		14.96		11.03	11.58		9.41			11.95		9.45		17.1		18.35	-	-	-	-

LG-Lam Guntur**, ND-** Nandyal, **DW-**Dharwad, **RC-**Raichur, **CN-** Chamarajanagar,**O.V-**Original Value **; T.V-**Transformed value, **T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plant.

Table: 158. Ent 5: Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton. (South Zone) (Yield)

Treatment	Yield (q.)/ha.				
	LG	ND	DW	RC	CN
T1	7.03	-	14.95	11.63	-
T2	8.31	-	7.29	1.9	-
T3	10.77	-	11.01	15.21	-
T4	9.88	-	13.03	5.62	-
T5	10.42	-	13.27	19.12	-
T6	12.49	-	12.68	11.31	-

LG-Lam Guntur**, ND-** Nandyal, **DW-**Dharwad, **RC-**Raichur, **CN-** Chamarajanagar,**T1**-100 % Bt, **T2**-100% Non-Bt, **T3**-20% structured refugia(Border sowing 4 rows & ETL based spray against bollworms), **T4**-RIB-Random(5-10% Minimal Non-Bt seeds)- Commerical Pack, **T5**- RIB-Fixed pattern (5 % Minimal Non Bt seeds).Non Bt plant should be surrounded by 4 Bt plants, **T6**-RIB-Fixed pattern (10 % Maximum Non Bt seeds). Non Bt plant should be surrounded by 4 Bt plants

Table: 159. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2022-23)-North Zone.

Treatment	No. of larvae per plant (ABW/SBW/TC)														
	BT					FA					HI*				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	0.00	-	0.00	-	-	0.00		0.00	-	-	1.40	1.55	1.50	1.58	23.73
T2	0.00	-	0.00	-	-	0.00		0.00	-	-	1.47	1.57	1.43	1.55	27.12
T3	0.00	-	0.00	-	-	0.00		0.00	-	-	1.50	1.58	1.53	1.59	22.03
T4	0.00	-	0.00	-		0.00		0.00	--	-	1.37	1.54	1.20	1.48	38.98
T5	0.00	-	0.00	-	-	0.00		0.00	--	-	1.50	1.58	1.33	1.53	32.20
T6	0.00	-	0.00	-	-	0.20		0.00	-	-	1.33	1.53	0.97	1.40	50.85
T7	0.00	-	0.00	-	-	0.00		0.00	-	-	1.33	1.53	1.07	1.44	45.76
T8	0.00	-	0.00	-	-	0.00		0.00	-	-	1.33	1.53	1.13	1.46	42.37
T9	0.00	-	0.00	-	-	0.00		0.00	-	-	1.27	1.51	0.93	1.39	52.54
T10	0.00	-	0.00	-	-	0.00		0.00	-	-	1.27	1.50	1.00	1.41	49.15
T11	0.00	-	0.00	-	-	0.00		0.00	-	-	1.40	1.55	1.17	1.47	40.68
T12	0.00	-	0.00	-	-	-		-	-	-	1.47	1.57	1.27	1.50	35.59
T`13	0.00	-	0.00	-	-	0.00		0.00	-	-	1.87	1.69	1.97	1.72	-
CD (5%)	-	-	-	-	-	-	-	-	-	-	-	N/A	-	0.12	-
SE (m)	-	-	-	-	-	-	-	-	-	-	-	0.04	-	0.04	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	0.05	-	0.06	-
CV (%)	--	--	--	--	--	--	--	--	--	-	-	3.97	-	4.62	-

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar; **DAS**-day after spray, *SBW LARVAE/PLANT**O.V-**Original Value **; T.V-**Transformed value **Treatments Details:** T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 160. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2022-23)-North Zone.

Treatment	No. of larvae per plant (ABW/SBW/TC)									
	SR					SG*				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	0.34	1.05	0.07	1.01	89.55	2.85	1.83	1.76	1.50	43.15
T2	0.33	1.05	0.03	1.01	95.31	2.31	1.67	1.68	1.48	45.63
T3	0.32	1.05	0.06	1.01	91.04	2.24	1.66	1.80	1.52	41.75
T4	0.29	1.05	0.04	1.01	93.75	2.77	1.81	1.56	1.43	49.62
T5	0.28	1.05	0.07	1.01	89.55	2.39	1.70	1.64	1.46	46.93
T6	0.27	1.04	0.04	1.01	93.75	2.18	1.63	1.33	1.35	56.85
T7	0.23	1.04	0.08	1.01	88.06	3.08	1.89	1.49	1.41	51.78
T8	0.32	1.05	0.08	1.01	87.50	2.31	1.67	1.46	1.40	52.86
T9	0.27	1.04	0.04	1.01	94.03	2.55	1.75	1.20	1.30	61.17
T10	0.29	1.05	0.05	1.01	92.19	2.17	1.63	1.29	1.34	58.25
T11	0.30	1.05	0.08	1.01	88.06	2.34	1.68	1.40	1.38	54.69
T12	0.31	1.05	0.08	1.01	87.50	2.65	1.77	1.73	1.49	43.91
T`13	0.74	1.11	0.67	1.08	-	2.34	1.69	3.09	1.89	0.00
CD (5%)	-	N/A	-	0.02	-		0.25		0.18	-
SE (m)	-	0.02	-	0.01	-	-	-	-	-	-
SE (d)	-	0.02	-	0.01	--	-	0.08		0.06	-
CV (%)	--	2.66	--	0.93	--	-	6.02		5.12	--

SR- Sirsa**; SG-** Sriganganagar **, DAS**-day after spray, ***SBW LARVAE/PLANT ,** **O.V-**Original Value **; T.V-**Transformed value **Treatments Details:** T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 161. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2022-23)-North Zone.

Treatment	No. of larvae per plant in flower (PBW)														
	BT					FA					HI				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	3.87	2.19	3.40	2.08	22.73	0.00	-	0.00		-	2.17	1.78	2.47	1.86	10.70
T2	4.13	2.26	2.67	1.90	39.39	0.00	-	2.00		-	2.07	1.75	2.33	1.82	12.52
T3	3.80	2.18	2.47	1.84	43.94	0.00	-	0.00		-	2.20	1.79	2.33	1.83	12.47
T4	3.97	2.22	2.73	1.91	37.88	0.00	-	2.00		-	1.73	1.65	1.73	1.65	20.82
T5	3.93	2.21	2.67	1.90	39.39	0.00	-	2.00		-	2.00	1.73	2.00	1.73	17.07
T6	4.20	2.27	3.20	2.04	27.27	0.00	-	0.00		-	1.87	1.69	1.77	1.66	20.43
T7	4.67	2.38	3.93	2.20	10.61	0.00	-	0.00		-	1.90	1.70	1.83	1.68	19.42
T8	3.87	2.19	3.47	2.10	21.21	0.00	-	0.00		-	1.80	1.67	1.77	1.66	20.29
T9	3.53	2.11	2.47	1.84	43.94	0.00	-	0.00		-	1.63	1.62	1.47	1.57	24.70
T10	4.07	2.24	3.00	1.98	31.82	0.00	-	0.00		-	2.03	1.74	1.83	1.68	19.38
T11	3.23	2.04	2.20	1.77	50.00	0.00	-	0.00		-	1.57	1.60	1.47	1.57	24.75
T12	3.87	2.19	3.60	2.13	18.18	-		-		-	1.97	1.72	2.07	1.75	16.02
T13	3.93	2.21	4.40	2.31	0.00	0.00	-	0.00		-	2.60	1.89	3.37	2.09	-
CD (5%)		NS		0.15	-		-	NS		-	-	N/A	-	0.16	-
SE (m)		0.06		0.05	-		-	0.78		-	-	0.05	-	0.05	-
SE (d)		0.08		0.07	-		-			-	-	0.07	-	0.08	-
CV (%)		4.79		4.474	-		-	220.19		-	-	5.30	-	5.29	-

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; DAS**-day after spray, ***SBW LARVAE/PLANT** **O.V-**Original Value **; T.V-**Transformed value **Treatments Details:** T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 162. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2022-23)-North Zone.

Treatment	No. of larvae per plant in flower (PBW)									
	SR					SG				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	0.00	0.00	0.00	0.00	-	2.27	1.66	1.27	1.33	50.00
T2	0.00	0.00	0.00	0.00	-	2.53	1.74	1.13	1.28	55.26
T3	0.00	0.00	0.00	0.00	-	2.20	1.64	1.33	1.35	47.37
T4	0.00	0.00	0.00	0.00	-	2.47	1.72	1.00	1.22	60.53
T5	0.00	0.00	0.00	0.00	-	2.40	1.70	1.07	1.25	57.89
T6	0.00	0.00	0.00	0.00	-	2.33	1.68	1.13	1.28	55.26
T7	0.00	0.00	0.00	0.00	-	2.13	1.62	1.27	1.33	50.00
T8	0.00	0.00	0.00	0.00	-	2.67	1.78	1.07	1.25	57.89
T9	0.00	0.00	0.00	0.00	-	2.60	1.76	0.87	1.17	65.79
T10	0.00	0.00	0.00	0.00	-	2.47	1.72	0.93	1.20	63.16
T11	0.00	0.00	0.00	0.00	-	2.87	1.83	1.00	1.22	60.53
T12	0.00	0.00	0.00	0.00	-	2.73	1.80	1.33	1.35	47.37
T13	0.00	0.00	0.00	0.00	-	2.33	1.68	2.53	1.74	0.00
CD (5%)					-		0.24		0.16	
SE (m)					-					
SE (d)					-		0.08		0.06	
CV (%)					-		5.79		5.20	

SR- Sirsa**; SG-** Sriganganagar **, DAS**-day after spray, ***SBW LARVAE/PLANT** **O.V**-Original Value **; T.V-**Transformed value **Treatments Details: T_1** – T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:163. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2022-23)-North Zone.

Treatment	Green Boll damage due to SBW/ABW or Fruiting Body Damage (%)														
	BT					FA					HI				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	0.00	-	0.00	-	-	3.26	-	0.45	-	79.09	7.50	15.74	9.17	17.58	31.25
T2	0.00	-	0.00	-	-	1.76	-	0.83	-	61.63	6.67	14.90	9.17	17.58	31.25
T3	0.00	-	0.00	-	-	1.95	-	1.00	-	53.94	6.67	14.90	9.17	17.58	31.25
T4	0.00	-	0.00	-	-	1.95	-	1.67	-	23.26	6.67	14.90	7.50	15.89	43.75
T5	0.00	-	0.00	-	-	0.51	-	1.24	-	42.84	7.50	15.74	8.33	16.73	37.50
T6	0.00	-	0.00	-	-	3.05	-	0.00	-	100.00	4.17	11.64	5.00	12.92	62.50
T7	0.00	-	0.00	-	-	1.06	-	0.00	-	100.00	5.00	12.63	5.00	12.63	62.50
T8	0.00	-	0.00	-	-	3.35	-	1.11	-	48.83	5.83	13.91	7.50	15.74	43.75
T9	0.00	-	0.00	-	-	1.49	-	0.00	-	100.00	5.00	12.92	5.00	12.92	62.50
T10	0.00	-	0.00	-	-	1.85	-	0.00	-	100.00	5.00	12.63	5.00	12.92	62.50
T11	0.00	-	0.00	-	-	2.10	-	0.00	-	100.00	5.83	13.91	7.50	15.89	43.75
T12	0.00	-	0.00	-	-	-		-		-	6.67	14.75	7.50	15.89	43.75
T13	0.00	-	0.00	-	-	2.64	-	2.17	-	-	9.17	17.58	13.33	21.33	-
CD (5%)		-		-	-	NS	-	NS	-	-	-	N/A	-	2.77	-
SE (m)		-		-	-	1.00	-	0.72	-	-	-	1.36	-	0.94	-
SE (d)		-		-	-		-		-	-	-	1.93	-	1.34	-
CV (%)		-		-	-	84.00	-	145.49	-	-	-	16.47	-	10.34	-

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; DAS**-day after spray, ***SBW LARVAE/PLANT** **O.V-**Original Value **; T.V-**Transformed value **Treatments Details:** T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:164. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2022-23)-North Zone.

Treatment	Green Boll damage due to SBW/ABW or Fruiting Body Damage (%)									
	SR					SG				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	12.4	20.59	7.56	15.91	44.37	21.67	27.70	13.33	21.33	52.94
T2	13.23	21.3	6.43	14.65	58.27	20.00	26.55	11.67	19.88	58.82
T3	13.86	21.78	5.6	13.65	58.79	23.33	28.84	15.00	22.78	47.05
T4	13.51	21.48	5.53	13.6	64.11	18.33	25.30	10.00	18.43	64.70
T5	12.78	20.92	5.26	13.25	61.30	21.67	27.70	11.67	19.88	58.82
T6	11.65	19.94	4.93	12.83	68.01	25.00	29.99	8.33	16.59	70.58
T7	11.49	19.79	4.41	12.12	67.55	23.33	28.84	8.33	16.59	70.58
T8	11.61	19.91	4.87	12.74	68.40	20.00	26.55	10.00	18.43	64.70
T9	12.38	20.59	5.12	13.06	62.33	18.33	25.30	6.67	14.75	76.47
T10	13.09	21.2	5.11	13.06	66.84	23.33	28.84	8.33	16.59	70.58
T11	12.89	21.03	5.57	13.64	59.01	25.00	29.99	10.00	18.43	64.70
T12	12.78	20.94	5.75	13.85	62.69	21.67	27.70	13.33	21.33	52.94
T13	16.06	23.6	13.59	21.54	-	21.67	27.70	28.33	32.13	52.94
CD (5%)		1.89		1.76			4.17		5.40	
SE (m)		0.65		0.6			-		-	
SE (d)		0.91		0.85			1.43		1.85	
CV (%)		5.27		7.05			6.30		11.46	

SR- Sirsa**; SG-** Sriganganagar **, DAS**-day after spray, ***SBW LARVAE/PLANT, O.V-**Original Value **; T.V-**Transformed value **Treatments Details:** T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:165. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2022-23)-North Zone.

Treatment	Green Boll damage(%) due to PBW														
	BT					FA					HI				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	26.67	30.94	41.67	40.11	13.79	10.00	-	0.00	-	100.00	10.00	18.43	14.17	22.08	29.17
T2	48.33	44.04	26.67	30.67	44.83	10.00	-	20.00	-	0.00	10.83	19.03	10.83	19.09	45.83
T3	26.67	30.18	25.00	29.52	48.28	0.00	-	0.00	-	100.00	10.00	18.34	13.33	21.33	33.33
T4	25.00	29.68	28.33	32.14	41.38	10.00	-	20.00	-	0.00	8.33	16.73	8.33	16.73	58.33
T5	23.33	28.78	28.33	32.01	41.38	0.00	-	20.00	-	0.00	8.33	16.73	11.67	19.94	41.67
T6	30.00	33.21	38.33	38.19	20.69	0.00	-	20.00	-	0.00	9.17	17.49	9.17	17.58	54.17
T7	43.33	41.16	46.67	43.07	3.45	0.00	-	40.00	-	100.00	10.00	18.34	10.00	18.34	50.00
T8	46.67	43.08	43.33	41.07	10.34	20.00	-	0.00	-	100.00	8.33	16.73	8.33	16.73	58.33
T9	30.00	32.76	25.00	29.30	48.28	0.00	-	0.00	-	100.00	9.17	17.49	7.50	15.74	62.50
T10	48.33	44.04	31.67	34.18	34.48	0.00	-	0.00	-	100.00	8.33	16.64	9.17	17.60	54.17
T11	26.67	30.99	21.67	27.71	55.17	20.00	-	20.00	-	0.00	9.17	17.49	7.50	15.89	62.50
T12	43.33	41.07	43.33	41.16	10.34	-		-		-	10.00	18.43	11.67	19.94	41.67
T13	50.00	45.00	48.33	44.03	0.00	0.00	-	20.00	-	0.00	14.17	21.89	20.00	26.29	-
CD (5%)		15.70		15.34	-	NS	-	NS	-	-		N/A		3.96	-
SE (m)		4.68		4.46	-	9.00	-	7.93	-	-		1.24		1.35	-
SE (d)		9.67		9.21	-		-		-	-		1.75		1.91	-
CV (%)		3.83		3.39	-	218.28	-	84.11	-	-		11.91		12.29	-

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; DAS**-day after spray, ***SBW LARVAE/PLANT** **O.V-**Original Value **; T.V-**Transformed value **Treatments Details:** T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:166. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2022-23)-North Zone.

Treatment	Green Boll damage(%) due to PBW									
	SR					SG*				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	12.5	20.59	5.83	13.6	72.01	21.67	27.70	13.33	21.33	52.94
T2	15.83	23.24	6.67	14.35	65.21	20.00	26.55	11.67	19.88	58.82
T3	10.83	19.17	5.83	11.72	72.01	23.33	28.84	16.67	24.04	41.17
T4	10.00	18.31	5.00	12.74	73.92	21.67	27.70	10.00	18.43	64.70
T5	11.67	19.92	4.17	9.86	79.98	25.00	29.99	11.67	19.88	58.82
T6	13.33	21.20	6.67	14.72	65.21	18.33	25.30	13.33	21.33	52.94
T7	10.83	18.73	4.17	11.62	79.98	23.33	28.84	15.00	22.78	47.05
T8	11.67	19.72	6.67	14.72	65.21	21.67	27.70	13.33	21.33	52.94
T9	10.83	19.17	5.00	10.98	76.00	20.00	26.55	6.67	14.75	76.47
T10	11.67	19.72	6.67	12.59	65.21	23.33	28.84	8.33	16.59	70.58
T11	10.00	17.94	4.17	9.86	79.98	21.67	27.70	13.33	21.33	52.94
T12	11.67	19.72	5.83	13.60	69.59	18.33	25.30	15.00	22.78	47.05
T13	30.00	33.06	20.83	27.10	-	21.67	27.70	28.33	32.13	0.00
CD (5%)	-	5.33	-	7.70	-	-	4.25	-	5.44	-
SE (m)	-	1.86	-	2.68	-	-	-	-		-
SE (d)	-	2.63	-	3.79	-	-	1.46	-	1.86	-
CV (%)	-	17.15	-	36.95	-	-	6.46	-	10.73	-

SR- Sirsa**; SG-** Sriganganagar **, DAS**-day after spray, ***SBW LARVAE/PLANT** **O.V**-Original Value **; T.V-**Transformed value **Treatments Details** T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 167. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2022-23)-North Zone.

Treatment	Nantural Enemies /plant *														
	BT					FA					HI				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	1.47	1.56	0.87	1.36	48.00	4.89	-	3.99	-	29.55	1.37	1.54	1.23	1.49	5.46
T2	2.13	1.76	1.00	1.41	40.00	4.00	-	4.33	-	23.59	1.43	1.56	1.23	1.49	5.39
T3	1.80	1.66	0.67	1.29	60.00	4.89	-	4.55	-	19.63	1.30	1.52	1.23	1.49	5.20
T4	2.20	1.79	1.07	1.43	36.00	4.22	-	4.22	-	25.57	1.43	1.56	1.27	1.51	4.51
T5	2.07	1.75	1.27	1.50	24.00	4.33	-	4.55	-	19.71	1.37	1.54	1.27	1.50	4.57
T6	2.27	1.80	1.27	1.50	24.00	4.11	-	3.66	-	35.37	1.27	1.51	1.33	1.53	3.24
T7	2.20	1.78	1.40	1.54	16.00	3.55	-	3.66	-	35.33	1.33	1.53	1.27	1.50	4.57
T8	1.73	1.65	0.93	1.38	44.00	4.00	-	4.44	-	21.65	1.43	1.56	1.30	1.51	3.93
T9	2.00	1.72	1.40	1.55	16.00	5.22	-	4.33	-	23.65	1.53	1.59	1.33	1.52	3.43
T10	1.87	1.69	1.13	1.45	32.00	4.34	-	4.00	-	29.45	1.40	1.55	1.40	1.55	1.84
T11	1.87	1.69	1.07	1.43	36.00	4.11	-	4.22	-	25.59	1.40	1.55	1.27	1.51	4.51
T12	2.13	1.76	1.27	1.49	24.00	-		-		-	1.43	1.56	1.27	1.50	4.82
T13	2.40	1.84	1.67	1.62	0.00	4.67	-	5.67	-	-	1.53	1.59	1.50	1.58	-
CD (5%)	-	11.53	-	12.11	-	0.67	-	NS	-	-	-	N/A	-	N/A	-
SE (m)	-	0.16	-	0.14	-	1.02	-	1.02	-	-	-	0.06	-	0.06	-
SE (d)	-	NS	-	NS	-		-		-	-	-	0.08	-	0.08	-
CV (%)	-	0.43	-	0.77	-	11.09	-	10.57	-	-	-	6.37	-	6.75	-

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; DAS**-day after spray, ***SBW LARVAE/PLANT** **O.V-**Original Value **; T.V-**Transformed value **Treatments Details:** T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

*Natural Enemies include coccinellids, chrysopids, syrphids and spider

Table: 168. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2022-23)-North Zone.

Treatment	Natural Enemies/plant*									
	SR					SG				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	0.93	1.2	0.77	-	14.15	1.82	1.52	1.39	1.37	27.40
T2	0.67	1.1	0.80	-	11.33	1.80	1.51	1.41	1.38	26.18
T3	0.85	1.13	0.73	-	19.07	1.57	1.44	1.31	1.35	31.24
T4	0.97	1.16	0.78	-	13.44	1.85	1.53	1.49	1.41	21.99
T5	0.61	1.10	0.77	-	14.15	1.58	1.44	1.53	1.43	19.72
T6	0.59	1.09	0.81	-	9.93	1.45	1.40	1.62	1.45	15.01
T7	0.96	1.15	0.80	-	11.33	1.97	1.57	1.79	1.51	6.46
T8	0.86	1.13	0.75	-	16.96	2.09	1.61	1.69	1.48	11.69
T9	0.63	1.10	0.84	-	6.41	1.79	1.51	1.89	1.55	0.87
T10	0.67	1.11	0.87	-	2.89	1.83	1.52	1.87	1.54	2.27
T11	0.60	1.09	0.79	-	12.74	1.65	1.47	1.84	1.53	3.66
T12	0.53	1.09	0.81	-	9.93	1.75	1.50	1.31	1.35	31.24
T13	0.98	1.14	0.90	-	-	1.64	1.46	1.91	1.55	-
CD (5%)	-	1.14	-	-	-	-	0.22	-	0.18	-
SE (m)	-	N/A	-	-	-	-		-		-
SE (d)	-	0.04	-	-	-	-	0.08	-	0.06	-
CV (%)	-	6.15	-	-	-	-	6.14	-	5.17	-

SR- Sirsa**; SG-** Sriganganagar **, DAS**-day after spray, ***SBW LARVAE/PLANT** **O.V**-Original Value **; T.V-**Transformed value **Treatments Details:** T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 169. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2022-23)-North Zone.

Treatment	Open Boll and Locule Damage (%) due to PBW																			
	BT				FA				HI				SR				SG			
	Boll Damage (%)		Locule Damage (%)		Boll Damage (%)		Locule Damage (%)		Boll Damage (%)		Locule Damage (%)		Boll Damage (%)		Locule Damage (%)		Boll Damage (%)		Locule Damage (%)	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	23.33	28.66	7.71	16.03	2.88	-	1.30	-	11.81	20.07	6.78	15.08	17.52	24.72	12.84	20.96	11.33	19.65	5.68	13.78
T2	15.00	21.90	6.15	14.31	4.61	-	1.80	-	10.66	19.05	6.39	14.62	15.5	22.67	10.25	17.55	9.33	17.76	4.69	12.48
T3	15.00	21.90	6.05	14.23	0.00	-	0.00	-	11.02	19.36	6.56	14.81	18.26	25.24	14.54	22.37	15.33	23.03	7.32	15.68
T4	16.67	24.04	6.33	14.56	3.67	-	2.00	-	9.97	18.38	6.16	14.31	17.78	24.92	13.59	21.61	8.67	17.09	4.31	11.93
T5	16.67	23.36	6.20	14.41	3.71	-	1.90	-	10.08	18.50	6.13	14.29	14.88	21.89	10.95	18.22	9.33	17.76	4.63	12.39
T6	21.67	27.59	7.63	16.02	4.71	-	2.20	-	8.65	17.07	5.23	13.22	18.62	25.52	15.40	23.03	11.33	19.65	5.51	13.55
T7	33.33	35.16	9.87	18.31	3.49	-	2.00	-	8.94	17.37	5.27	13.22	11.61	18.02	9.01	15.65	12.67	20.83	6.32	14.55
T8	25.00	29.52	9.45	17.87	5.74	-	3.00	-	9.54	17.98	5.80	13.92	18.92	25.70	15.65	22.86	10.67	19.04	5.35	13.35
T9	10.00	18.04	4.07	11.54	1.54	-	1.00	-	8.25	16.66	5.06	12.99	18.14	25.08	14.32	21.98	6.67	14.92	3.60	10.90
T10	20.00	25.37	7.05	15.34	3.05	-	1.50	-	9.79	18.22	5.90	14.02	14.55	20.06	9.41	15.81	7.33	15.67	3.79	11.20
T11	6.67	14.75	2.66	9.19	2.27	-	1.30	-	9.48	17.90	5.74	13.84	17.29	24.47	14.63	22.44	10.00	18.37	5.25	13.18
T12	30.00	32.89	9.47	17.91	-	-	-	-	10.29	18.67	6.25	14.45	16.47	23.93	14.78	22.55	12.00	20.22	6.05	14.20
T13	56.67	48.93	11.41	19.73	5.17	-	2.70	-	16.98	24.31	10.37	18.76	33.87	35.57	20.06	26.59	23.33	28.87	13.78	21.77
CD (5%)	-	23.90	-	6.21	NS	-	NS	-		1.91		1.83	-	8.42	-	N/A	-	3.08	-	2.47
SE (m)	-	5.29	-	0.78	2.09	-	1.08	-		0.65		0.62	-	2.88	-	2.56	-	-	-	-
SE (d)	-	10.91	-	1.61	-	-	-	-		0.92		0.88	-	4.07	-	3.63	-	1.05	-	0.85
CV (%)	-	5.36	-	4.02	84.61	-	87.68	-		6.02		7.49	-	19.86	-	20.91	-	6.64	-	7.53

BT- Bathinda**; FA-** Faridkot**; HI –** Hisar**; SR-** Sirsa**; SG-** Sriganganagar **, *SBW LARVAE/PLANT, O.V-**Original Value **; T.V-**Transformed value **Treatments Details:** T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 170. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2022-23)-North Zone.

Treatment	Yield(q/ha)					Phytotoxicity symptom				
	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
T1	23.34	5.66	14.17	23.04	22.72	-	-	Nil	-	Nil
T2	25.44	6.21	14.63	22.34	22.86	-	-	Nil	-	Nil
T3	25.73	7.27	14.33	23.25	21.75	-	-	Nil	-	Nil
T4	24.65	5.91	15.70	23.75	23.59	-	-	Nil	-	Nil
T5	25.06	5.64	15.09	22.48	23.11	-	-	Nil	-	Nil
T6	23.71	6.12	16.46	22.31	24.07	-	-	Nil	-	Nil
T7	18.19	6.36	15.85	21.47	23.10	-	-	Nil	-	Nil
T8	21.30	6.48	15.70	20.65	23.50	-	-	Nil	-	Nil
T9	26.55	7.24	16.77	20.13	25.06	-	-	Nil	-	Nil
T10	24.29	5.61	16.16	20.95	24.24	-	-	Nil	-	Nil
T11	27.46	6.58	16.00	22.98	23.87	-	-	Nil	-	Nil
T12	19.54	-	14.78	24.20	22.42	-	-	Nil	-	Nil
T13	14.21	5.01	11.89	17.45	19.78	-	-	Nil	-	Nil
CD (5%)	3.06	NS	0.91	-	4.25	-	-	-	-	-
SE (m)	1.05	1.15	0.31	-	-	-	-	-	-	-
SE (d)	1.48	-	0.44	-	1.46	-	-	-	-	-
CV (%)	7.89	32.38	3.52	-	8.84	-	-	-	-	-

BT- Bathinda**; FA-** Faridkot**; HI** – Hisar**; SR-** Sirsa**; SG-** Sriganganagar **, Treatments Details** T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:171.Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23.- Central Zone

Treatment	No. of larvae per plant (American Bollworm)														
	JU					SU					AK				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	3.51	-	1.42	-	69.92	2.58	1.76	2.59	1.76	26.42	1.00	1.22	0.73	1.11	74.97
T2	2.98	-	1.26	-	73.31	2.45	1.72	2.12	1.62	39.77	1.10	1.26	0.80	1.14	72.70
T3	3.37	-	1.55	-	67.16	2.73	1.80	1.65	1.47	53.13	1.63	1.45	0.90	1.18	69.28
T4	4.45	-	0.96	-	79.66	2.65	1.77	1.26	1.33	64.20	1.30	1.34	0.87	1.17	70.42
T5	4.4	-	1.42	-	69.92	2.73	1.80	1.86	1.54	47.16	1.37	1.35	0.77	1.12	73.83
T6	4.65	-	0.40	-	91.53	2.79	1.81	0.20	0.84	94.32	1.20	1.30	0.50	1.00	82.94
T7	3.71	-	1.79	-	62.08	2.80	1.82	0.53	1.02	84.94	1.10	1.26	0.80	1.14	72.70
T8	4.26	-	0.72	-	84.75	2.86	1.83	0.06	0.75	98.30	1.50	1.40	0.47	0.98	84.07
T9	3.79	-	1.06	-	77.54	2.53	1.74	1.13	1.28	67.90	1.70	1.47	0.90	1.18	69.28
T10	3.58	-	0.53	-	88.77	2.52	1.74	0.39	0.95	88.92	1.20	1.30	0.70	1.09	76.11
T11	4.04	-	0.46	-	90.25	2.66	1.78	0.26	0.87	92.61	1.53	1.41	0.57	1.03	80.66
T12	4.33	-	1.85	-	60.81	2.65	1.77	2.06	1.60	41.48	1.20	1.30	0.80	1.14	72.70
T13	3.91	-	4.72	-	-	2.93	1.85	3.52	2.01	0.00	1.13	1.27	2.93	1.85	-
CD (5%)	-	-	-	-	-	-	NS	-	0.15	-	-	-	-	0.159	-
SE (m)	-	-	-	-	-	-	0.07	-	0.05	-	-	0.100	-	0.055	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-		-
CV (%)	-	-	-	-	-	-	7.02	-	6.61	-	-	13.03	-	8.12	-

JU- Junagadh**, SU-** Surat**, AK-** Akola**, O.V-**Original Value **; T.V-**Transformed value **,DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:172.Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23.- Central Zone

Treatment	No. of larvae per plant (American Bollworm)														
	NA					RA					BW				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	0.30	-	0.16	-	44.44	0.38	0.94	0.27	0.88	37.21	1.03	1.24	0.10	0.77	89.25
T2	0.32	-	0.21	-	24.60	0.42	0.96	0.32	0.90	25.58	1.13	1.28	0.10	0.77	89.25
T3	0.27	-	0.14	-	48.41	0.24	0.86	0.28	0.88	34.88	0.97	1.21	0.03	0.73	96.42
T4	0.20	-	0.10	-	64.29	0.40	0.95	0.26	0.87	39.53	0.90	1.18	0.03	0.73	96.42
T5	0.27	-	0.17	-	40.48	0.31	0.9	0.32	0.91	25.58	1.03	1.24	0.00	0.71	100.00
T6	0.23	-	0.07	-	76.19	0.35	0.92	0.3	0.89	30.23	1.07	1.25	0.00	0.71	100.00
T7	0.23	-	0.08	-	72.22	0.38	0.94	0.25	0.86	41.86	0.97	1.21	0.07	0.75	92.83
T8	0.20	-	0.07	-	76.19	0.37	0.93	0.28	0.88	34.88	0.97	1.21	0.07	0.75	92.83
T9	0.21	-	0.07	-	76.19	0.41	0.95	0.21	0.84	51.16	0.87	1.17	0.03	0.73	96.42
T10	0.20	-	0.08	-	72.22	0.29	0.89	0.2	0.84	53.49	0.93	1.20	0.03	0.73	96.42
T11	0.23	-	0.07	-	76.19	0.38	0.94	0.26	0.87	39.53	1.03	1.24	0.00	0.71	100.00
T12	0.28	-	0.10	-	64.29	0.31	0.9	0.25	0.87	41.86	1.00	1.22	0.00	0.71	100.00
T13	0.33	-	0.28	-	-	0.43	0.96	0.43	0.97	-	1.37	1.36	0.93	1.20	-
CD (5%)	-	-	-	-	-	-	NS	-	-	-		0.10		0.07	
SE (m)	-	-	-	-	-	-	0.03	-	-	-		0.04		0.02	
SE (d)	-	-	-	-	-	-	-	-	-	-		0.05		0.04	
CV (%)	-	-	-	-	-	-	6.35	-	-	-		5.06		5.59	

NA- Nanded**, RA-** Rahuri, **BW-** Bhawanipatna, **O.V**-Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:173.Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23. - Central Zone

Treatment	No. of larvae per plant (Spotted Bollworm)														
	JU					SU					AK				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	0.00	-	0.00	-	-	1.65	1.47	1.78	1.51	29.51	0.66	1.74	0.49	0.99	68.38
T2	0.00	-	0.00	-	-	1.25	1.32	1.99	1.58	21.03	0.53	1.65	0.39	0.94	74.79
T3	0.00	-	0.00	-	-	1.45	1.40	1.45	1.40	42.62	0.83	1.83	0.63	1.06	59.83
T4	0.00	-	0.00	-	-	1.39	1.37	1.26	1.33	49.96	0.69	1.85	0.49	0.99	68.38
T5	0.00	-	0.00	-	-	1.52	1.42	1.64	1.46	35.02	0.79	1.93	0.59	1.04	61.97
T6	0.00	-	0.00	-	-	1.30	1.34	0.25	0.86	90.22	0.76	1.83	0.23	0.85	85.47
T7	0.00	-	0.00	-	-	1.24	1.32	1.25	1.32	50.49	0.76	1.75	0.53	1.01	66.24
T8	0.00	-	0.00	-	-	1.38	1.37	0.13	0.79	94.89	0.86	1.99	0.09	0.77	94.44
T9	0.00	-	0.00	-	-	1.24	1.32	1.23	1.32	51.22	0.73	1.88	0.49	1.00	68.38
T10	0.00	-	0.00	-	-	1.45	1.40	0.86	1.17	65.71	0.56	1.66	0.36	0.92	76.92
T11	0.00	-	0.00	-	--	1.31	1.34	0.59	1.05	76.42	0.96	1.93	0.15	0.80	90.60
T12	0.00	-	0.00	-	-	1.52	1.42	1.80	1.52	28.64	0.66	1.76	0.43	0.96	72.65
T13	0.00	-	0.00	-	-	1.79	1.51	2.52	1.74	29.51	0.79	1.93	1.56	1.43	-
CD (5%)	-	-	-	-	-	-	NS	-	0.26	-	-	-	-	0.17	-
SE (m)	-	-	-	-	-	-	0.10	-	0.09	-	-	0.09	-	0.05	-
SE (d)	-	-	-	-	-	-		-	-	-	-	-	-		-
CV (%)	-	-	-	-	-	-	12.04	-	11.63	-	-	14.26	-	10.31	-

JU- Junagadh**, SU-** Surat**, AK-** Akola**, O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:174. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23- Central Zone

Treatment	No. of larvae per plant (Spotted Bollworm)														
	NA					RA					BW				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	0.00	-	0.00	-	-	0.05	0.74	0.00	0.71	0.00	1.13	1.28	0.20	0.84	89.30
T2	0.00	-	0.00	-	-	0.02	0.72	0.00	0.71	0.00	1.17	1.29	0.27	0.88	85.74
T3	0.00	-	0.00	-	-	0.03	0.73	0.00	0.71	0.00	1.07	1.25	0.23	0.86	87.52
T4	0.00	-	0.00	-	-	0.04	0.73	0.00	0.71	0.00	1.07	1.25	0.20	0.84	89.30
T5	0.00	-	0.00	-	-	0.04	0.73	0.00	0.71	0.00	1.03	1.24	0.23	0.85	87.52
T6	0.00	-	0.00	-	-	0.03	0.73	0.00	0.71	0.00	0.77	1.12	0.00	0.71	100.00
T7	0.00	-	0.00	-	-	0.06	0.75	0.00	0.71	0.00	0.97	1.21	0.10	0.77	94.65
T8	0.00	-	0.00	-	-	0.04	0.73	0.00	0.71	0.00	1.00	1.22	0.13	0.80	92.87
T9	0.00	-	0.00	-	-	0.06	0.75	0.00	0.71	0.00	0.90	1.18	0.10	0.77	94.65
T10	0.00	-	0.00	-	-	0.03	0.73	0.00	0.71	0.00	0.93	1.20	0.17	0.81	91.09
T11	0.00	-	0.00	-	-	0.03	0.73	0.00	0.71	0.00	0.90	1.18	0.10	0.77	94.65
T12	0.00	-	0.00	-	-	0.06	0.75	0.00	0.71	0.00	0.87	1.17	0.00	0.71	100.00
T13	0.00	-	0.00	-	-	0.02	0.72	0.00	0.71	0.00	2.07	1.60	1.87	1.54	-
CD (5%)	-	-	-	-	-	-	NS	-	-	-		0.08		0.08	
SE (m)	-	-	-	-	-	-	0.01	-	-	-		0.03		0.03	
SE (d)	-	-	-	-	-	-	-	-	-	-		0.04		0.04	
CV (%)	-	-	-	-	-	-	2.06	-	-	-		3.77		5.72	

NA- Nanded**, RA-** Rahuri, **BW-** Bhawanipatna, **O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:175. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23- Central Zone

Treatment	No. of larvae per plant (Tobacco caterpillar)														
	JU					SU					AK				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	0.00	-	0.00	-	-	2.13	1.62	1.80	1.52	27.01	-	-	-	-	-
T2	0.00	-	0.00	-	-	2.07	1.60	1.53	1.43	37.92	-	-	-	-	-
T3	0.00	-	0.00	-	-	2.33	1.68	1.27	1.33	48.74	-	-	-	-	-
T4	0.00	-	0.00	-	-	2.13	1.62	1.20	1.30	51.61	-	-	-	-	-
T5	0.00	-	0.00	-	-	2.13	1.62	1.33	1.35	46.24	-	-	-	-	-
T6	0.00	-	0.00	-	-	2.26	1.66	0.13	0.79	94.78	-	-	-	-	-
T7	0.00	-	0.00	-	-	2.00	1.58	0.80	1.14	67.81	-	-	-	-	-
T8	0.00	-	0.00	-	-	1.93	1.56	0.13	0.79	94.78	-	-	-	-	-
T9	0.00	-	0.00	-	-	2.13	1.62	1.00	1.23	59.49	-	-	-	-	-
T10	0.00	-	0.00	-	-	2.20	1.64	0.33	0.91	86.64	-	-	-	-	-
T11	0.00	-	0.00	-	-	2.07	1.60	0.26	0.87	89.32	-	-	-	-	-
T12	0.00	-	0.00	-	-	2.19	1.64	1.66	1.47	32.76	-	-	-	-	-
T13	0.00	-	0.00	-	-	2.38	1.70	2.47	1.72	-	-	-	-	-	-
CD (5%)	-	-	-	-	-	-	NS	-	0.12	-	-	-	-	-	-
SE (m)	-	-	-	-	-	-	0.07	-	0.04	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-		-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	7.37	-	5.77	-	-	-	-	-	-

JU- Junagadh**, SU-** Surat**, AK-** Akola**, O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:176. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23- Central Zone

Treatment	No. of larvae per plant (Tobacco caterpillar)														
	NA					RA					BW				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	0.00	-	0.00	-	-	0.07	0.75	0.00	0.71	0.00	-	-	-	-	-
T2	0.00	-	0.00	-	-	0.04	0.73	0.00	0.71	0.00	-	-	-	-	-
T3	0.00	-	0.00	-	-	0.04	0.73	0.00	0.71	0.00	-	-	-	-	-
T4	0.00	-	0.00	-	-	0.05	0.74	0.00	0.71	0.00	-	-	-	-	-
T5	0.00	-	0.00	-	-	0.03	0.73	0.00	0.71	0.00	-	-	-	-	-
T6	0.00	-	0.00	-	-	0.02	0.72	0.00	0.71	0.00	-	-	-	-	-
T7	0.00	-	0.00	-	-	0.05	0.74	0.00	0.71	0.00	-	-	-	-	-
T8	0.00	-	0.00	-	-	0.04	0.73	0.00	0.71	0.00	-	-	-	-	-
T9	0.00	-	0.00	-	-	0.04	0.73	0.00	0.71	0.00	-	-	-	-	-
T10	0.00	-	0.00	-	-	0.03	0.73	0.00	0.71	0.00	-	-	-	-	-
T11	0.00	-	0.00	-	-	0.04	0.73	0.00	0.71	0.00	-	-	-	-	-
T12	0.00	-	0.00	-	-	0.05	0.74	0.00	0.71	0.00	-	-	-	-	-
T13	0.00	-	0.00	-	-	0.08	0.76	0.00	0.71	0.00	-	-	-	-	-
CD (5%)	-	-	-	-	-	-	0.01	-	-	-	-	-	-	-	-
SE (m)	-	-	-	-	-	-	0.006	-	-	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	1.10	-	-	-	-	-	-	-	-

NA- Nanded**, RA-** Rahuri, **BW-** Bhawanipatna, **O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:177. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23- Central Zone

Treatment	No. of larvae per plant (Pink Bollworms)														
	JU					SU					AK				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	0.00	-	0.00	-	-	2.32	1.68	2.95	1.86	36.70	1.73	1.30	1.77	1.50	78.00
T2	0.00	-	0.00	-	-	2.65	1.77	1.93	1.56	58.58	1.47	1.16	0.90	1.16	88.79
T3	0.00	-	0.00	-	-	2.32	1.68	2.00	1.58	57.08	2.00	1.41	1.37	1.35	82.98
T4	0.00	-	0.00	-	-	2.32	1.68	1.64	1.46	64.81	1.13	1.06	0.77	1.12	90.45
T5	0.00	-	0.00	-	-	2.00	1.58	1.64	1.46	64.81	2.73	1.65	1.43	1.39	82.15
T6	0.00	-	0.00	-	-	2.32	1.68	0.27	0.88	94.21	2.13	1.45	0.13	0.80	98.34
T7	0.00	-	0.00	-	-	2.00	1.58	0.61	1.05	86.91	1.67	1.28	0.50	0.98	93.77
T8	0.00	-	0.00	-	-	2.32	1.68	0.27	0.88	94.21	1.40	1.18	0.13	0.79	98.34
T9	0.00	-	0.00	-	-	2.00	1.58	2.00	1.58	57.08	1.73	1.31	1.57	1.43	80.49
T10	0.00	-	0.00	-	-	2.00	1.58	0.27	0.88	94.21	2.40	1.51	0.37	0.93	95.43
T11	0.00	-	0.00	-	-	2.32	1.68	0.27	0.88	94.21	1.67	1.18	0.17	0.81	97.92
T12	0.00	-	0.00	-	-	2.32	1.68	3.00	1.87	35.62	2.60	1.59	1.17	1.27	85.47
T13	0.00	-	0.00	-	-	2.00	1.58	4.66	2.27	0.00	1.53	1.21	8.03	2.91	-
CD (5%)	-	-	-	-	-	-	NS	-	0.41	-	-	-	-	0.33	-
SE (m)	-	-	-	-	-	-	0.07	-	0.14	-	-	0.179	-	0.11	-
SE (d)	-	-	-	-	-	-	-	-		-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	7.79	-	17.14	-	-	23.32	-	15.81	-

JU- Junagadh**, SU-** Surat**, AK-** Akola**, O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:178. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23- Central Zone

Treatment	No. of larvae per plant (Pink Bollworms)														
	NA					RA					BW				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	0.20	-	0.07	-	77.01	5.35	2.42	3.81	2.24	41.68	-	-	-	-	-
T2	0.24	-	0.07	-	77.01	5.12	2.37	3.73	2.19	42.85	-	-	-	-	-
T3	0.20	-	0.04	-	84.67	4.78	2.30	3.54	2.12	45.83	-	-	-	-	-
T4	0.18	-	0.07	-	77.01	4.22	2.17	3.14	2.03	51.99	-	-	-	-	-
T5	0.27	-	0.27	-	8.05	5.84	2.52	3.85	2.23	41.05	-	-	-	-	-
T6	0.27	-	0.07	-	77.01	4.25	2.18	2.56	1.86	60.73	-	-	-	-	-
T7	0.22	-	0.07	-	77.01	4.36	2.20	3.28	2.05	49.72	-	-	-	-	-
T8	0.20	-	0.07	-	77.01	5.62	2.47	3.63	2.16	44.4	-	-	-	-	-
T9	0.27	-	0.09	-	69.35	5.28	2.40	2.87	1.93	56.05	-	-	-	-	-
T10	0.27	-	0.09	-	69.35	4.82	2.31	3.13	2.02	52.05	-	-	-	-	-
T11	0.20	-	0.07	-	77.01	4.95	2.33	2.72	1.97	58.33	-	-	-	-	-
T12	0.20	-	0.13	-	53.64	5.46	2.44	3.96	2.27	39.39	-	-	-	-	-
T13	0.27	-	0.29	-	-	4.98	2.34	6.53	2.84	-	-	-	-	-	-
CD (5%)	-	-	-	-	-	-	0.241	-	0.18	-	-	-	-	-	-
SE (m)	-	-	-	-	-	-	N/A	-	0.06	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-	14.61	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	2.42	-	7.22	-	-	-	-	-	-

NA- Nanded**, RA-** Rahuri, **BW-** Bhawanipatna, **O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:179. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23 - Central Zone

Treatment	Rosette flower (%) due to Pink Bollworm														
	JU					SU					AK				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	9.36	-	3.96	-	63.87	7.31	15.69	7.65	16.06	51.40	7.50	15.84	12.23	20.44	29.81
T2	10.74	-	3.82	-	65.15	9.17	17.63	7.57	15.97	51.93	7.83	16.22	10.10	18.32	42.05
T3	10.71	-	4.62	-	57.85	9.07	17.53	4.45	12.17	71.73	6.50	14.59	6.73	14.85	61.37
T4	9.1	-	3.54	-	67.70	8.52	16.97	4.15	11.76	73.61	6.00	14.13	5.83	13.96	66.53
T5	8.42	-	4.29	--	60.86	7.45	15.84	6.38	14.63	59.44	9.67	18.11	8.70	17.14	50.09
T6	8.96	-	2.38	-	78.28	8.39	16.84	1.38	6.75	91.23	7.83	16.18	2.50	8.96	85.66
T7	9.44	-	4.52	-	58.76	8.32	16.76	3.15	10.22	80.00	7.17	15.47	5.70	13.74	67.30
T8	8.02	-	2.72	-	75.18	8.11	16.54	1.26	6.46	91.97	7.00	15.29	3.50	9.86	79.92
T9	7.88	-	2.95	-	73.08	8.92	17.38	3.53	10.83	77.55	7.33	15.70	5.37	13.35	69.21
T10	8.83	-	3.37	-	69.25	8.25	16.70	2.18	8.48	86.17	8.83	17.12	3.97	11.39	77.24
T11	9.36	-	2.06	-	81.20	7.99	16.42	1.92	7.97	87.77	7.00	14.97	0.70	4.72	95.98
T12	9.9	-	4.69	-	57.21	8.18	16.62	6.06	14.25	61.48	9.33	17.64	5.23	13.11	69.98
T13	11.24	-	10.96	-	0.00	8.86	17.32	15.73	23.37	-	7.00	15.18	17.43	24.49	-
CD (5%)	-	-	-	-	-	-	NS	-	2.66	-	-	-	-	4.65	-
SE (m)	-	-	-	-	-	-	0.52	-	0.91	-	-	1.350	-	1.59	-
SE (d)	-	-	-	-	-	-		-		-	-	-	-		-
CV (%)	-	-	-	-	-	-	5.39	-	12.92	-	-	14.75	-	19.47	-

JU- Junagadh**, SU-** Surat**, AK-** Akola**, O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:180. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23 - Central Zone

Treatment	Rosette flower (%) due to Pink Bollworm														
	NA					RA					BW				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	3.57	-	0.40	-	74.73	30.83	33.73	15.22	22.96	44.80	-	-	-	-	-
T2	4.29	-	0.38	-	75.58	30.8	33.71	17.48	24.71	36.60	-	-	-	-	-
T3	3.70	-	0.41	-	73.81	32.27	34.62	8.43	16.88	69.42	-	-	-	-	-
T4	3.57	-	0.40	-	74.73	31.91	34.39	7.83	16.25	71.60	-	-	-	-	-
T5	4.43	-	1.11	-	29.23	35.79	36.74	6.30	14.54	77.15	-	-	-	-	-
T6	4.30	-	0.38	-	75.58	28.32	32.15	0.34	3.34	98.77	-	-	-	-	-
T7	3.70	-	0.37	-	76.43	36.70	37.29	3.37	10.58	87.78	-	-	-	-	-
T8	3.45	-	0.38	-	75.58	34.97	36.25	8.01	16.44	70.95	-	-	-	-	-
T9	4.30	-	0.48	-	69.33	30.88	33.76	0.24	2.81	99.13	-	-	-	-	-
T10	4.28	-	0.72	-	54.35	30.46	33.5	3.57	10.89	87.05	-	-	-	-	-
T11	3.57	-	0.38	-	75.70	30.25	33.37	2.30	8.72	91.66	-	-	-	-	-
T12	3.70	-	0.79	-	49.47	35.31	36.46	8.34	16.79	69.75	-	-	-	-	-
T13	4.30	-	1.57		-	32.96	35.04	27.57	31.67	-	-	-	-	-	-
CD (5%)	-	-	-	-	-	-	N/A	-	5.73	-	-	-	-	-	-
SE (m)	-	-	-	-	-	-	1.98	-	1.95	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	8.06	-	16.34	-	-	-	-	-	-

NA- Nanded**, RA-** Rahuri, **BW-** Bhawanipatna, **O.V**-Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:181. Ent 6. Evaluation of prominent insecticides against bollworm complerx of cotton 2022-23- Central Zone

Treatment	Green Boll damage due to SBW/ABW/TC or Fruiting Body Damage (%)														
	JU					SU					AK				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	-	-	-	-	-	11.57	19.88	26.69	31.11	18.79	7.97	16.36	3.80	11.00	72.12
T2	-	-	-	-	-	13.57	21.61	26.90	31.24	18.17	9.84	18.21	4.67	12.46	65.76
T3	-	-	-	-	-	14.54	22.42	20.12	26.65	38.80	17.30	24.23	5.97	14.13	56.23
T4	-	-	-	-	-	12.58	20.78	18.78	25.68	42.87	12.64	20.70	5.54	13.45	59.41
T5	-	-	-	-	-	13.90	21.89	23.87	29.25	27.37	13.57	20.37	4.24	11.74	68.94
T6	-	-	-	-	-	13.91	21.90	10.00	18.44	69.58	15.44	22.41	0.76	4.82	94.45
T7	-	-	-	-	-	11.74	20.04	15.32	23.05	53.38	9.84	18.21	4.67	12.40	65.76
T8	-	-	-	-	-	14.18	22.12	8.10	16.53	75.36	11.24	19.20	0.33	3.25	97.56
T9	-	-	-	-	-	13.06	21.18	15.90	23.50	51.62	17.77	24.38	5.97	14.10	56.23
T10	-	-	-	-	-	14.17	22.11	13.36	21.44	59.37	10.77	18.73	3.37	10.31	75.29
T11	-	-	-	-	-	13.85	21.85	13.02	21.15	60.40	15.90	22.90	1.63	6.94	88.03
T12	-	-	-	-	-	13.17	21.28	23.70	29.13	27.89	10.77	19.13	4.67	12.19	65.76
T13	-	-	-	-	-	13.88	21.87	32.87	34.98	-	9.84	17.63	13.64	21.66	-
CD (5%)	-	-	-	-	-	-	NS	-	2.89	-	-	-	-	3.597	-
SE (m)	-	-	-	-	-	-	0.62	-	0.99	-	-	3.378	-	1.233	-
SE (d)	-	-	-	-	-	-		-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	5.89	-	6.71	-	-	28.98	-	18.69	-

JU- Junagadh**, SU-** Surat**, AK-** Akola**, O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control **DAS-Days after Spray**

Table:182. Ent 6. Evaluation of prominent insecticides against bollworm complerxof cotton 2022-23- Central Zone

Treatment	Green Boll damage due to SBW/ABW/TC or Fruiting Body Damage (%)														
	NA					RA					BW*				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	6.06	-	3.99	-	23.96	13.24	21.34	8.82	17.27	26.77	6.17	2.58	2.37	1.69	71.58
T2	6.45	-	4.16	-	20.72	14.15	22.10	9.69	18.14	19.52	6.14	2.58	2.42	1.71	70.98
T3	6.25	-	3.93	-	25.14	11.88	20.16	7.93	16.36	34.11	6.25	2.60	2.26	1.66	72.86
T4	4.17	-	1.77	-	66.22	11.95	20.22	8.17	16.61	32.14	6.10	2.57	2.12	1.62	74.58
T5	6.06	-	3.84	-	26.86	9.56	18.01	6.44	14.7	46.51	6.09	2.57	2.16	1.63	74.10
T6	3.81	-	1.02	-	80.61	7.84	16.26	4.26	11.91	64.65	5.72	2.49	1.03	1.23	87.65
T7	3.92	-	1.06	-	79.87	8.75	17.21	5.31	13.32	55.92	5.77	2.50	1.47	1.40	82.39
T8	4.17	-	1.22	-	76.83	9.68	18.13	6.12	14.33	49.14	5.97	2.54	1.68	1.48	79.82
T9	3.81	-	1.03	-	80.36	8.32	16.76	4.91	12.8	59.25	5.78	2.51	1.61	1.45	80.74
T10	3.92	-	1.04	-	80.25	10.25	18.67	6.79	15.1	43.6	5.85	2.52	1.74	1.50	79.10
T11	4.17	-	1.09	-	79.22	8.46	16.91	5.44	13.48	54.84	5.58	2.47	1.32	1.35	84.21
T12	4.76	-	2.61	-	50.24	11.08	19.44	7.62	16.03	36.68	5.44	2.44	1.21	1.31	85.49
T13	6.58	-	5.25	-		13.54	21.59	12.04	20.31	26.77	8.84	3.05	8.34	2.97	-
CD (5%)	-	-	-	-	-	-	2.38	-	0.76	-	-	0.20	-	0.15	-
SE (m)	-	-	-	-	-	-	N/A	-	0.26	-	-	0.07	-	0.05	-
SE (d)	-	-	-	-	-	-	17.81	-	-	-	-	0.10	-	0.07	-
CV (%)	-	-	-	-	-	-	21.34	-	2.95	-	-	4.53	-	5.41	-

***Green Boll Damage due to ABW/SBW , JU-** Junagadh**, SU-** Surat**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **BW-** Bhawanipatna, **O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:183. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23- Central Zone

Treatment	Green Boll damage (%) due to PBW														
	JU					SU					AK				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	22.15	-	13.20	-	56.41	23.16	28.77	29.65	32.99	36.41	11.17	19.43	9.97	18.35	71.79
T2	24.34	-	13.55	-	55.25	26.50	30.98	19.30	26.06	58.60	9.83	17.91	5.63	13.65	84.06
T3	22.27	-	14.00	-	53.76	23.16	28.77	19.98	26.55	57.13	12.50	20.65	7.97	16.20	77.45
T4	23.4	-	12.87	-	57.50	23.16	28.77	16.34	23.85	64.94	8.17	16.55	4.97	12.71	85.94
T5	23.89	-	14.46	-	52.25	19.98	26.55	16.34	23.85	64.94	16.17	23.69	8.30	16.65	76.51
T6	22.62	-	9.85	-	67.47	23.16	28.77	1.15	6.14	97.54	13.17	21.15	1.97	7.92	94.43
T7	26.35	-	16.32	-	46.10	19.98	26.55	4.53	12.29	90.29	10.83	19.12	4.97	12.76	85.94
T8	21.74	-	10.65	-	64.83	23.16	28.77	1.15	6.14	97.54	9.50	17.90	1.33	6.52	96.23
T9	21.99	-	12.12	-	59.97	19.98	26.55	19.98	26.55	57.13	11.17	19.51	8.97	17.37	74.62
T10	25.12	-	11.32	-	62.62	19.98	26.55	1.15	6.14	97.54	14.50	22.08	3.97	11.49	88.77
T11	22.87	-	8.96	-	70.41	23.16	28.77	1.15	6.14	97.54	10.83	18.44	2.30	8.57	93.49
T12	25.77	-	15.77	-	47.92	23.16	28.77	29.98	33.20	35.69	15.50	22.95	6.97	14.99	80.28
T13	25.98	-	30.28	-	0.00	19.98	26.55	46.62	43.06	-	10.17	18.37	35.33	36.34	-
CD (5%)	-	-	-	-	-	-	NS	-	12.68	-	-	-	-	4.616	-
SE (m)	-	-	-	-	-	-	1.70	-	4.34	-	-	2.109	-	1.582	-
SE (d)	-	-	-	-	-	-		-		-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	10.49	-	35.83	-	-	18.43	-	18.41	-

JU- Junagadh**, SU-** Surat**, AK-** Akola**, O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:184. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23 - Central Zone

Treatment	Green Boll damage (%) due to PBW														
	NA					RA					BW				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	20.00	26.06	10.00	18.43	62.50	24.35	29.57	23.03	28.68	37.17	-	-	-	-	-
T2	20.00	26.06	10.00	18.43	62.50	22.98	28.64	21.63	27.72	40.98	-	-	-	-	-
T3	16.67	23.35	10.00	18.43	62.50	22.12	28.06	20.76	27.11	43.35	-	-	-	-	-
T4	16.67	23.35	10.00	18.43	62.50	21.48	27.61	19.77	26.4	46.07	-	-	-	-	-
T5	20.00	26.06	13.33	21.14	50.00	23.42	28.94	22.88	28.58	37.58	-	-	-	-	-
T6	26.67	30.98	13.33	21.14	50.00	16.55	24.01	16.86	24.24	54.01	-	-	-	-	-
T7	23.33	28.27	13.33	21.14	50.00	20.36	26.82	18.96	25.81	48.27	-	-	-	-	-
T8	16.67	23.35	10.00	18.43	62.50	23.28	28.85	22.12	28.05	39.65	-	-	-	-	-
T9	13.33	21.14	6.67	12.29	75.00	18.42	25.42	17.50	24.73	52.26	-	-	-	-	-
T10	23.33	28.27	13.33	21.14	50.00	20.26	26.75	19.24	26.01	47.51	-	-	-	-	-
T11	20.00	26.06	10.00	18.43	62.50	18.36	25.37	18.01	25.11	50.87	-	-	-	-	-
T12	26.67	30.98	13.33	21.14	50.00	24.52	29.68	23.56	29.04	35.72	-	-	-	-	-
T13	33.33	35.00	26.67	30.98	-	25.86	30.57	36.65	37.26	-	-	-	-	-	-
CD (5%)	-	6.00	-	6.45	-	-	2.14	-	2.84	-	-	-	-	-	-
SE (m)	-	2.04	-	2.20	-	-	N/A	-	1.00	-	-	-	-	-	-
SE (d)	-	2.89	-	3.11	-	-	10.94	-	-	-	-	-	-	-	-
CV (%)	-	13.19	-	19.06	-	24.35	29.57	-	8.99	6.88	-	-	-	-	-

NA- Nanded**, RA-** Rahuri, **BW-** Bhawanipatna, **O.V-**Original Value ; **T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:185. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23- Central Zone

Treatment	Natural Enemies/plant														
	JU				Reduction over Control (%)	SU				Reduction over Control (%)	AK				Reduction over Control (%)
	Pre		14 DAS			Pre		14 DAS			Pre		14 DAS		
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	7.88	-	4.33	-	30.94	2.59	1.76	1.00	1.22	77.27	0.48	0.99	0.37	0.93	52.38
T2	8.98	-	4.64	-	26.00	2.59	1.76	1.06	1.25	75.91	0.68	1.09	0.50	1.00	35.06
T3	10.09	-	4.91	-	21.69	2.71	1.79	1.46	1.40	66.82	0.82	1.13	0.23	0.85	69.70
T4	8.53	-	4.11	-	34.45	2.87	1.84	1.52	1.42	65.45	0.42	0.96	0.30	0.89	61.04
T5	9.65	-	4.99	-	20.41	2.73	1.80	1.40	1.38	68.18	0.75	1.12	0.43	0.96	43.72
T6	8.07	-	2.89	-	53.91	2.65	1.77	1.87	1.54	57.50	0.42	0.96	0.37	0.92	52.38
T7	8.29	-	5.79	-	7.66	2.78	1.81	1.66	1.47	62.27	0.48	0.99	0.37	0.92	52.38
T8	8.20	-	3.78	-	39.71	2.73	1.80	2.00	1.58	54.55	0.42	0.95	0.37	0.92	52.38
T9	9.73	-	4.11	-	34.45	2.46	1.72	1.60	1.45	63.64	0.75	1.12	0.37	0.93	52.38
T10	8.05	-	3.84	-	38.76	3.00	1.87	1.80	1.52	59.09	0.68	1.08	0.43	0.96	43.72
T11	9.36	-	2.82	-	55.02	2.80	1.82	1.85	1.53	57.95	0.82	1.15	0.57	1.03	26.41
T12	8.88	-	5.24	-	16.43	2.72	1.79	1.20	1.30	72.73	0.42	0.96	0.37	0.93	52.38
T13	8.55	-	6.27	-	-	3.00	1.87	4.40	2.21	77.27	1.08	1.24	0.77	1.11	-
CD (5%)	-	-	-	-	-	-	NS	-	0.15	-	-	-	-	-	-
SE (m)	-	-	-	-	-	-	0.07	-	0.05	-	-	0.078	-	0.06	-
SE (d)	-	-	-	-	-	-		-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	6.48	-	6.03	-	-	12.84	-	11.75	-

JU- Junagadh**, SU-** Surat**, AK-** Akola**, O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control , *Natural Enemies include coccinellids, chrysopids, syrphids and spider

Table:186. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23- Central Zone

Treatment	Natural Enemies/plant*														
	NA				Reduction over Control (%)	RA				Reduction over Control (%)	BW				Reduction over Control (%)
	Pre		14 DAS			Pre		14 DAS			Pre		14 DAS		
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	1.50	1.58	0.70	1.30	74.07	3.80	2.07	1.77	1.51	27.76	2.63	1.77	0.07	0.75	97.70
T2	1.40	1.54	0.60	1.25	77.78	2.87	1.84	1.69	1.48	31.02	2.53	1.74	0.00	0.71	100.00
T3	1.50	1.58	0.70	1.30	74.07	2.80	1.82	1.67	1.47	31.84	2.57	1.75	0.13	0.80	95.40
T4	1.80	1.67	0.80	1.33	70.37	2.73	1.80	1.76	1.50	28.16	2.77	1.81	0.20	0.83	93.10
T5	1.50	1.58	0.80	1.32	70.37	3.60	2.02	1.74	1.50	28.98	3.20	1.92	0.47	0.98	83.91
T6	2.10	1.76	1.80	1.67	33.33	2.67	1.78	1.81	1.52	26.12	3.23	1.93	0.60	1.05	79.31
T7	2.10	1.76	1.80	1.67	33.33	2.67	1.78	1.74	1.50	28.98	3.07	1.89	0.40	0.95	86.21
T8	1.90	1.70	1.50	1.58	44.44	2.47	1.72	1.65	1.47	32.65	2.77	1.81	0.30	0.89	89.66
T9	2.20	1.79	1.90	1.70	29.63	2.47	1.72	1.90	1.55	22.45	3.03	1.88	0.60	1.05	79.31
T10	2.10	1.76	1.80	1.67	33.33	2.73	1.80	1.70	1.48	30.61	3.00	1.87	0.33	0.91	88.51
T11	1.90	1.70	1.50	1.58	44.44	2.53	1.74	1.60	1.45	34.69	3.20	1.92	0.53	1.02	81.61
T12	1.80	1.67	1.50	1.58	44.44	2.67	1.78	1.51	1.42	38.37	3.23	1.93	0.53	1.01	81.61
T13	2.20	1.79	2.70	1.92	-	2.87	1.84	2.45	1.72	-	4.40	2.21	2.90	1.84	-
CD (5%)	-	NS	-	0.24	-	-	N/A	-	0.08	-		0.12		0.08	-
SE (m)	-	0.07	-	0.08	-	-	0.15	-	0.03	-		0.04		0.03	-
SE (d)	-	0.11	-	0.12	-	-	-	-	-	-		0.06		0.04	-
CV (%)	-	7.61	-	9.38	-	-	11.66	-	5.93	-		8.81		5.12	-

NA- Nanded**, RA-** Rahuri, **BW-** Bhawanipatna, **O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control, *Natural Enemies include coccinellids, chrysopids, syrphids and spider

Table:187. Ent 6. Evaluation of prominent insecticides against bollworm complerx of cotton 2022-23 (Open Boll and Locule Damage)- Central Zone

Treatment	Open Boll and Locule Damage (%)											
	JU				SU				AK			
	Boll Damage (%)		Locule Damage (%)		Boll Damage (%)		Locule Damage (%)		Boll Damage (%)		Locule Damage (%)	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	19.90	-	16.81	-	21.89	27.90	11.19	19.54	15.28	22.98	4.39	12.07
T2	20.14	-	17.95	-	19.04	25.87	9.66	18.11	11.67	19.91	3.78	11.20
T3	20.98	-	18.3	-	15.20	22.94	7.61	16.01	16.00	23.43	5.71	13.64
T4	19.18	-	15.84	-	13.41	21.48	6.88	15.21	11.64	19.75	4.06	11.57
T5	21.02	-	18.86	-	17.14	24.46	9.03	17.49	23.24	28.71	6.87	15.14
T6	15.59	-	12.87	-	4.43	12.16	2.21	8.55	10.83	19.18	4.29	11.89
T7	22.51	-	19.36	-	7.09	15.45	3.95	11.46	14.36	21.94	4.16	11.68
T8	16.49	-	13.70	-	3.75	11.17	1.98	8.09	7.69	15.98	2.37	8.77
T9	17.13	-	14.27	-	11.38	19.72	6.10	14.30	19.77	26.17	6.04	14.15
T10	18.34	-	15.14	-	6.16	14.38	3.22	10.34	17.61	24.53	5.44	13.39
T11	14.87	-	11.83	-	4.30	11.97	2.43	8.97	9.42	17.61	3.04	9.86
T12	21.85	-	19.07	-	17.29	24.57	9.44	17.89	20.37	26.80	6.75	15.02
T13	29.84	-	27.50	-	30.13	33.29	16.54	24.00	34.07	35.65	13.18	21.23
CD (5%)	-	-	-	-	-	2.18	-	1.48	-	6.16	-	2.91
SE (m)	-	-	-	-	-	0.75	-	0.51	-	2.11	-	0.99
SE (d)	-	-	-	-	-		-	-	-	-	-	-
CV (%)	-	-	-	-	-	6.35	-	5.99	-	15.71	-	13.24

JU- Junagadh**, SU-** Surat**, AK-** Akola**, O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:188.Ent 6. Evaluation of prominent insecticides against bollworm complerx of cotton 2022-23 (Open Boll and Locule Damage)- Central Zone

Treatment	Open Boll and Locule Damage (%)											
	NA				RA				BW			
	Boll Damage (%)		Locule Damage (%)		Boll Damage (%)		Locule Damage (%)		Boll Damage (%)		Locule Damage (%)	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	8.60	16.78	3.72	11.04	37.47	37.74	23.43	28.95	28.32	5.37	11.42	3.45
T2	9.29	17.70	3.87	11.26	36.33	37.07	24.72	29.81	25.75	5.12	11.75	3.50
T3	8.53	16.92	3.62	10.89	36.28	37.04	20.57	26.97	23.96	4.95	10.62	3.33
T4	7.84	16.18	3.40	10.51	36.16	36.97	19.47	26.18	23.01	4.85	9.84	3.22
T5	12.49	20.64	6.90	15.13	39.51	38.94	25.20	30.13	17.75	4.27	5.90	2.53
T6	9.80	18.07	4.26	11.88	23.78	29.19	15.12	22.88	17.75	4.27	5.90	2.53
T7	10.60	18.97	4.37	12.03	35.86	36.79	21.85	27.87	21.51	4.69	8.96	3.08
T8	9.27	17.69	3.97	11.40	36.97	37.45	20.57	26.97	22.43	4.79	9.56	3.17
T9	8.43	16.87	3.50	10.76	23.68	29.12	17.27	24.56	21.03	4.64	8.66	3.03
T10	9.87	18.24	3.97	11.38	34.77	36.13	18.57	25.53	22.69	4.81	9.73	3.20
T11	9.20	17.63	3.80	11.12	34.82	36.16	17.06	24.4	19.75	4.50	7.87	2.89
T12	10.07	18.48	4.30	11.95	36.23	37.01	25.41	30.27	19.07	4.42	7.09	2.75
T13	20.50	26.89	8.82	17.23	52.74	46.57	38.56	38.39	29.71	5.49	17.35	4.22
CD (5%)	-	3.27	-	1.69	-	5.65	-	6.38	-	0.22	-	0.14
SE (m)	-	1.12	-	0.57	-	1.82	-	2.05	-	0.08	-	0.05
SE (d)	-	1.58	-	0.81	-	-	-	-	-	0.11	-	0.07
CV (%)	-	10.41	-	8.26	-	7.01	-	10.39	-	2.79	-	2.67

NA- Nanded**, RA-** Rahuri, **BW-** Bhawanipatna, **O.V-**Original Value **; T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:189.Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23 (Yield and Phytotoxicity symptom)- Central Zone

Treatment	Yield/q./ha						Phytotoxicity symptom					
	JU	SU	AK	NA	RA	BW	JU	SU	AK	NA	RA	BW
T1	26.01	15.74	9.03	12.50	13.56	14.18	-	0.00	-	-	-	-
T2	25.57	17.18	12.59	12.27	12.65	14.09	-	0.00	-	-	-	-
T3	24.69	18.00	10.56	12.77	13.18	14.66	-	0.00	-	-	-	-
T4	26.34	20.99	15.95	13.22	15.35	15.02	-	0.00	-	-	-	-
T5	24.03	16.67	8.57	11.80	12.16	15.46	-	0.00	-	-	-	-
T6	30.20	23.46	17.32	13.75	18.65	18.76	-	0.00	-	-	-	-
T7	23.04	21.19	12.37	13.48	15.40	16.40	-	0.00	-	-	-	-
T8	29.98	22.74	18.68	13.42	14.35	15.69	-	0.00	-	-	-	-
T9	27.56	19.85	12.14	13.85	17.50	16.18	-	0.00	-	-	-	-
T10	28.66	22.02	12.89	13.13	15.64	15.60	-	0.00	-	-	-	-
T11	31.19	23.25	17.74	13.57	16.42	17.16	-	0.00	-	-	-	-
T12	23.37	16.15	10.88	12.77	14.18	17.56	-	0.00	-	-	-	-
T13	19.29	13.89	5.42	8.45	10.26	9.16	-	0.00	-	-	-	-
CD (5%)	-	2.95	3.75	1.28	N/A	0.87	-	-	-	-	-	-
SE (m)	-	1.01	1.28	0.43	0.37	0.30	-	-	-	-	-	-
SE (d)	-		-	0.61	-	0.42	-	-	-	-	-	-
CV (%)	-	9.05	17.65	5.93	13.66	3.38	-	-	-	-	-	-

JU- Junagadh**, SU-** Surat**, AK-** Akola**, NA-** Nanded**, RA-** Rahuri, **BW-** Bhawanipatna, **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 190. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23. (Larval Recovery)- South Zone

Treatment	No. of larva per plant (ABW)														
	LG					ND					DW				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	1.00	1.22	0.47	0.98	85.04
T2	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	1.07	1.25	0.60	1.05	80.77
T3	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.93	1.20	0.73	1.11	76.50
T4	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.93	1.20	0.60	1.05	80.77
T5	-	-	-	-	-	-	-	-	-	-	1.27	1.28	0.67	1.08	78.53
T6	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	1.07	1.25	0.75	1.12	78.63
T7	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.87	1.17	0.69	1.09	78.63
T8	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	1.27	1.28	0.75	1.12	74.36
T9	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.93	1.20	0.41	0.95	91.35
T10	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.93	1.19	0.52	1.01	89.42
T11	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.93	1.16	0.73	1.11	80.77
T12	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	1.33	1.27	1.12	1.27	72.22
T13	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	2.60	1.76	3.06	1.84	-
CD (5%)	-	-	-	-	-	-	-	-	-	-		0.52		0.46	
SE (m)	-	-	-	-	-	-	-	-	-	-		0.18		0.16	
SE (d)	-	-	-	-	-	-	-	-	-	-					
CV (%)	-	-	-	-	-	-	-	-	-	-		8.22		8.37	

LG-Lam Guntur**; ND-** Nandyal**; DW**-Dharwad**,RC**-Raichur**, CN-** Chamarajanagar**, CBE-** Coimbatore**, SVPR**-Srivilliputtur,**O.V**-Original Value **, T.V**-Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 191. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23. (Larval Recovery)- South Zone

Treatment	No. of larva per plant (ABW)																			
	RC					CN					CBE					SVPR				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	2.04	1.59	0.60	1.05	80.99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T2	1.63	1.46	0.74	1.11	76.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T3	1.56	1.44	0.98	1.22	69.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T4	1.62	1.46	0.81	1.15	74.37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5	1.24	1.32	1.31	1.35	58.71	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6	1.49	1.41	0.35	0.92	89.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7	1.17	1.29	0.53	1.01	83.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T8	1.25	1.32	0.74	1.11	76.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T9	1.68	1.48	1.02	1.23	67.96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T10	1.66	1.47	0.22	0.85	93.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T11	1.56	1.44	0.39	0.95	87.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12	1.70	1.48	0.52	1.01	83.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13	1.48	1.41	3.17	1.92	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CD (5%)	-	2.21	-	2.23	-	-		-		-	-	-	-	-	-	-	-	-	-	-
SE (m)	-	0.71	-	0.75	-	-		-		-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	0.02	-	0.2	-	-		-		-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	16.12	-	18.24	-	-		-		-	-	-	-	-	-	-	-	-	-	-

RC-Raichur**, CN**- Chamarajanagar**, CBE**- Coimbatore**, SVPR**-Srivilliputtur,**O.V**-Original Value **, T.V**-Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:192.Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23. (Larval Recovery)- South Zone

Treatment	No. of larva per plant (SBW)														
	LG					ND					DW				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T2	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T3	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T4	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T7	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T8	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T9	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T10	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T11	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T12	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T13	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
CD (5%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LG-Lam Guntur**; ND-** Nandyal**; DW-**Dharwad**, RC-**Raichur**, CN-** Chamarajanagar**, CBE-** Coimbatore**, SVPR-**Srivilliputtur,**O.V-**Original Value **, T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 193. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23. (Larval Recovery)- South Zone

Treatment	No. of larva per plant (SBW)																			
	RC					CN					CBE					SVPR				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T2	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T3	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T4	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T8	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T9	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T10	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T11	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CD (5%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

RC-Raichur**, CN-** Chamarajanagar**, CBE-** Coimbatore**, SVPR-**Srivilliputtur,**O.V-**Original Value **, T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 194.Ent 6.Evaluation of prominent insecticides against bollworm complex of cotton 2022-23. (Larval Recovery)- South Zone

Treatment	No. of larva per plant (TC)														
	LG					ND					DW				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T2	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T3	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T4	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T7	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T8	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T9	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T10	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T11	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T12	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
T13	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
CD (5%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LG-Lam Guntur**; ND-** Nandyal**; DW-**Dharwad**, O.V-**Original Value **, T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 195.Ent 6.Evaluation of prominent insecticides against bollworm complex of cotton 2022-23. (Larval Recovery)- South Zone

Treatment	No. of larva per plant (TC)																			
	RC					CN					CBE					SVPR				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	2.22	1.65	0.84	1.16	86.98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T2	2.41	1.70	1.02	1.23	85.59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T3	2.10	1.61	1.25	1.32	74.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T4	2.07	1.60	1.16	1.29	81.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5	2.59	1.76	2.16	1.63	71.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6	1.49	1.41	0.37	0.93	94.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7	1.63	1.46	0.72	1.10	90.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T8	1.86	1.54	0.48	0.99	85.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T9	2.29	1.67	1.47	1.40	79.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T10	1.05	1.24	0.23	0.86	97.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T11	1.24	1.32	0.49	0.99	94.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12	1.83	1.53	0.69	1.09	89.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13	3.10	1.90	7.00	2.74	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CD (5%)	-	0.98	-	1.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (m)	-	0.33	-	0.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	0.04	-	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	12.74	-	16.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

RC-Raichur**, CN-** Chamarajanagar**, CBE-** Coimbatore**, SVPR-**Srivilliputtur,**O.V-**Original Value **, T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:196. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23 (Larval Recovery) - South Zone

Treatment	Number of larvae/20 bolls (PBW)														
	LG					ND					DW				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	1.67	-	-	-	-	12.00	3.57	2.33	1.68	47.99	10.33	3.29	6.67	2.68	**79.90**
T2	2.00	-	-	-	-	11.33	3.50	7.00	2.73	15.48	10.67	3.34	6.33	2.61	**80.90**
T3	1.67	-	-	-	-	11.67	3.55	2.67	1.77	45.20	11.67	3.49	8.67	3.03	**73.86**
T4	1.00	-	-	-	-	12.67	3.69	6.00	2.54	21.36	10.67	3.34	7.33	2.80	**77.89**
T5	1.33	-	-	-	-	-	-	-	-	-	15.67	3.86	12.67	3.63	**61.79**
T6	2.00	-	-	-	-	13.67	3.82	2.00	1.56	51.70	12.33	3.58	10.67	3.14	**67.83**
T7	1.67	-	-	-	-	13.00	3.74	7.33	2.77	14.24	11.33	3.44	6.67	2.67	**79.90**
T8	2.00	-	-	-	-	14.00	3.85	6.00	2.53	21.67	11.00	3.30	7.33	2.80	**77.89**
T9	2.00	-	-	-	-	11.67	3.55	2.00	1.56	51.70	8.00	2.91	3.33	1.96	**89.96**
T10	1.67	-	-	-	-	11.67	3.55	4.00	2.11	34.67	9.00	2.99	4.00	2.12	**87.94**
T11	1.67	-	-	-	-	11.67	3.55	6.67	2.68	17.03	13.00	3.66	7.67	2.86	**76.88**
T12	1.00	-	-	-	-	11.00	3.46	1.00	1.17	63.78	12.67	3.51	9.00	3.03	**72.86**
T13	2.00	-	-	-	-	11.33	3.51	10.00	3.23	-	30.15	5.54	33.16	5.80	
CD (5%)	NA	-	-	-	-	-	N/A	-	0.5	-		**1.62**		**1.56**	
SE (m)	0.15	-	-	-	-	-	0.177	-	0.17	-		**0.55**		**0.53**	
SE (d)	-	-	-	-	-	-	0.25	-	-	-					
CV (%)	16.37	-	-	-	-	-	8.46	-	13.39	-		**9.13**		**10.52**	

LG-Lam Guntur**; ND-** Nandyal**; DW-**Dharwad**, RC-**Raichur**, CN-** Chamarajanagar**, CBE-** Coimbatore**, SVPR-**Srivilliputtur,**O.V-**Original Value **, T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 197.Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23 (Larval Recovery) - South Zone

Treatment	Number of larvae/20 bolls (PBW)																			
	RC					CN					CBE					SVPR				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	2.60	1.76	1.22	1.31	75.91	7.58	2.83	4.24	2.22	61.76	6.45	-	16.08	-	33.90	-	-	-	-	-
T2	2.65	1.77	1.22	1.31	73.50	8.07	2.92	5.09	2.40	54.10	8.25	-	17.20	-	29.31	-	-	-	-	-
T3	2.56	1.75	1.89	1.55	56.62	7.77	2.87	3.40	2.01	69.34	9.65	-	15.53	-	36.16	-	-	-	-	-
T4	2.00	1.58	1.33	1.35	68.69	8.56	3.00	5.71	2.53	48.51	10.32	-	18.50	-	23.96	-	-	-	-	-
T5	2.67	1.78	2.89	1.84	42.17	7.89	2.89	5.30	2.44	52.20	7.50	-	18.42	-	24.30	-	-	-	-	-
T6	1.81	1.52	0.33	0.91	95.19	8.52	3.00	5.58	2.51	49.68	8.45	-	7.67	-	68.49	-	-	-	-	-
T7	1.89	1.55	0.67	1.08	86.74	7.51	2.83	5.24	2.43	52.75	8.95	-	9.12	-	62.53	-	-	-	-	-
T8	2.33	1.68	1.55	1.43	66.24	8.47	2.98	5.28	2.45	52.38	8.47	-	12.32	-	49.38	-	-	-	-	-
T9	2.56	1.75	2.44	1.72	48.20	8.10	2.92	4.65	2.31	58.07	9.68	-	12.50	-	48.62	-	-	-	-	-
T10	1.56	1.43	0.33	0.91	95.22	8.34	2.97	5.62	2.51	49.32	11.25	-	11.03	-	54.65	-	-	-	-	-
T11	2.33	1.68	0.53	1.01	89.46	8.54	3.00	5.91	2.57	46.70	10.36	-	14.67	-	39.72	-	-	-	-	-
T12	2.56	1.75	1.22	1.31	75.91	8.74	3.03	6.17	2.62	44.36	7.66	-	14.75	-	39.38	-	-	-	-	-
T13	2.67	1.78	5.11	2.37	0.00	8.8	3.04	11.09	3.36	-	12.36	-	24.33	-	0.00	-	-	-	-	-
CD (5%)	-	1.97	-	3.05	-	-	0.44	-	0.45	-	-	-	-	-	-	-	-	-	-	-
SE (m)	-	0.65	-	0.98	-	-	0.15	-	0.15	-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	0.03	-	0.17	-	-	0.21	-	0.22	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	18.15	-	17.15	-	-	8.96	-	11.4	-	-	-	-	-	-	-	-	-	-	-

RC-Raichur**, CN-** Chamarajanagar**, CBE-** Coimbatore**, SVPR**-Srivilliputtur,**O.V-**Original Value **, T.V**-Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:198. Ent 6. Evaluation of prominent insecticides against bollworm complerx of cotton 2022-23(GBD or Fruiting Body Damage)- South Zone

Treatment	Green Boll damage due to SBW/ABW or Fruiting Body Damage (%)														
	LG					ND					DW				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5	-	-	-	-	-						-	-	-	-	-
T6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CD (5%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LG-Lam Guntur**; ND-** Nandyal**; DW-**Dharwad**, O.V-**Original Value **, T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 199. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23(GBD or Fruiting Body Damage)- South Zone

Treatment	Green Boll damage due to SBW/ABW or Fruiting Body Damage (%)																			
	RC					CN					CBE					SVPR				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	27.42	31.58	9.39	17.84	70.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T2	27.95	31.92	11.37	19.70	68.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T3	32.11	34.52	18.40	25.40	56.92	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T4	30.82	33.72	15.08	22.85	62.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5	31.21	33.96	19.76	26.40	42.97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6	21.77	27.81	7.46	15.85	80.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7	25.75	30.49	8.06	16.49	74.34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T8	29.61	32.97	14.27	22.19	63.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T9	30.77	33.69	18.60	25.55	55.64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T10	22.08	28.03	4.10	11.68	85.22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T11	26.44	30.95	7.75	16.16	75.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12	25.82	30.54	9.62	18.07	72.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13	36.92	37.42	50.74	45.42	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CD (5%)	-	1.10	-	2.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (m)	-	0.32	-	0.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	0.73	-	2.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	13.63	-	13.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LG-Lam Guntur**; ND-** Nandyal**; DW**-Dharwad**, RC**-Raichur**, CN-** Chamarajanagar**, CBE-** Coimbatore**, SVPR-**Srivilliputtur,**O.V-**Original Value **, T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 200. Ent 6. Evaluation of prominent insecticides against bollworm complerx of cotton 2022-23 (Green Boll damage due to PBW)- South Zone

Treatment	Green Boll damage (%) due to PBW														
	LG					ND					DW				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	16.70	23.84	27.80	31.67	50.98	55.83	48.32	15.00	22.78	78.82	-	-	-	-	-
T2	23.30	28.27	24.40	29.57	56.86	58.33	49.80	47.50	43.55	32.94	-	-	-	-	-
T3	26.70	30.98	30.00	33.02	47.06	63.33	52.74	22.50	28.27	68.23	-	-	-	-	-
T4	26.70	30.98	38.90	38.54	31.37	60.83	51.25	47.50	43.55	32.94	-	-	-	-	-
T5	20.00	26.55	45.60	42.42	19.61	-	-	-	-	-	-	-	-	-	-
T6	23.30	28.76	47.80	43.71	15.69	65.83	54.22	16.67	24.09	76.47	-	-	-	-	-
T7	20.00	26.55	31.10	33.79	45.10	63.33	52.73	55.83	48.33	21.17	-	-	-	-	-
T8	30.00	33.19	37.80	37.88	33.33	61.67	51.75	51.67	45.94	27.06	-	-	-	-	-
T9	26.70	30.98	46.70	43.07	17.65	63.33	52.69	16.67	24.06	76.47	-	-	-	-	-
T10	30.00	33.19	45.60	42.41	19.61	54.50	47.62	39.17	38.73	44.70	-	-	-	-	-
T11	23.30	28.27	34.40	35.92	39.22	63.33	52.69	48.33	44.03	31.76	-	-	-	-	-
T12	20.00	26.06	36.70	37.25	35.29	65.00	53.71	11.67	19.97	83.53	-	-	-	-	-
T13	-	30.98	-	48.82	-	69.15	56.29	70.83	57.29	-	-	-	-	-	-
CD (5%)	-	NA	-	4.94	-	-	N/A	-	3.78	-	-	-	-	-	-
SE (m)	-	2.67	-	1.68	-	-	2.05	-	1.20	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-	2.90	-	1.70	-	-	-	-	-	-
CV (%)	-	15.88	-	7.6	-	-	5.58	-	4.62	-	-	-	-	-	-

LG-Lam Guntur**; ND-** Nandyal**; DW-**Dharwad**, RC-**Raichur**, CN-** Chamarajanagar**, CBE-** Coimbatore**, SVPR-**Srivilliputtur,**O.V-**Original Value **, T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table:201. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23 (Green Boll damage due to PBW)- South Zone

Treatment	Green Boll damage (%) due to PBW																			
	RC					CN					CBE					SVPR				
	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)	Pre		14 DAS		Reduction over Control (%)
	O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V		O.V	T.V	O.V	T.V	
T1	28.55	32.30	13.56	21.60	67.38	37.79	37.91	12.93	19.33	69.86	39.56	-	16.19	-	54.05	-	-	-	-	-
T2	29.44	32.86	16.16	23.70	66.10	36.78	37.31	16.79	23.23	60.87	33.45	-	18.17	-	48.45	-	-	-	-	-
T3	30.56	33.56	18.38	25.38	57.92	38.90	38.58	11.62	17.60	72.92	25.36	-	14.55	-	58.71	-	-	-	-	-
T4	29.51	32.91	16.30	23.81	61.72	35.96	36.83	19.85	25.86	53.74	24.85	-	19.67	-	44.19	-	-	-	-	-
T5	30.60	33.58	34.17	35.77	36.79	37.75	37.88	18.64	24.88	56.56	30.84	-	20.33	-	42.30	-	-	-	-	-
T6	22.13	28.06	7.42	15.81	80.02	35.50	36.54	18.94	25.12	55.86	28.35	-	8.53	-	75.79	-	-	-	-	-
T7	25.29	30.19	13.99	21.97	70.46	35.77	36.73	18.18	24.51	57.63	20.15	-	9.62	-	72.71	-	-	-	-	-
T8	28.01	31.96	16.77	24.17	63.02	39.40	38.87	18.10	24.37	57.81	35.55	-	11.32	-	67.89	-	-	-	-	-
T9	32.22	34.58	20.25	26.74	56.45	37.97	38.03	14.62	20.95	65.92	32.85	-	12.08	-	65.71	-	-	-	-	-
T10	21.50	27.63	6.03	14.21	82.76	37.07	37.50	19.40	25.48	54.78	39.85	-	10.75	-	69.49	-	-	-	-	-
T11	25.43	30.29	9.71	18.16	60.68	38.00	38.03	20.59	26.43	52.01	32.24	-	13.13	-	62.73	-	-	-	-	-
T12	27.73	31.77	14.32	22.24	69.81	36.11	36.92	21.67	27.33	49.49	32.55	-	13.58	-	61.45	-	-	-	-	-
T13	-	45.63	-	50.32	-	-	38.08	-	40.91	-	-	-	-	-	-	-	-	-	-	-
CD (5%)	-	1.07	-	2.78	-	-	3.88	-	4.51	-	-	-	-	-	-	-	-	-	-	-
SE (m)	-	0.35	-	0.92	-	-	1.33	-	1.54	-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	1.22	-	2.58	-	-	1.88	-	2.18	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	13.45	-	15.17	-	-	6.13	-	11.19	-	-	-	-	-	-	-	-	-	-	-

LG-Lam Guntur**; ND**- Nandyal**; DW**-Dharwad**, RC**-Raichur**, CN**- Chamarajanagar**, CBE**- Coimbatore**, SVPR**-Srivilliputtur,**O.V**-Original Value **, T.V**-Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 202. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23 (Natural Enemies)- South Zone

Treatment	Natural Enemies /plant*											
	LG				ND				DW			
	Pre		14 DAS		Pre		14 DAS		Pre		14 DAS	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	0.40	-	0.38	-	-	-	-	-	0.47	0.98	0.30	0.89
T2	0.40	-	0.49	-	-	-	-	-	0.43	0.97	0.33	0.91
T3	0.20	-	0.20	-	-	-	-	-	0.47	0.98	0.35	0.92
T4	0.27	-	0.24	-	-	-	-	-	1.26	1.32	1.16	1.29
T5	0.60	-	0.36	-					0.60	1.05	0.43	0.97
T6	0.33	-	0.33	-	-	-	-	-	1.57	1.44	1.40	1.38
T7	0.27	-	0.47	-	-	-	-	-	1.06	1.25	0.92	1.19
T8	0.27	-	0.47	-	-	-	-	-	0.92	1.19	0.67	1.08
T9	0.40	-	0.40	-	-	-	-	-	1.62	1.45	1.43	1.39
T10	0.47	-	0.49	-	-	-	-	-	1.53	1.43	1.38	1.37
T11	0.27	-	0.29	-	-	-	-	-	1.10	1.26	1.00	1.22
T12	0.33	-	0.40	-	-	-	-	-	0.53	1.02	0.40	0.95
T13	0.33	-	0.40	-	-	-	-	-	2.71	1.79	2.82	1.82
CD (5%)	-	-	-	-	-	-	-	-	-	**0.23**	-	**0.22**
SE (m)	-	-	-	-	-	-	-	-	-	**0.07**	-	**0.08**
SE (d)	-	-	-	-	-	-	-	-	-	**-**	-	**-**
CV (%)	-	-	-	-	-	-	-	-	-	**7.34**	-	**11.01**

LG-Lam Guntur**; ND-** Nandyal**; DW-**Dharwad,**O.V-**Original Value **, T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control , *Natural Enemies include coccinellids, chrysopids, syrphids and spider

Table: 203. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23 (Natural Enemies)- South Zone

Treatment	Natural Enemies /plant*															
	RC				CN				CBE				SVPR			
	Pre		14 DAS		Pre		14 DAS		Pre		14 DAS		Pre		14 DAS	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	1.34	1.36	1.42	1.39	2.62	1.76	1.64	1.45	5.25	-	4.30	-	-	-	-	-
T2	1.38	1.37	1.34	1.36	2.63	1.77	1.65	1.46	6.35	-	4.70	-	-	-	-	-
T3	1.28	1.34	1.38	1.37	2.61	1.76	1.63	1.46	7.41	-	5.43	-	-	-	-	-
T4	1.37	1.37	1.28	1.34	3.37	1.96	1.99	1.58	7.56	-	3.42	-	-	-	-	-
T5	1.42	1.39	1.37	1.37	2.63	1.77	1.65	1.46	5.85	-	3.83	-	-	-	-	-
T6	1.34	1.36	1.38	1.37	2.73	1.8	1.75	1.5	9.58	-	10.50	-	-	-	-	-
T7	1.38	1.37	1.28	1.34	3.01	1.86	2.03	1.57	8.25	-	9.83	-	-	-	-	-
T8	1.28	1.34	1.37	1.37	3.37	1.96	2.39	1.68	7.63	-	7.78	-	-	-	-	-
T9	1.37	1.37	1.42	1.39	2.66	1.78	1.68	1.47	8.96	-	8.08	-	-	-	-	-
T10	1.42	1.39	1.45	1.40	3.53	2.01	2.55	1.74	6.41	-	8.75	-	-	-	-	-
T11	1.02	1.23	1.78	1.51	2.89	1.84	1.91	1.55	6.23	-	6.85	-	-	-	-	-
T12	1.54	1.43	1.81	1.52	2.91	1.84	1.93	1.56	4.55	-	7.70	-	-	-	-	-
T13	1.78	1.51	1.89	1.55	3.41	1.97	2.43	1.69	7.65	-	12.86	-	-	-	-	-
CD (5%)	-	0.12	-	0.17	-	0.25	-	0.27	-	-	-	-	-	-	-	-
SE (m)	-	0.35	-	0.51	-	0.08	-	0.09	-	-	-	-	-	-	-	-
SE (d)	-	0.01	-	0.019	-	0.12	-	0.13	-	-	-	-	-	-	-	-
CV (%)	-	14.34	-	13.45	-	8.23	-	10.33	-	-	-	-	-	-	-	-

RC-Raichur**, CN**- Chamarajanagar**, CBE**- Coimbatore**, SVPR**-Srivilliputtur,**O.V**-Original Value **, T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control, *Natural Enemies include coccinellids, chrysopids, syrphids and spider

Table: 204. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2022-23 (Open Boll and Locule Damage)- South Zone

Treatment	Open Boll and Locule Damage (%)											
	LG				ND				DW			
	Boll Damage (%)		Locule Damage (%)		Boll Damage (%)		Locule Damage (%)		Boll Damage (%)		Locule Damage (%)	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	25.97	30.55	16.00	22.99	10.67	18.86	6.33	2.61	18.95	25.79	-	-
T2	22.70	28.19	13.35	21.40	35.00	36.26	15.00	3.92	19.91	26.49	-	-
T3	30.13	33.05	16.86	24.12	15.00	22.61	9.00	3.08	22.51	28.31	-	-
T4	32.32	34.62	20.26	26.71	28.33	32.16	16.00	4.06	20.92	27.21	-	-
T5	40.30	39.36	22.68	28.26	-	-	-	-	22.88	28.57	-	-
T6	38.80	38.36	25.18	29.84	9.33	17.78	6.67	2.68	22.61	28.38	-	-
T7	34.95	35.89	28.06	31.69	21.67	27.72	14.67	3.87	20.48	26.90	-	-
T8	32.41	34.60	24.41	29.39	33.33	35.19	13.33	3.70	19.50	26.19	-	-
T9	38.89	38.51	25.77	30.41	13.33	21.35	7.00	2.73	13.83	21.82	-	-
T10	34.02	35.58	26.27	30.69	21.67	27.72	9.00	3.08	16.05	23.61	-	-
T11	27.87	31.84	18.34	25.21	25.00	29.94	11.67	3.48	24.69	29.78	-	-
T12	31.26	33.96	20.08	26.61	6.00	14.15	5.33	2.39	24.27	29.50	-	-
T13	50.80	45.44	35.91	36.77	41.67	40.19	18.33	4.33	42.71	40.79	-	-
CD (5%)	-	8.53	-	7.94	-	5.26	-	0.49	-	7.08	-	-
SE (m)	-	2.91	-	2.71	-	1.79	-	0.17	-	2.30	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	14.23	-	16.73	-	11.51	-	8.42	-	9.61	-	-

LG-Lam Guntur**; ND-** Nandyal**; DW-**Dharwad**, O.V-**Original Value **, T.V-**Transformed value **, DAS**-day after spray, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 205. Ent 6. Evaluation of prominent insecticides against bollworm complerx of cotton 2022-23 (Open Boll and Locule Damage)- South Zone

Treatment	Open Boll and Locule Damage (%)															
	RC				CN				CBE				SVPR			
	Boll Damage (%)		Locule Damage (%)		Boll Damage (%)		Locule Damage (%)		Boll Damage (%)		Locule Damage (%)		Boll Damage (%)		Locule Damage (%)	
	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V	O.V	T.V
T1	18.46	25.45	14.25	22.18	7.88	16.28	9.36	17.76	20.85	-	63.58	-	-	-	-	-
T2	19.47	26.18	14.95	22.75	11.74	20.03	13.87	21.86	23.18	-	65.25	-	-	-	-	-
T3	23.37	28.91	19.03	25.86	6.57	14.82	7.69	16.05	18.45	-	60.84	-	-	-	-	-
T4	22.56	28.36	18.73	25.64	16.08	23.55	18.21	25.18	24.08	-	68.25	-	-	-	-	-
T5	47.56	43.60	30.76	33.68	14.16	22.09	16.29	23.79	25.67	-	69.35	-	-	-	-	-
T6	13.46	21.52	9.76	18.20	14.81	22.6	16.94	24.28	9.52	-	38.25	-	-	-	-	-
T7	16.78	24.18	14.25	22.18	13.85	21.78	15.98	23.51	11.53	-	41.63	--	-	-	-	-
T8	20.13	26.66	15.05	22.83	13.30	21.36	15.43	23.1	15.08	-	52.34	-	-	-	-	-
T9	25.13	30.09	19.73	26.37	9.40	17.77	9.73	18.15	15.11	-	48.32	-	-	-	-	-
T10	10.69	19.08	8.16	16.60	15.20	22.86	17.33	24.53	12.50	-	44.36	-	-	-	-	-
T11	24.56	29.71	13.90	21.89	16.69	24.01	18.82	25.63	16.48	-	55.32	-	-	-	-	-
T12	17.08	24.41	13.93	21.91	18.45	25.39	20.58	26.94	17.53	-	56.38	-	-	-	-	-
T13	76.38	60.92	68.93	56.12	47.35	43.48	49.48	44.70	40.23	-	85.95	-	-	-	-	-
CD (5%)	-	1.05	-	1.55	-	3.69	-	3.60	-	-	-	-	-	-	-	-
SE (m)	-	3.23	-	4.69	-	1.26	-	1.23	-	-	-	-	-	-	-	-
SE (d)	-	3.05	-	2.77	-	1.79	-	1.74	-	-	-	-	-	-	-	-
CV (%)	-	17.41	-	16.52	-	9.63	-	8.82	-	-	-	-	-	-	-	-

RC-Raichur**, CN-** Chamarajanagar**, CBE-** Coimbatore**, SVPR-**Srivilliputtur,**O.V-**Original Value **, T.V-**Transformed value **,** T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 206.Ent 6. Evaluation of prominent insecticides against bollworm complerx of cotton 2022-23 (Yield and Phytotoxicity symptom)- South Zone

Treatment	Yield/q./ha						
	LG	ND	DW	RC	CN	CBE	SVPR
T1	6.55	-	12.23	19.51	17.38	15.86	-
T2	9.42	-	11.66	18.80	16.33	15.96	-
T3	6.26	-	10.48	15.37	18.95	16.40	-
T4	7.43	-	12.12	16.60	14.74	15.38	-
T5	7.43		7.93	15.33	12.73	15.01	-
T6	5.79	-	8.13	27.46	15.44	17.28	-
T7	8.60	-	11.69	26.64	13.85	17.20	-
T8	8.48	-	11.51	16.58	14.25	16.81	-
T9	8.77	-	15.17	27.03	18.41	16.95	-
T10	8.89	-	14.65	29.50	16.12	17.05	-
T11	9.94	-	9.12	27.18	11.49	16.74	-
T12	7.66	-	7.82	20.28	10.33	16.64	-
T13	5.50	-	6.29	16.21	6.38	14.68	-
CD (5%)	NA	-	3.82	19.51	0.53	-	-
SE (m)	1.02	-	1.24	18.80	0.18	-	-
SE (d)	-	-	-	15.37	0.26	-	-
CV (%)	22.72	-	12.29	16.60	8.31	-	-

LG-Lam Guntur**; ND-** Nandyal**; DW-**Dharwad**, RC**-Raichur**, CN-** Chamarajanagar**, CBE-** Coimbatore**, SVPR-**Srivilliputtur, T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fanopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35 SC, T8 – Indoxacarb 14.5 SC, T9- Spinetoram 11.7 SC, T10- Spinosad 45 SC , T11- Emamectin benzoate 5 SG, T12- Pyridalyl 10 EC, T13- Control

Table: 207. Ento 6a: Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (North zone)

Treatment	Whitefly/3leaves														
	BT					HI					SG				
	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC
	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)	OV	TV	OV	TV	(%)**
Flonicamid 50 WG (Systemic)	31.67	5.71	28.00	5.383	30.00	60.40	7.75	48.33	7.01	51.41	37.52	6.16	12.92	3.66	73.73
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	32.00	5.74	28.33	5.414	29.17	61.87	7.91	44.57	6.74	55.20	36.20	6.05	11.54	3.46	76.54
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	31.67	5.71	25.00	5.098	37.50	67.60	8.24	55.00	7.48	44.71	38.91	6.27	9.92	3.22	79.83
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	30.00	5.56	24.67	5.057	38.33	59.47	7.74	77.23	8.84	22.36	35.44	5.99	17.02	4.19	65.39
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	31.33	5.68	24.00	4.987	40.00	60.33	7.82	73.03	8.60	26.58	39.05	6.28	14.84	3.92	69.83
Spinetoram 11.7 SC+MakAdjuvol @ 1.5 % (15 ml/L water)	31.00	5.65	23.00	4.898	42.50	60.93	7.78	69.27	8.37	30.36	42.18	6.53	12.68	3.62	74.22
Emamectin benzoate 5 SG (Translaminar)	31.67	5.70	24.00	4.995	40.00	71.80	8.49	89.83	9.53	9.69	39.74	6.33	19.91	4.52	59.52
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	32.33	5.76	24.33	5.004	39.17	59.00	7.74	86.67	9.35	12.87	35.65	6.00	18.27	4.33	62.84
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	31.67	5.71	20.67	4.638	48.33	63.53	7.99	91.57	9.62	7.95	39.22	6.29	16.71	4.14	66.03
Profenofos 50 EC (Contact)	31.67	5.71	17.00	4.235	57.50	69.13	8.34	71.67	8.52	27.95	37.17	6.13	14.92	3.92	69.66
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	33.67	5.88	17.00	4.235	57.50	63.93	8.05	79.77	8.99	19.81	37.89	6.19	12.81	3.64	73.95
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	30.33	5.59	10.33	3.353	74.17	68.27	8.32	74.67	8.69	24.94	39.68	6.33	10.94	3.38	77.76
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	30.33	5.59	28.00	5.381	30.00	68.60	8.33	93.27	9.70	6.24	35.46	5.99	36.80	6.10	25.17
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	31.00	5.65	28.67	5.438	28.33	56.73	7.59	88.52	9.46	11.01	36.65	6.08	33.53	5.83	31.82
Control (Water Spray)	31.67	5.71	40.00	6.401	0	68.93	8.35	99.47	10.02	0.00	38.55	6.24	49.18	7.05	0.01
C.D.	-	NS	-	0.520	-	-	N/A	-	0.52	-	-	0.96	-	0.60	-
SE(m)	-	0.12	-	0.18	-	-	0.43	-	0.18	-	-	-	-	-	-
SE(d)	-	0.17	-	0.254	-	-	0.61	-	0.25	-	-	0.33	-	0.21	-
C.V.	-	3.77	-	6.258	-	-	9.28	-	3.53	-	-	6.54	-	5.84	-

BT- Bathinda**; HI –** Hisar**; SG-** Sriganganagar, **O.V-**Original Value **, T.V-**Transformed value **, **ROC-** Reduction over control, **DAS**-day after spray.

Table: 208. Ento 6a: Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (North zone)

Treatment	Thrips/3 leaves														
	BT					HI					SG				
	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC
	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**
Flonicamid 50 WG (Systemic)	25.00	5.09	17.00	4.24	47.42	53.07	7.33	6.80	2.79	16.03	20.28	4.56	9.74	3.20	62.47
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	26.00	5.19	17.00	4.24	47.42	56.73	7.59	6.30	2.70	19.42	21.18	4.64	8.35	2.97	67.82
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	23.33	4.93	8.33	3.04	74.23	49.80	7.12	5.70	2.58	24.51	22.75	4.82	7.63	2.85	70.60
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	24.67	5.06	5.00	2.41	84.54	51.07	7.21	3.97	2.23	49.96	24.22	4.97	5.49	2.45	78.86
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	24.00	4.99	3.00	1.97	90.72	51.80	7.26	3.77	2.18	52.50	22.09	4.75	3.97	2.11	84.72
Spinetoram 11.7 SC+MakAdjuvol @ 1.5 % (15 ml/L water)	24.67	5.05	3.33	2.03	89.69	56.40	7.56	3.50	2.12	54.20	21.86	4.72	3.30	1.95	87.29
Emamectin benzoate 5 SG (Translaminar)	25.00	5.09	9.00	3.05	72.16	55.27	7.50	5.13	2.47	24.51	24.25	4.96	8.72	3.04	66.40
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	25.33	5.12	8.33	3.01	74.23	51.13	7.22	4.73	2.39	29.60	21.37	4.66	7.30	2.78	71.87
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	24.00	4.997	4.00	2.23	87.63	57.00	7.60	5.07	2.46	27.06	21.49	4.69	6.48	2.63	75.05
Profenofos 50 EC (Contact)	25.67	5.15	9.00	2.99	72.16	57.53	7.64	4.53	2.35	39.78	20.57	4.58	7.98	2.91	69.27
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	24.00	4.99	9.00	3.14	72.16	58.93	7.74	4.20	2.28	44.87	21.04	4.63	6.42	2.63	75.27
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	23.67	4.96	5.00	2.45	84.54	52.07	7.26	4.07	2.25	48.26	23.57	4.90	5.70	2.48	78.06
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	24.67	5.04	25.00	5.09	22.68	57.00	7.60	8.37	3.06	4.16	22.69	4.80	17.84	4.27	31.27
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	28.00	5.38	26.33	5.23	18.56	54.67	7.45	8.03	3.00	7.55	20.33	4.55	15.89	4.04	38.80
Control (Water Spray)	29.00	5.47	32.33	5.77		57.73	7.66	9.17	3.18	-	22.15	4.76	25.96	5.14	0.01
C.D.	-	NS	-	0.92	-	-	N/A	-	0.27	-	-	0.80	-	0.47	-
SE(m)	-	0.171	-	0.45	-	-	0.28	-	0.09	-	-	-	-	-	-
SE(d)	-	0.230	-	0.32	-	-	0.39	-	0.13	-	-	0.28	-	0.16	-
C.V.	-	5.507	-	16.27	-	-	6.47	-	6.32	-	-	7.18	-	6.55	-

BT- Bathinda**; HI –** Hisar**; SG-** Sriganganagar **, O.V-**Original Value **, T.V-**Transformed value **, , **ROC-** Reduction over control, **DAS**-day after spray.

Table: 209. Ento 6a:Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (North zone)

Treatment	Jassid/3leaves														
	BT					HI					SG				
	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC
	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**
Flonicamid 50 WG (Systemic)	8.33	3.04	1.67	1.577	87.18	8.80	3.12	2.90	1.97	58.39	2.51	1.74	0.89	1.18	72.38
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	9.33	3.20	4.00	2.229	69.23	8.40	3.06	2.50	1.87	64.13	2.40	1.70	0.78	1.13	75.80
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	8.67	3.10	2.33	1.727	82.05	9.33	3.21	2.70	1.92	61.26	2.38	1.70	0.73	1.11	77.15
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	8.67	3.10	6.33	2.707	51.28	8.40	3.06	5.57	2.56	20.13	2.64	1.77	1.16	1.29	63.97
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	9.33	3.20	7.33	2.871	43.59	9.40	3.22	5.07	2.46	27.31	2.39	1.70	1.07	1.25	66.77
Spinetoram 11.7 SC+MakAdjuvol @ 1.5 % (15 ml/L water)	8.33	3.04	4.67	2.373	64.10	8.13	3.02	5.37	2.52	23.00	2.51	1.74	1.02	1.23	68.12
Emamectin benzoate 5 SG (Translaminar)	9.00	3.15	7.00	2.818	46.15	9.87	3.30	5.87	2.62	15.83	2.41	1.70	1.29	1.34	59.81
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	8.00	2.99	6.67	2.759	48.72	7.80	2.97	5.57	2.56	20.13	2.37	1.69	1.19	1.30	62.93
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	8.33	3.04	2.67	1.865	79.49	7.67	2.93	5.27	2.50	24.44	2.49	1.73	1.14	1.28	64.38
Profenofos 50 EC (Contact)	9.33	3.20	3.67	2.150	71.79	9.67	3.27	4.00	2.24	42.61	2.17	1.63	1.13	1.27	64.69
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	9.00	3.16	3.67	2.139	71.79	9.07	3.17	4.30	2.30	38.31	2.78	1.81	1.02	1.23	68.12
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	7.67	2.90	3.00	1.962	76.92	8.33	3.05	4.50	2.35	35.44	2.89	1.84	0.93	1.20	70.92
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	9.33	3.20	9.67	3.244	25.64	9.80	3.28	6.43	2.73	7.70	3.01	1.87	2.67	1.77	16.93
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	8.33	3.04	8.33	2.979	35.90	8.00	3.00	6.17	2.68	11.53	2.71	1.79	2.53	1.74	21.08
Control (Water Spray)	9.00	3.15	13.00	3.737		9.87	3.29	6.97	2.82	-	2.72	1.79	3.21	1.92	0.00
C.D.	-	NS	-	0.71	-	-	N/A	-	0.13	-	-	0.25		0.18	
SE(m)	-	0.17	-	0.24	-	-	0.12	-	0.05	-	-	-		-	
SE(d)	-	0.24	-	0.35	-	-	0.16	-	0.06	-	-	0.09		0.06	
C.V.	-	3.53	-	14.38	-	-	6.40	-	3.21	-	-	6.06		5.72	

BT- Bathinda**; HI –** Hisar**; SG-** Sriganganagar **, O.V-**Original Value **, T.V-**Transformed value **, , **ROC-** Reduction over control, **DAS**-day after spray.

Table: 210. Ento 6a:Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (North zone)

Treatment	BT		HI		SG	
	Yield(q/ha)	Phyto-toxicity	Yield(q/ha)	Phyto-toxicity	Yield(q/ha)	Phyto-toxicity
Flonicamid 50 WG (Systemic)	27.91	Nil	17.68	Nil	25.18	Nil
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	28.11	Nil	18.44	Nil	25.47	Nil
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	29.50	Nil	17.22	Nil	25.76	Nil
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	29.60	Nil	16.31	Nil	25.86	Nil
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	29.82	Nil	17.07	Nil	26.08	Nil
Spinetoram 11.7 SC+MakAdjuvol @ 1.5 % (15 ml/L water)	30.98	Nil	16.77	Nil	26.69	Nil
Emamectin benzoate 5 SG (Translaminar)	28.85	Nil	16.16	Nil	24.78	Nil
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	29.43	Nil	16.76	Nil	25.40	Nil
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	29.91	Nil	15.70	Nil	25.77	Nil
Profenofos 50 EC (Contact)	29.86	Nil	16.31	Nil	25.37	Nil
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	30.44	Nil	15.70	Nil	25.72	Nil
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	31.00	Nil	15.24	Nil	25.91	Nil
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	27.40	Nil	14.33	Nil	22.87	Nil
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	25.61	Nil	14.63	Nil	23.42	Nil
Control (Water Spray)	18.26	Nil	14.17	Nil	18.88	Nil
C.D.	2.84	-	0.67	-	5.81	-
SE(m)	0.98	-	0.23	-	-	-
SE(d)	1.38	-	0.33	-	2.01	-
C.V.	5.96	-	2.47	-	9.88	-

BT- Bathinda**; HI –** Hisar**; SG**- Sriganganagar

Table: 211. Ento 6a:Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (Central zone)

Treatment	Whitefly/3leaves														
	NA					JU					BA				
	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC
	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**
Flonicamid 50 WG (Systemic)	3.13	2.03	0.80	1.34	86.37	15.26	3.91	12.44	3.53	33.55	19.33	4.39	8.33	2.88	65.29
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	2.87	1.96	0.67	1.29	88.64	15.47	3.93	8.07	2.84	56.89	20.33	4.51	7.33	2.70	69.46
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	2.73	1.93	0.47	1.21	92.05	13.67	3.70	3.56	1.89	80.98	21.67	4.65	6.34	2.52	73.60
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	4.53	2.35	3.60	2.14	38.67	18.26	4.27	11.24	3.35	39.96	22.33	4.72	10.00	3.15	58.33
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	4.40	2.32	3.60	2.14	38.67	19.1	4.37	8.84	2.97	52.78	21.00	4.58	9.67	3.11	59.71
Spinetoram 11.7 SC+MakAdjuvol @ 1.5 % (15 ml/L water)	4.20	2.28	3.33	2.08	43.21	16.21	4.03	4.38	2.09	76.60	21.00	4.58	8.67	2.94	63.88
Emamectin benzoate 5 SG (Translaminar)	4.20	2.28	2.80	1.95	52.30	14.67	3.83	13.3	3.65	28.95	22.33	4.72	10.67	3.26	55.54
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	4.07	2.25	2.67	1.91	54.57	16.86	4.11	9.51	3.08	49.20	20.33	4.51	10.00	3.16	58.33
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	3.93	2.22	2.40	1.84	59.11	13.84	3.72	5.81	2.41	68.96	20.67	4.54	9.33	3.05	61.13
Profenofos 50 EC (Contact)	3.53	2.13	1.60	1.61	72.74	14.93	3.86	14.77	3.84	21.10	19.67	4.43	9.00	3.00	62.50
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	3.67	2.16	1.53	1.59	73.88	13.71	3.70	10.2	3.19	45.51	20.00	4.47	8.33	2.88	65.29
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	3.53	2.13	1.20	1.48	79.56	13.84	3.72	6.81	2.61	63.62	22.67	4.76	7.33	2.70	69.46
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	4.60	2.37	5.80	2.61	1.19	17.19	4.15	15.31	3.91	18.22	21.67	4.65	10.00	3.15	58.33
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	4.53	2.35	5.73	2.59	2.33	19.27	4.39	16.38	4.05	12.50	19.33	4.39	9.33	3.05	61.13
Control (Water Spray)	4.67	2.38	5.87	2.62	0.06	18.98	4.36	18.72	4.33	0.00	21.00	4.58	24.00	4.90	0.00
C.D.	-	0.11		0.15		-	NS		0.45		-	-		0.36	
SE(m)	-	0.04		0.05		-	0.20		0.16		-	-		0.12	
SE(d)	-	0.05		0.07		-	-		8.45		-	-		-	
C.V.	-	3.02		4.56		-	8.48	12.44	3.53	33.55	-	-		6.91	

JU- Junagadh**, NA-** Nanded**,** , **BA-** Banswara , **O.V-**Original Value **, T.V-**Transformed value **, , **ROC-** Reduction over control, **DAS**-day after spray.

Table: 212. Ento 6a:Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (Central zone)

Treatment	Thrips/3 leaves														
	NA					JU					BA				
	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC
	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**
Flonicamid 50 WG (Systemic)	12.80	3.71	4.31	2.30	76.66	35.70	5.97	14.3	3.78	39.66	-	-	-	-	-
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	12.51	3.67	4.04	2.24	78.10	37.60	6.13	10.2	3.2	56.96	-	-	-	-	-
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	12.11	3.62	3.53	2.13	80.87	39.90	6.31	7	2.65	70.46	-	-	-	-	-
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	12.27	3.64	4.49	2.34	75.70	36.10	6.01	14.9	3.86	37.13	-	-	-	-	-
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)-	12.04	3.61	3.91	2.22	78.82	38.80	6.23	11.5	3.39	51.48	-	-	-	-	-
Spinetoram -11.7 SC+Mak Ad-juvol @ 1.5 % (15 ml/L water)	11.58	3.54	3.33	2.08	81.95	39.50	6.29	6.4	2.53	73.00	-	-	-	-	-
Emamectin benzoate 5 SG (Translaminar)	15.13	4.01	6.73	2.78	63.54	40.70	6.38	15.7	3.96	33.76	-	-	-	-	-
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	15.04	4.00	6.44	2.73	65.11	33.70	5.81	12.3	3.51	48.10	-	-	-	-	-
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	14.13	3.88	5.82	2.61	68.48	33.80	5.81	8.8	2.96	62.87	-	-	-	-	-
Profenofos 50 EC (Contact)	14.98	3.99	5.87	2.62	68.24	37.60	6.13	16.9	4.11	28.69	-	-	-	-	-
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	14.73	3.96	5.24	2.49	71.61	38.90	6.24	13.7	3.7	42.19	-	-	-	-	-
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	14.20	3.90	4.93	2.44	73.29	34.30	5.86	9.8	3.13	58.65	-	-	-	-	-
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	17.44	4.29	18.29	4.38	0.98	35.80	5.98	18.4	4.29	22.36	-	-	-	-	-
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	17.49	4.30	18.11	4.37	1.94	33.80	5.81	20.1	4.48	15.19	-	-	-	-	-
Control (Water Spray)	17.60	4.31	18.47	4.41	0.02	35.70	5.98	23.7	4.87	-	-	-	-	-	-
C.D.	-	0.38		0.24		-	NS	-	0.54		-	-	-	-	-
SE(m)	-	0.13		0.08		-	0.29	-	0.19	-	-	-	-	-	-
SE(d)	-	0.18		0.12		-	-	-	-	-	-	-	-	-	-
C.V.	-	5.72		5.16		-	8.32	-	8.97	-	-	-	-	-	-

JU- Junagadh**, NA-** Nanded**,** , **BA-** Banswara , **O.V-**Original Value **, T.V-**Transformed value **, , **ROC-** Reduction over control, **DAS**-day after spray.

Table: 213. Ento 6a:Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (Central zone)

Treatment	Jassid/3 leaves														
	NA					JU					BA				
	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC
	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**
Flonicamid 50 WG (Systemic)	4.73	2.39	1.82	1.68	63.04	18.03	4.25	33.45	4.09	38.63	12.33	3.50	5.33	2.31	64.44
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	4.67	2.38	1.51	1.58	69.35	18.95	4.35	26.80	3.61	50.83	13.00	3.60	4.00	2.00	73.33
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	4.67	2.38	1.24	1.50	74.76	19.6	4.43	17.01	2.95	68.79	13.33	3.64	3.00	1.73	80.00
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	5.27	2.50	3.80	2.19	22.92	18.89	4.35	32.29	4.08	40.75	12.00	3.46	8.00	2.82	46.67
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	5.24	2.50	3.62	2.15	26.53	18.69	4.32	29.01	3.74	46.78	12.67	3.56	7.67	2.77	48.89
Spinetoram 11.7 SC+MakAdjuvol @ 1.5 % (15 ml/L water)	5.20	2.49	3.33	2.08	32.39	21.87	4.68	20.40	3.20	62.57	13.00	3.60	6.33	2.51	57.80
Emamectin benzoate 5 SG (Translaminar)	5.24	2.50	2.91	1.98	40.95	19.57	4.42	35.81	4.22	34.30	12.33	3.50	4.67	2.16	68.89
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	5.00	2.45	2.73	1.93	44.56	17.42	4.17	30.79	3.84	43.50	12.67	3.55	6.67	2.58	55.56
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	5.07	2.46	2.53	1.88	48.61	16.95	4.12	22.52	3.34	58.67	12.67	3.56	6.00	2.44	60.00
Profenofos 50 EC (Contact)	5.07	2.46	2.24	1.80	54.47	18.06	4.25	38.59	4.35	29.20	13.33	3.65	6.33	2.51	57.80
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	4.87	2.42	2.13	1.77	56.73	17	4.12	32.69	3.95	40.02	13.67	3.70	5.33	2.31	64.44
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	4.67	2.38	1.87	1.69	62.14	20.76	4.56	24.91	3.49	54.30	13.33	3.65	4.67	2.16	68.89
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	5.31	2.51	4.78	2.40	3.09	21.72	4.66	42.31	4.48	22.36	12.33	3.51	6.67	2.58	55.56
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	5.29	2.51	4.70	2.39	4.67	19.95	4.47	44.05	4.57	19.17	12.67	3.56	6.67	2.58	55.56
Control (Water Spray)	5.33	2.51	4.93	2.44	-0.07	22.53	4.25	54.50	5.00	-0.01	13.00	3.60	15.00	3.87	0.00
C.D.	-	NS	1.82	1.68	63.04	-	NS	-	0.15	-	-	-	-	0.27	-
SE(m)	-	0.05	1.51	1.58	69.35	-	0.22	-	0.05	-	-	-	-	0.09	-
SE(d)	-	0.07	1.24	1.50	74.76	-	-	-	0.07	-	-	-	-	-	-
C.V.	-	3.51	3.80	2.19	22.92	-	8.55	-	1.70	-	-	-	-	6.41	-

JU- Junagadh**, NA-** Nanded**,** , **BA-** Banswara, **O.V**-Original Value **, T.V-**Transformed value **, , **ROC-** Reduction over control, **DAS**-day after spray.

Table: 214. Ento 6a:Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (Central zone)

Treatment	Aphid/3 leaves														
	NA					JU					BA				
	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC
	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**
Flonicamid 50 WG (Systemic)	-	-	-	-	-	27.40	5.23	16.0	4.0	39.39	-	-	-	-	-
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	-	-	-	-	-	24.20	4.92	11.5	3.39	56.44	-	-	-	-	-
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	-	-	-	-	-	22.80	4.78	8.2	2.86	68.94	-	-	-	-	-
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	-	-	-	-	-	28.50	5.34	16.9	4.11	35.98	-	-	-	-	-
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	-	-	-	-	-	24.30	4.93	13.1	3.61	50.38	-	-	-	-	-
Spinetoram 11.7 SC+MakAdjuvol @ 1.5 % (15 ml/L water)	-	-	-	-	-	25.70	5.07	9.7	3.12	63.26	-	-	-	-	-
Emamectin benzoate 5 SG (Translaminar)	-	-	-	-	-	22.30	4.72	18.8	4.33	28.79	-	-	-	-	-
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	-	-	-	-	-	23.90	4.89	14.7	3.83	44.32	-	-	-	-	-
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	-	-	-	-	-	27.00	5.19	11.1	3.33	57.95	-	-	-	-	-
Profenofos 50 EC (Contact)	-	-	-	-	-	28.60	5.35	19.8	4.45	25.00	-	-	-	-	-
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	-	-	-	-	-	30.30	5.51	16.1	4.01	39.02	-	-	-	-	-
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	-	-	-	-	-	29.20	5.40	10.6	3.26	59.85	-	-	-	-	-
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	-	-	-	-	-	31.20	5.58	22.6	4.75	14.39	-	-	-	-	-
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	-	-	-	-	-	32.60	5.71	23.2	4.81	12.12	-	-	-	-	-
Control (Water Spray)	-	-	-	-	-	32.90	5.73	26.4	5.13	0.00	-	-	-	-	-
C.D.	-	-	-	-	-	-	NS		0.6		-	-	-	-	-
SE(m)	-	-	-	-	-	-	0.25		0.21		-	-	-	-	-
SE(d)	-	-	-	-	-	-	-		-		-	-	-	-	-
C.V.	-	-	-	-	-	-	8.29		9.11		-	-	-	-	-

JU- Junagadh**, NA-** Nanded**,** , **BA-** Banswara, **O.V-**Original Value **, T.V-**Transformed value **, , **ROC-** Reduction over control, **DAS**-day after spray.

Table: 215. Ento 6a:Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (Central zone)

Treatment	NA		JU		BA	
	Yield (q/ha)	Phyto-toxicity	Yield(q/ha)	Phyto-toxicity	Yield(q/ha)	Phyto-toxicity
Flonicamid 50 WG (Systemic)	23.58	NIL	23.37	-	23.10	NIL
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	24.05	NIL	26.90	-	24.02	NIL
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	24.48	NIL	31.53	-	24.64	NIL
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	23.80	NIL	23.04	-	17.86	NIL
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	24.30	NIL	25.35	-	18.48	NIL
Spinetoram 11.7 SC+MakAdjuvol @ 1.5 % (15 ml/L water)	24.93	NIL	30.20	-	19.71	NIL
Emamectin benzoate 5 SG (Translaminar)	21.53	NIL	22.27	-	18.07	NIL
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	21.90	NIL	24.91	-	18.48	NIL
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	22.38	NIL	28.88	-	19.10	NIL
Profenofos 50 EC (Contact)	22.73	NIL	21.38	-	20.64	NIL
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	23.00	NIL	24.25	-	21.56	NIL
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	23.87	NIL	28.00	-	22.33	NIL
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	16.62	NIL	20.61	-	17.56	NIL
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	16.50	NIL	20.28	-	18.17	NIL
Control (Water Spray)	16.48	NIL	18.08	-	17.25	NIL
C.D.	2.29	-	3.62	-	4.30	-
SE(m)	0.79	-	1.25	-	0.48	-
SE(d)	1.11	-	-	-	-	-
C.V.	6.19	-	8.8	-	12.80	-

JU- Junagadh**, NA-** Nanded**,** , **BA-** Banswara

Table: 216. Ento 6a:Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (South zone)

Treatment	Whitefly/3 leaves									
	LG					RC				
	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC
	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**
Flonicamid 50 WG (Systemic)	5.20	2.46	3.11	2.02	60.32	-	-	-	-	-
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	6.27	2.64	2.64	1.90	66.27	-	-	-	-	-
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	6.80	2.75	3.11	2.02	60.32	-	-	-	-	-
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	6.40	2.68	3.87	2.19	50.68	-	-	-	-	-
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	6.47	2.68	3.62	2.12	53.80	-	-	-	-	-
Spinetoram 11.7 SC+MakAdjuvol @ 1.5 % (15 ml/L water)	5.40	2.46	3.69	2.16	52.95	-	-	-	-	-
Emamectin benzoate 5 SG (Translaminar)	6.47	2.69	3.89	2.19	50.40	-	-	-	-	-
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	5.40	2.47	3.91	2.21	50.11	-	-	-	-	-
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	6.33	2.67	3.56	2.11	54.65	-	-	-	-	-
Profenofos 50 EC (Contact)	6.00	2.60	3.67	2.14	53.23	-	-	-	-	-
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	5.67	2.54	3.42	2.08	56.35	-	-	-	-	-
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	5.47	2.49	3.56	2.13	54.65	-	-	-	-	-
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	5.87	2.51	6.93	2.81	11.56	-	-	-	-	-
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	6.07	2.57	7.40	2.90	5.61	-	-	-	-	-
Control (Water Spray)	7.60	2.82	7.84	2.97	-0.06	-	-	-	-	-
C.D.	-	NA		0.07		-	-	-	-	-
SE(m)	-	0.11		0.20		-	-	-	-	-
SE(d)	-	-		-		-	-	-	-	-
C.V.	-	7.38		5.18		-	-	-	-	-

LG-Lam Guntur , **RC-**Raichur**,** **O.V-**Original Value **, T.V-**Transformed value **, **ROC-** Reduction over control, **DAS**-day after spray.

Table: 217. Ento 6a: Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (South zone)

Treatment	Thrips/3 leaves									
	LG					RC				
	Pre spray		07 DAS		ROC (%)**	Pre spray		07 DAS		ROC (%)**
	OV	TV	OV	TV		OV	TV	OV	TV	
Flonicamid 50 WG (Systemic)	5.73	2.58	3.48	2.09	54.61	7.33	2.85	3.52	2.111	61.19
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	5.20	2.44	2.43	1.84	68.32	5.56	2.52	1.63	1.567	84.59
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	4.93	2.37	2.60	1.90	66.10	5.22	2.44	0.89	1.349	91.51
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	5.60	2.54	1.89	1.69	75.37	5.00	2.42	1.26	1.502	87.45
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	2.60	1.83	1.96	1.70	74.41	3.56	2.11	0.63	1.273	92.91
Spinetoram 11.7 SC+MakAdjuvol @ 1.5 % (15 ml/L water)	4.33	2.29	1.70	1.63	77.79	4.17	2.23	0.41	1.183	95.44
Emamectin benzoate 5 SG (Translaminar)	6.47	2.72	4.19	2.27	45.34	5.89	2.62	3.59	2.141	63.69
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	3.87	2.19	3.51	2.12	54.22	7.44	2.85	4.55	2.291	47.98
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	3.47	2.10	4.05	2.23	47.17	7.89	2.97	3.44	2.077	62.76
Profenofos 50 EC (Contact)	4.20	2.25	2.50	1.85	67.45	7.00	2.81	3.00	1.984	71.24
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	1.53	1.59	3.52	2.12	54.08	5.67	2.55	2.00	1.684	80.49
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	4.13	2.27	2.90	1.96	62.24	5.00	2.44	1.37	1.504	85.37
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	2.87	1.95	8.25	3.03	-7.59	8.67	3.10	6.33	2.631	44.82
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	4.53	2.32	7.39	2.88	3.71	8.11	3.01	7.33	2.837	33.97
Control (Water Spray)	4.33	2.30	7.67	2.92	-0.05	8.56	3.08	10.22	3.349	0.01
C.D.	-	NS		0.18		-	0.62		0.735	
SE(m)	-	0.23		0.51		-	0.21		0.252	
SE(d)	-	-		-		-	0.30		0.357	
C.V.	-	17.82		14.11		-	13.81		22.24	

LG-Lam Guntur , **RC**-Raichur, **O.V**-Original Value , **T.V**-Transformed value , ****ROC**- Reduction over control, **DAS**-day after spray.

Table: 218. Ento 6a:Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (South zone)

Treatment	Jassid/3leaves									
	LG					RC				
	Pre spray		07 DAS		ROC	Pre spray		07 DAS		ROC
	OV	TV	OV	TV	(%)**	OV	TV	OV	TV	(%)**
Flonicamid 50 WG (Systemic)	13.33	3.78	2.16	1.77	77.91	3.00	1.96	1.22	1.485	90.41
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	14.67	3.96	2.00	1.73	79.51	5.70	2.56	0.30	1.132	98.57
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	10.33	3.35	2.02	1.73	79.28	3.63	2.06	0.04	1.018	99.65
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	9.47	3.23	2.76	1.93	71.77	10.78	3.22	3.89	2.199	68.43
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	10.73	3.42	2.42	1.85	75.18	6.00	2.49	1.15	1.444	93.45
Spinetoram 11.7 SC+MakAdjuvol @ 1.5 % (15 ml/L water)	10.13	3.33	2.84	1.96	70.86	6.00	2.50	1.87	1.633	84.70
Emamectin benzoate 5 SG (Translaminar)	10.67	3.42	3.98	2.22	59.24	6.33	2.67	3.37	2.043	73.93
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	12.27	3.62	3.04	2.01	68.81	10.19	3.00	2.19	1.767	85.12
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	12.07	3.61	3.42	2.10	64.94	8.44	2.99	1.48	1.543	89.76
Profenofos 50 EC (Contact)	11.20	3.49	5.93	2.63	39.21	7.78	2.96	7.22	2.81	36.78
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	12.67	3.69	4.22	2.28	56.74	9.30	3.20	6.63	2.751	46.78
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	11.07	3.47	5.22	2.49	46.49	7.33	2.86	6.19	2.648	48.93
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	13.27	3.78	4.27	2.30	56.28	8.00	2.95	15.93	4.067	-30.72
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	13.73	3.83	3.78	2.18	61.29	10.22	3.33	11.59	3.53	14.16
Control (Water Spray)	13.00	3.74	9.76	3.28	0.05	10.55	3.25	13.63	3.801	-0.01
C.D.	-	NA		0.09		-	N/A		0.748	
SE(m)	-	0.15		0.25		-	0.37		0.257	
SE(d)	-	-		-		-	0.523		0.363	
C.V.	-	7.18		6.90		-	22.851		19.708	

LG-Lam Guntur , **RC**-Raichur, **O.V**-Original Value , **T.V**-Transformed value , ****ROC**- Reduction over control, **DAS**-day after spray.

Table: 219. Ento 6a:Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (South zone)

Treatment	Aphid/3 leaves									
	LG					RC				
	Pre spray		07 DAS		ROC (%)**	Pre spray		07 DAS		ROC (%)**
	OV	TV	OV	TV		OV	TV	OV	TV	
Flonicamid 50 WG (Systemic)	-	-	-	-	-	4.00	2.22	0.78	1.333	89.10
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	-	-	-	-	-	3.55	2.09	0.33	1.153	95.56
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	-	-	-	-	-	2.78	1.83	0.22	1.102	96.19
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	-	-	-	-	-	3.22	2.00	2.78	1.921	57.05
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	-	-	-	-	-	4.22	2.24	1.06	1.431	86.42
Spinetoram 11.7 SC+MakAdjuvol @ 1.5 % (15 ml/L water)	-	-	-	-	-	3.85	2.11	1.00	1.411	86.56
Emamectin benzoate 5 SG (Translaminar)	-	-	-	-	-	5.89	2.60	4.11	2.245	44.22
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	-	-	-	-	-	3.56	2.12	4.11	2.173	36.10
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	-	-	-	-	-	4.78	2.40	1.37	1.518	83.55
Profenofos 50 EC (Contact)	-	-	-	-	-	5.78	2.55	1.33	1.525	80.78
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water	-	-	-	-	-	3.78	2.16	0.78	1.327	90.38
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	-	-	-	-	-	3.00	1.98	0.48	1.217	93.77
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	-	-	-	-	-	4.93	2.42	2.59	1.881	70.08
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	-	-	-	-	-	2.63	1.85	5.30	2.482	23.70
Control (Water Spray)	-	-	-	-	-	4.48	2.34	7.33	2.886	-0.02
C.D.	-	-	-	-	-	-	N/A		0.505	
SE(m)	-	-	-	-	-	-	0.27		0.173	
SE(d)	-	-	-	-	-	-	0.38		0.245	
C.V.	-	-	-	-	-	-	21.45		17.584	

LG-Lam Guntur , **RC**-Raichur, **O.V**-Original Value , **T.V**-Transformed value , ****ROC**- Reduction over control, **DAS**-day after spray.

Table: 220. Ento 6a: Evaluation of MakAdjuvol (Mineral Paraffin Oil) as adjuvant with insecticides—sponsored product (South zone)

Treatment	LG		RC	
	Yield (q./ha)	Phyto-toxicity	Yield	Phyto-toxicity
Flonicamid 50 WG (Systemic)	11.64	Nil	3.38	-
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 0.75 % (7.5 ml/L water)	8.95	Nil	3.65	-
Flonicamid 50 WG (Systemic)+MakAdjuvol @ 1.5 % (15 ml/L water)	8.19	Nil	4.46	-
Spinetoram 11.7 SC (Product of fermentation of Saccharopolyspora Sinosa)	9.53	Nil	9.41	-
Spinetoram 11.7 SC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	9.36	Nil	11.58	-
Spinetoram 11.7 SC+MakAdjuvol @ 1.5 % (15 ml/L water)	7.49	Nil	12.80	-
Emamectin benzoate 5 SG (Translaminar)	8.95	Nil	13.46	-
Emamectin benzoate 5 SG+MakAdjuvol @ 0.75 % (7.5 ml/L water)	10.41	Nil	15.56	-
Emamectin benzoate 5 SG+MakAdjuvol @ 1.5 % (15 ml/L water)	7.61	Nil	19.93	-
Profenofos 50 EC (Contact)	7.43	Nil	13.14	-
Profenofos 50 EC+MakAdjuvol @ 0.75 % (7.5 ml/L water)	9.07	Nil	14.26	-
Profenofos 50 EC+MakAdjuvol @ 1.5 % (15 ml/L water)	8.01	Nil	16.40	-
Water+MAK HMO @ 0.75 % OR 7.5 ml/litre (Control)	6.44	Nil	3.38	-
Water+MAK HMO @ 1.5 % OR 15 ml/litre (Control)	7.13	Nil	3.01	-
Control (Water Spray)	8.07	Nil	2.91	-
C.D.	NA	-	1.67	-
SE(m)	1.00	-	0.55	-
SE(d)	-	-	-	-
C.V.	20.70	-	14.54	-

LG-Lam Guntur , **RC**-Raichur**,**

Table: 221. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Bathinda)

Name of Treatment	Whitefly / trap		Jassids / trap		Thrips/ trap		Dusky cotton bug / trap		Pink bollworm adult /trap		Natural enemies / trap	
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV
CICRMV-W	761.00	-	269.91	-	-	-	-	-	-	-	5.00	-
CICRMV-J	958.44	-	319.52	-	-	-	-	-	-	-	4.55	-
CICRMV-A	916.00	-	301.00	-	-	-	-	-	-	-	2.66	-
CICRMV-T	1230.44	-	375.86	-	-	-	-	-	-	-	5.11	-
CICRMVBI-W	858.77	-	260.44	-	-	-	-	-	-	-	3.44	-
CICRMVBI-J	1346.55	-	385.13	-	-	-	-	-	-	-	3.88	-
CICRMVBI-A	1027.00	-	308.66	-	-	-	-	-	-	-	4.55	-
CICRMVBI-T	1273.11	-	407.19	-	-	-	-	-	-	-	4.22	-
YST + Solvent (+VE)	938.66	-	304.66	-	-	-	-	-	-	-	3.66	-
YST only (-VE)	865.00	-	257.91	-	-	-	-	-	-	-	3.22	-
CD (5%)	-	-	-	-		-		-		-	-	-
SE (m)	-	-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	-	-	-	-	-	-

O.V-Original Value**, T.V-**Transformed value**,**

Table: 222. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Hisar)

Name of Treatment	Whitefly/ trap		Jassid/ trap		Thrips/ trap		Dusky cotton bug/ trap		Pink bollworm adult/ trap		Natural enemies/ trap	
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV
CICRMV-W	1315.92	36.28	58.75	7.73	-	-	-	-	-	-	43.92	6.70
CICRMV-J	1145.17	33.85	68.58	8.34	-	-	-	-	-	-	45.33	6.81
CICRMV-A	1074.75	32.79	64.67	8.10	-	-	-	-	-	-	45.17	6.79
CICRMV-T	1216.42	34.89	62.08	7.94	-	-	-	-	-	-	43.92	6.70
CICRMVBI-W	1337.92	36.55	60.00	7.81	-	-	-	-	-	-	43.00	6.63
CICRMVBI-J	1052.50	32.45	67.00	8.25	-	-	-	-	-	-	43.33	6.66
CICRMVBI-A	1248.67	35.34	57.58	7.65	-	-	-	-	-	-	43.58	6.68
CICRMVBI-T	1171.92	34.25	55.75	7.53	-	-	-	-	-	-	43.42	6.66
YST + Solvent (+VE)	1067.42	32.69	53.83	7.40	-	-	-	-	-	-	44.00	6.70
YST only (-VE)	1097.75	33.13	54.58	7.45	-	-	-	-	-	-	46.67	6.90
C.D.	-	1.40	-	0.29	-	-	-	-	-	-	-	N/A
SE(m)	-	0.47	-	0.10	-	-	-	-	-	-	-	0.13
SE(d)	-	0.66	-	0.14	-	-	-	-	-	-	-	0.18
CV	-	2.37	-	2.15	-	-	-	-	-	-	-	3.24

O.V-Original Value **, T.V-**Transformed value **,**

Table: 223. Ento 7: Microbial based volatiles for sucking pest management in Bt-Cotton (Sponsored Technology) (Sirsa)

Name of Treatment	Whitefly/ trap		Jassid/ trap		Thrips/ trap		Chriso/ trap		Spider/ trap		Dusky Cotton Bug/ trap		Other Insect/ trap	
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV
CICRMV-W	837.50	30.50	38.25	6.25	74.92	8.71	0.33	1.13	0.33	1.16	11.43	3.49	14.24	3.9
CICRMV-J	711.42	28.81	60.50	7.81	74.17	8.67	0.42	1.20	0.33	1.16	6.64	2.76	11.22	3.49
CICRMV-A	763.92	30.21	51.50	7.22	75.17	8.72	0.42	1.18	0.33	1.16	9.53	3.22	23.02	4.89
CICRMV-T	813.42	26.55	54.83	7.40	73.50	8.63	0.58	1.26	0.42	1.17	9.42	3.20	19.79	4.55
CICRMVBI-W	830.83	25.12	56.75	7.59	74.75	8.70	0.83	1.36	0.42	1.20	14.78	3.93	12.81	3.71
CICRMVBI-J	820.58	29.87	57.25	7.60	74.17	8.67	0.58	1.26	0.75	1.30	10.00	3.29	15.38	4.04
CICRMVBI-A	812.83	23.81	54.00	7.40	73.17	8.61	0.50	1.21	1.33	1.51	11.43	3.51	9.23	3.19
CICRMVBI-T	818.42	24.97	50.33	7.16	76.25	8.79	0.33	1.16	0.33	1.15	12.43	3.65	20.35	4.62
YST + Solvent (+VE)	808.92	30.68	42.58	6.59	75.58	8.75	0.83	1.36	0.75	1.32	14.34	3.88	10.59	3.40
YST only (-VE)	802.50	28.91	39.83	6.38	72.92	8.60	0.17	1.09	0.58	1.25	10.10	3.30	9.21	3.19
C.D.	-	N/A	-	0.85	-	0.14	-	N/A	-	N/A	-	0.25	-	0.33
SE(m)	-	4.49	-	0.28	-	0.04	-	0.08	-	0.10	-	0.08	-	0.11
SE(d)	-	6.35	-	0.40	-	0.06	-	0.11	-	0.14	-	0.11	-	0.15
C.V.	-	28.02	-	7.01	-	0.97	-	11.59	-	14.03	-	4.27	-	5.08

O.V-Original Value , **T.V**-Transformed value ,

Table: 224. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Sriganganagar)

Name of Treatment	Whitefly / trap		Jassids / trap		Aphids / trap		Thrips / trap		Dusky cotton bug / trap		Pink bollworm adult / trap		Natural enemies / trap		Other insect / trap		Seed cotton yield (q/ha)
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV
CICRMV-W	1247.33	-	19.42	-	-	-	51.25	-	2.75	-	0.83	-	6.08	-	-	-	-
CICRMV-J	1174.00	-	23.67	-	-	-	51.42	-	2.17	-	0.58	-	5.67	-	-	-	-
CICRMV-A	1160.75	-	18.08	-	-	-	52.75	-	2.17	-	0.67	-	6.17	-	-	-	-
CICRMV-T	1163.83	-	19.42	-	-	-	60.42	-	2.42	-	0.83	-	5.50	-	-	-	-
CICRMVBI-W	1298.00	-	20.83	-	-	-	52.83	-	2.50	-	0.58	-	6.25	-	-	-	-
CICRMVBI-J	1208.92	-	25.33	-	-	-	51.92	-	2.83	-	0.42	-	5.67	-	-	-	-
CICRMVBI-A	1166.00	-	20.50	-	-	-	51.08	-	2.17	-	0.67	-	6.75	-	-	-	-
CICRMVBI-T	1162.83	-	19.25	-	-	-	63.67	-	2.92	-	1.00	-	6.42	-	-	-	-
YST + Solvent (+VE)	1166.50	-	19.50	-	-	-	52.58	-	3.58	-	0.50	-	6.00	-	-	-	-
YST only (-VE)	1172.92	-	19.50	-	-	-	50.17	-	3.25	-	0.67	-	6.17	-	-	-	-
Control	1160.92	-	18.42	-	-	-	50.75	-	2.92	-	0.50	-	6.92	-	-	-	-
CD (5%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-		-				-		-		-		-				

O.V-Original Value , **T.V**-Transformed value ,

Table: 225. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Surat)

Name of Treatment	Whitefly/ trap		Jassids / trap		Aphids / trap		Thrips / trap		Dusky cotton bug / trap		Pink bollworm adult / trap		Natural enemies / trap		Other Insect/ trap		Seed cotton yield (q/ha)
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV
CICRMV-W	56.11	7.52	33.85	5.86	11.02	3.39	12.62	3.62	0.00	0.71	0.00	0.71	5.45	2.44	1.88	1.54	23.15
CICRMV-J	22.19	4.76	52.29	7.27	13.55	3.75	11.72	3.50	0.00	0.71	0.06	0.75	6.10	2.57	2.30	1.67	23.28
CICRMV-A	27.84	5.32	36.03	6.04	24.73	5.02	7.37	2.81	0.00	0.71	0.00	0.71	5.21	2.39	2.10	1.61	22.12
CICRMV-T	22.71	4.82	31.31	5.64	8.60	3.02	29.74	5.50	0.00	0.71	0.00	0.71	3.95	2.11	2.28	1.67	21.35
CICRMVBI-W	50.88	7.17	34.44	5.91	8.33	2.97	11.09	3.41	0.00	0.71	0.00	0.71	10.52	3.32	6.44	2.63	19.29
CICRMVBI-J	42.99	6.60	62.37	7.93	11.60	3.48	11.09	3.41	0.00	0.71	0.35	0.92	13.86	3.79	4.86	2.32	23.15
CICRMVBI-A	26.05	5.15	32.86	5.78	22.59	4.81	8.40	2.98	0.00	0.71	0.12	0.79	11.68	3.49	6.46	2.64	21.09
CICRMVBI-T	17.10	4.20	26.58	5.20	7.35	2.80	25.67	5.12	0.00	0.71	0.06	0.75	11.54	3.47	4.14	2.15	19.55
YST + Solvent (+VE)	10.75	3.35	22.00	4.74	3.31	1.95	6.55	2.66	0.00	0.71	0.00	0.71	4.30	2.19	3.25	1.94	18.39
YST only (-VE)	8.25	2.96	18.39	4.35	3.15	1.91	5.40	2.43	0.00	0.71	0.06	0.75	3.74	2.06	2.93	1.85	16.72
CD (5%)	-	1.37	-	1.04	-	0.84	-	0.88	-	-	-	0.11	-	0.50	-	0.43	3.00
SE (m)	-	0.47	-	0.36	-	0.29	-	0.30	-	-	-	0.04	-	0.18	-	0.15	1.16
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	22.38	-	7.38	-	16.73	-	17.19	-	-	-	16.66	-	22.04	-	25.42	9.37

O.V-Original Value **, T.V-**Transformed value **,**

Table: 226. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Junagadh)

Name of Treatment	Whitefly/ trap		Jassid/ trap		Thrips/ trap		Dusky cotton bug/ trap		Pink bollworm adult/ trap		Natural enemies/ trap	
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV
CICRMV-W	158.25	-	106.25	-	36.50	-	0.00	-	0.00	-	18.00	-
CICRMV-J	66.00	-	165.50	-	38.75	-	0.00	-	0.00	-	20.00	-
CICRMV-A	82.25	-	115.25	-	22.75	-	0.00	-	0.00	-	18.50	-
CICRMV-T	77.50	-	91.75	-	89.00	-	0.00	-	0.00	-	14.00	-
CICRMVBI-W	157.25	-	106.50	-	34.75	-	0.00	-	0.00	-	34.00	-
CICRMVBI-J	132.50	-	195.00	-	32.25	-	0.00	-	0.00	-	45.75	-
CICRMVBI-A	95.25	-	101.75	-	22.75	-	0.00	-	0.00	-	38.50	-
CICRMVBI-T	63.50	-	81.00	-	69.50	-	0.00	-	0.00	-	39.25	-
YST + Solvent (+VE)	33.75	-	65.75	-	18.00	-	0.00	-	0.00	-	15.25	-
YST only (-VE)	28.75	-	53.50	-	14.25	-	0.00	-	0.00	-	13.75	-
C.D.	-	-	-	-	-	-	-	-	-	-	-	-
SE(m)	-	-	-	-	-	-	-	-	-	-	-	-
SE(d)	-	-	-	-	-	-	-	-	-	-	-	-
CV	-	-	-	-	-	-	-	-	-	-	-	-

O.V-Original Value **, T.V-**Transformed value **,**

Table: 227. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Rahuri)

Name of Treatment	Thrips/Trap		Jassid/Trap		Whitefly/Trap		LBB/Trap		Chrysoperla/Trap		Spider/Trap		Syrphid/Trap	
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV
CICRMV-W	56.42	7.54	89.33	9.48	88.58	9.44	6.08	2.57	0.33	0.91	1.92	1.55	3.83	2.08
CICRMV-J	57.08	7.59	91.42	9.59	93.67	9.70	6.92	2.72	0.17	0.82	1.50	1.41	3.67	2.04
CICRMV-A	55.33	7.47	84.50	9.22	90.17	9.52	7.08	2.75	0.17	0.82	0.92	1.19	2.58	1.76
CICRMV-T	56.58	7.56	81.67	9.06	84.75	9.23	8.33	2.97	0.08	0.76	1.17	1.29	2.50	1.73
CICRMVBI-W	47.25	6.91	74.17	8.64	83.25	9.15	8.42	2.99	0.58	1.04	1.50	1.41	6.17	2.58
CICRMVBI-J	46.50	6.86	87.67	9.39	80.33	8.99	8.42	2.99	0.67	1.08	1.42	1.38	1.67	1.47
CICRMVBI-A	53.25	7.33	86.75	9.34	88.08	9.41	9.83	3.21	0.33	0.91	1.08	1.26	3.25	1.94
CICRMVBI-T	50.00	7.11	82.00	9.08	79.92	8.97	6.67	2.68	0.50	1.00	1.33	1.35	10.00	3.24
YST + Solvent (+VE)	51.75	7.23	85.42	9.27	77.42	8.83	7.00	2.74	0.17	0.82	1.17	1.29	2.50	1.73
YST only (-VE)	39.25	6.30	79.33	8.93	74.75	8.67	3.92	2.10	0.33	0.91	0.83	1.15	3.75	2.06
C.D.	-	0.78	-	NA	-	NA	-	0.46	-	0.75	-	NA	-	NA
SE(m)	-	0.27	-	0.52	-	0.35	-	0.16	-	0.26	-	0.16	-	0.22
SE(d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV	-	7.55	-	11.82	-	7.67	-	11.53	-	7.49	-	24.82	-	4.56

O.V-Original Value **, T.V**-Transformed value **,**

Table: 228. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Nanded)

Name of Treatments	Whitefly /trap		Jassids / trap		Aphids / trap		Thrips / trap		Dusky cotton bug / trap		Pink bollworm adult / trap		Natural enemies / trap		Other insect / trap		Seed cotton yield (q/ha)
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV
CICRMV-W	59.25	-	47.58	-	-	-	84.92	-	-	-	-	-	10.83	-	-	-	-
CICRMV-J	44.00	-	71.25	-	-	-	89.25	-	-	-	-	-	13.83	-	-	-	-
CICRMV-A	42.58	-	58.17	-	-	-	90.83	-	-	-	-	-	13.25	-	-	-	-
CICRMV-T	51.00	-	49.67	-	-	-	127.67	-	-	-	-	-	14.83	-	-	-	-
CICRMVBI-W	74.42	-	52.67	-	-	-	92.67	-	-	-	-	-	17.58	-	-	-	-
CICRMVBI-J	48.33	-	81.58	-	-	-	99.75	-	-	-	-	-	10.75	-	-	-	-
CICRMVBI-A	51.08	-	60.42	-	-	-	97.92	-	-	-	-	-	13.42	-	-	-	-
CICRMVBI-T	44.08	-	51.17	-	-	-	133.00	-	-	-	-	-	9.75	-	-	-	-
YST + Solvent (+VE)	38.25	-	44.92	-	-	-	82.58	-	-	-	-	-	12.75	-	-	-	-
YST only (-VE)	33.75	-	37.00	-	-	-	71.50	-	-	-	-	-	9.17	-	-	-	-
CD (5%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

O.V-Original Value **, T.V**-Transformed value **,**

Table: 229. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Akola)

Name of Treatment	Aphids/ Trap		Jassids/ Trap		Thrips/ Trap		Whitefly/ Trap		Lady Bird Beetle/ Trap	
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV
CICRMV-W	18.08	4.24	57.42	7.58	70.50	8.40	65.42	8.09	3.17	1.78
CICRMV-J	17.42	4.17	71.75	8.47	64.33	8.02	74.92	8.65	5.08	2.25
CICRMV-A	27.25	5.22	63.17	7.94	64.17	8.01	66.58	8.15	5.75	2.37
CICRMV-T	20.67	4.54	66.50	8.15	73.08	8.55	59.58	7.68	5.25	2.29
CICRMVBI-W	19.08	4.36	69.42	8.33	65.50	8.09	64.08	7.99	5.25	2.29
CICRMVBI-J	20.42	4.52	65.92	8.11	64.25	8.01	63.83	7.99	4.25	2.04
CICRMVBI-A	17.92	4.22	65.92	8.11	65.25	8.07	61.67	7.85	4.75	2.17
CICRMVBI-T	19.33	4.39	65.92	8.12	55.42	7.44	56.08	7.49	4.83	2.19
YST + Solvent (+VE)	18.33	4.28	63.58	7.96	61.58	7.85	62.83	7.91	3.92	1.97
YST only (-VE)	13.25	3.61	40.67	6.38	55.08	7.39	57.00	7.55	5.50	2.30
C.D.	-	0.39	-	0.55	-	0.61	-	-	-	-
SE(m)	-	0.13	-	0.18	-	0.20	-	0.28	-	0.18
SE(d)	-	-	-	-	-	-	-	-	-	-
C.V.	-	5.22	-	4.12	-	4.50	-	6.17	-	15.15

O.V-Original Value **, T.V**-Transformed value **,**

Table: 230. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Banswara)

Name of Treatment	Whitefly/ trap		Jassid/ trap		N.E. (Coccinellids, spiders, predators, parasitoids etc) / trap		Seed cotton yield (q/ha)
	OV	TV	OV	TV	OV	TV	OV
CICRMV-W	224.00	-	62.00	-	6.00	-	22.64
CICRMV-J	214.00	-	74.00	-	6.00	-	22.89
CICRMV-A	212.00	-	58.00	-	7.00	-	21.25
CICRMV-T	211.00	-	62.00	-	6.00	-	21.56
CICRMVBI-W	238.00	-	66.00	-	7.00	-	23.25
CICRMVBI-J	227.00	-	83.00	-	6.00	-	23.92
CICRMVBI-A	214.00	-	65.00	-	7.00	-	20.79
CICRMVBI-T	213.00	-	62.00	-	7.00	-	21.10
YST + Solvent (+VE)	216.00	-	63.00	-	7.00	-	20.94
YST only (-VE)	214.00	-	61.00	-	7.00	-	22.58
C.D.	-	-	-	-	-	-	-
SE(m)	-	-	-	-	-	-	-
SE(d)	-	-	-	-	-	-	-
CV	-	-	-	-	-	-	-

O.V-Original Value **, T.V**-Transformed value **,**

Table: 231. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Dharwad)

Name of Treatment	Whitefly / trap		Jassids / trap		Aphids / trap		Thrips / trap		Dusky cotton bug / trap		Pink bollworm adult / trap		Natural enemies / trap		Other insect/ trap		Seed cotton yield (q/ha)
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV
CICRMV-W	20.17	-	22.00	-	14.17	-	24.00	-	-	-	-	-	13.83	-	-	-	17.82
CICRMV-J	14.17	-	26.75	-	17.42	-	23.50	-	-	-	-	-	13.58	-	-	-	22.20
CICRMV-A	13.25	-	18.75	-	28.92	-	26.08	-	-	-	-	-	17.83	-	-	-	18.12
CICRMV-T	15.17	-	19.00	-	16.83	-	41.75	-	-	-	-	-	19.42	-	-	-	15.08
CICRMVBI-W	25.50	-	25.42	-	20.17	-	20.50	-	-	-	-	-	18.08	-	-	-	18.55
CICRMVBI-J	16.42	-	31.33	-	16.25	-	27.08	-	-	-	-	-	18.92	-	-	-	17.70
CICRMVBI-A	13.08	-	21.67	-	30.33	-	30.42	-	-	-	-	-	20.00	-	-	-	16.66
CICRMVBI-T	10.17	-	17.83	-	20.17	-	48.00	-	-	-	-	-	21.75	-	-	-	17.58
YST + Solvent (+VE)	12.58	-	13.33	-	16.33	-	23.17	-	-	-	-	-	13.08	-	-	-	15.68
YST only (-VE)	11.33	-	14.33	-	13.33	-	22.67	-	-	-	-	-	9.67	-	-	-	15.02
CD (5%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NS
SE (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.28
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.35

O.V-Original Value **, T.V-**Transformed value **,**

Table: 232. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Raichur)

Name of Treatment	Whitefly / trap		Jassids / trap		Aphids / trap		Thrips / trap		Dusky cotton bug / trap		Pink bollworm adult / trap		Natural enemies / trap		Other Insect / trap		Seed cotton yield (q/ha)
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV
CICRMV-W	30.17	-	68.67	-	21.56	-	29.83	-	0.00	-	0.00	-	7.42	-	-	-	-
CICRMV-J	14.17	-	104.67	-	40.11	-	36.00	-	0.00	-	0.00	-	9.58	-	-	-	-
CICRMV-A	17.25	-	81.42	-	37.78	-	43.25	-	0.00	-	0.00	-	10.17	-	-	-	-
CICRMV-T	11.58	-	78.25	-	26.33	-	54.83	-	0.00	-	0.00	-	11.17	-	-	-	-
CICRMVBI-W	28.92	-	71.33	-	29.78	-	33.67	-	0.00	-	0.00	-	10.17	-	-	-	-
CICRMVBI-J	20.83	-	86.75	-	35.67	-	32.00	-	0.00	-	0.00	-	8.00	-	-	-	-
CICRMVBI-A	21.42	-	96.83	-	38.33	-	33.42	-	0.00	-	0.00	-	10.92	-	-	-	-
CICRMVBI-T	13.92	-	78.42	-	32.67	-	55.83	-	0.00	-	0.00	-	10.67	-	-	-	-
YST + Solvent (+VE)	11.00	-	79.75	-	29.78	-	35.08	-	0.00	-	0.00	-	11.75	-	-	-	-
YST only (-VE)	13.42	-	81.08	-	26.78	-	28.08	-	0.00	-	0.00	-	10.58	-	-	-	-
CD (5%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

O.V-Original Value **, T.V-**Transformed value **,**

Table: 233. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Chamrajnagar)

Name of Treatment	Whitefly / trap		Jassids / trap		Aphids / trap		Thrips / trap		Dusky cotton bug / trap		Pink bollworm adult / trap		Natural enemies / trap		OtherInsect / trap		Seed cotton yield (q/ha)
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV
CICRMV-W	52.42	-	66.50	-	-	-	36.75	-	-	-	-	-	9.25	-	-	-	-
CICRMV-J	30.92	-	57.83	-	-	-	37.17	-	-	-	-	-	6.83	-	-	-	-
CICRMV-A	41.17	-	65.50	-	-	-	49.58	-	-	-	-	-	5.58	-	-	-	-
CICRMV-T	56.50	-	100.67	-	-	-	65.42	-	-	-	-	-	13.17	-	-	-	-
CICRMVBI-W	29.58	-	48.75	-	-	-	40.67	-	-	-	-	-	7.08	-	-	-	-
CICRMVBI-J	38.08	-	64.00	-	-	-	51.17	-	-	-	-	-	9.67	-	-	-	-
CICRMVBI-A	29.17	-	70.58	-	-	-	48.08	-	-	-	-	-	9.92	-	-	-	-
CICRMVBI-T	44.08	-	62.17	-	-	-	39.17	-	-	-	-	-	4.83	-	-	-	-
YST + Solvent (+VE)	54.00	-	57.25	-	-	-	31.42	-	-	-	-	-	7.67	-	-	-	-
YST only (-VE)	25.92	-	31.42	-	-	-	27.58	-	-	-	-	-	5.92	-	-	-	-
CD (5%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

O.V-Original Value **, T.V-**Transformed value **,**

Table: 234. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Lam Guntur)

Name of Treatment	Whitefly/ trap		Jassid/ trap		Thrips/ trap		Dusky cotton bug/ trap		Pink bollworm adult/ trap		N.E.(Coccinellids, spiders, predators, parasitoids etc) / trap	
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV
CICRMV-W	52.83	7.34	243.75	15.64	16.92	4.22	-	-	-	-	6.25	2.68
CICRMV-J	51.17	7.22	286.00	16.87	18.33	4.36	-	-	-	-	9.17	3.18
CICRMV-A	51.08	7.21	246.75	15.74	20.42	4.63	-	-	-	-	9.25	3.17
CICRMV-T	35.67	5.96	267.25	16.36	22.25	4.80	-	-	-	-	7.42	2.90
CICRMVBI-W	75.75	8.64	274.17	16.56	21.17	4.71	-	-	-	-	5.58	2.55
CICRMVBI-J	42.50	6.58	263.17	16.23	17.00	4.24	-	-	-	-	5.08	2.45
CICRMVBI-A	48.67	7.05	247.67	15.71	18.08	4.34	-	-	-	-	5.17	2.48
CICRMVBI-T	53.42	7.37	241.67	15.57	26.17	5.21	-	-	-	-	7.00	2.82
YST + Solvent (+VE)	50.17	7.15	264.33	16.29	17.83	4.33	-	-	-	-	7.00	2.83
YST only (-VE)	53.33	7.31	203.42	14.30	20.58	4.65	-	-	-	-	6.42	2.72
C.D.		1.19	-	N/A	-	N/A	-	-	-	-	-	N/A
SE(m)	-	0.40	-	0.57	-	0.25	-	-	-	-	-	0.17
SE(d)	-	0.56	-	0.81	-	0.35	-	-	-	-	-	0.25
CV	-	9.62	-	6.19	-	9.32	-	-	-	-	-	10.87

O.V-Original Value **, T.V-**Transformed value **,**

Table: 235. Ento 7: Effect of microbial based volatiles on YST trap catches of insect pest management in Bt cotton (2022-23) (Nandyal)

Name of Treatment	Whitefly/ trap		Jassid/ trap		Thrips/ trap		Aphids/ trap		Pink bollworm adult/ trap		Ladybird Beetel/ trap		Spiders/ trap	
	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV	OV	TV
CICRMV-W	20.00	3.99	4.17	2.07	9.00	2.74	1.75	1.50	-	-	1.92	1.53	1.00	1.16
CICRMV-J	9.08	2.78	10.08	3.13	9.75	2.85	1.50	1.40	-	-	1.42	1.36	0.75	1.08
CICRMV-A	6.00	2.34	3.00	1.83	8.67	2.70	3.42	1.98	-	-	1.42	1.37	0.67	1.05
CICRMV-T	12.08	3.15	3.08	1.82	22.83	4.25	1.33	1.35	-	-	1.42	1.38	0.92	1.18
CICRMVBI-W	20.25	4.06	5.33	2.27	9.92	2.87	1.50	1.40	-	-	8.08	2.92	4.83	2.11
CICRMVBI-J	10.33	3.00	12.25	3.39	8.92	2.68	1.33	1.35	-	-	1.75	1.49	1.08	1.24
CICRMVBI-A	7.00	2.44	6.00	2.40	7.75	2.62	3.42	1.97	-	-	9.00	3.06	3.83	1.87
CICRMVBI-T	6.67	2.46	5.00	2.25	24.08	4.41	2.00	1.57	-	-	2.67	1.76	1.00	1.17
YST + Solvent (+VE)	5.08	2.12	2.92	1.74	8.00	2.54	0.75	1.12	-	-	6.33	2.48	2.08	1.48
YST only (-VE)	4.50	2.08	2.17	1.57	5.67	2.25	1.25	1.32	-	-	6.58	2.49	2.17	1.47
C.D.(5%)	-	0.89	-	0.56	-	0.78	-	0.15	-	-	-	0.53	-	0.77
SE(m)	-	0.31	-	0.19	-	0.27	-	0.05	-	-	-	0.18	-	0.26
SE(d)	-	0.434	-	0.275	-	0.379	-	0.071	-	-	-	0.26	-	0.37
CV	-	21.58	-	17.28	-	17.94	-	6.73	-	-	-	18.44	-	38.17

O.V-Original Value **, T.V**-Transformed value **,**

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CROP PROTECTION
PATHOLOGY

The following experiments were conducted in the discipline of Plant Pathology under the All India Coordinated Research Project (AICRP) on Cotton at different centers in North Zone (Faridkot, Bathinda, Hisar, ICAR-CICR RS Sirsa, Sriganganagar), in Central Zone (Akola, Nanded, Surat, Bharuch, Junagadh, Khandwa, Bhawanipatna, ICAR-CICR-Nagpur) and South Zone (Lam Guntur, Dharwad, TNAU Coimbatore):

Project	Title of the project	Participating Centers
Path.1	**Observations on the occurrence of the diseases (in farmer's fields and research farms)**	
Path.1(a)	Observations on the occurrence of various diseases (in farmer's fields and research farms)	All centers of the North, Central, and South zones
Path.1(b)	Disease progress in relation to weather factors	North (Faridkot, Sriganganagar, Hisar, Sirsa); Central (Nanded, Akola, Surat, Junagarh, Khandwa); South (Lam-Guntur, Dharwad, Coimbatore)
Path.1(c)	Studies on the variability in *Alternaria* causing leaf spots in cotton	All centers- Dharwad
Path.1(d)	Survey and epidemiology of TSV	All centers- Coimbatore, Guntur
Path.1(e)	Studies on the variability in *Corynespora* leaf spot in cotton	All centers- Sirsa, Junagarh, Lam-Guntur
Path. 2	**Screening of AICRP entries for disease reaction and confirmation**	
Path.2(a)	Screening of breeding lines for disease reaction	All centers
Path.2(b)	Confirmation and maintenance of disease-resistant lines	All centers
Path.2(c)	Monitoring of resistance against CLCuD in cotton	North (Sriganganagar, Hisar, Bathinda)
Path. 3	**Management of cotton diseases**	
Path.3(f)	Management of sooty mold (*Capnodium* spp.) in cotton	Faridkot, Hisar, Coimbatore
Path.3(h)	Evaluation of efficacy of bioagents against cotton diseases	Akola, Surat
Path.3(i)	Integrated management of CLCuD through its vector management	North (Bathinda, Faridkot, Sriganganagar, Hisar and CICR Sirsa)
Path.3(j)	Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations	North (Bathinda, Hisar); Central (Surat, Nagpur, Nanded); South (Coimbatore, Lam-Guntur, Dharwad)
Path.3(k)	Field evaluation (Rhizospheric fungi & chemicals etc.) for seed and soil-borne disease management	North (Bathinda, Sirsa, Hisar); Central (Nanded, Junagarh); South (Dharwad, Lam-Guntur, Coimbatore)

Path. 4	**Crop loss estimation and distribution pattern of cotton diseases**	
Path.4(e)	Exp. 1a. Crop loss estimation due to CLCuD	North (Hisar, Faridkot, Sriganganagar)
Path.4(e)	Exp. 1b. Study on the distribution pattern of cotton leaf curl virus disease on local popular Bt hybrid at farmer's fields	North Zone (Hisar, Faridkot, Sriganganagar)
Concluding Experiments-recommendations		
Path.3(f)	Management of sooty mold (*Capnodium* spp.) in cotton	Faridkot, Hisar, Coimbatore
Path.3(h)	Evaluation of efficacy of bioagents against cotton diseases	Akola, Surat
Path.3(i)	Integrated management of CLCuD through its vector management	North (Bathinda, Faridkot, Sriganganagar, Hisar and Sirsa)
Path.3(j)	Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations	North (Bathinda, Hisar); Central (Surat, Nagpur, Nanded); South (Lam-Guntur, Dharwad)
	Agronomy experiments-Organic cultivation practices and Crop geometry study	Junagarh, Surat

Research Findings:

Path.1 Observations on the occurrence of cotton diseases (in farmers' fields & research farms)

Path.1 (a): Observations on the occurrence of various diseases (in the farmer's field and research farms)

Farmer's field surveys to record the occurrence of various diseases in various cotton varieties/ hybrids were conducted by the respective Research Centers (about 10 locations in each village). The survey in the farmer's field was conducted thrice at regular intervals during the early/vegetative stage, mid/flowering, and late cropping /boll development stage in the defined cotton-growing farmer's fields. However, at on-station trials (research farm), the occurrence of various diseases in various cotton varieties/ hybrids was recorded five times during the season in all three cotton-growing zones.

NORTH ZONE

District Faridkot, Fazilka, Muktsar (Punjab)

Farmer's field survey was conducted by PAU Regional station **Faridkot** thrice at regular intervals, during the early, mid, and late cropping seasons in three cotton-growing districts of Punjab. The data from farmers' fields in the districts Faridkot, Fazilka, and Muktsar were recorded from cotton hybrids (RCH-773, RCH-776, RCH-926, Sim Sim, Balraj, RCH-653, ACH-177 and US-51) **(Table 1a).** During the early season (20-30 DAS) bacterial leaf blight (BLB), fungal foliar spots (FFLS) and CLCuD were not observed. During mid-season (60-80 DAS) the percent disease index (PDI) of MLS and CLCuD were observed to be in the range of 0.0-0.6% and 6.7-20.3% respectively. During the late season (120-150 DAS) the PDI of MLS and CLCuD were observed to be in the range of 2.5-8.8% and 13.8%-45.2%, respectively. The highest average CLCuD PDI 30.2% and MLS 5.6% were recorded during the late season. When comparing the disease incidence in the popular hybrids, the highest CLCuD and MLS were recorded in the hybrid RCH-773, and RCH-776 in the Muktsar and Fazilka districts. In district Fazilka, the average CLCuD PDI was observed to be 14.9 and 33.5% during mid and late-season, respectively. While in-district Muktsar, the average CLCuD PDI was observed to be

13.2% during the mid and 28.2% during the late season. Comparatively, the MLS and CLCuD were found to be higher in Fazilka. Overall, the PDI of Myrothecium leaf spot (MLS) and CLCuD were observed to be 5.6 and 30.2% during the late season in these districts, respectively. The PDI of CLCuD during the late season varied from 18.5 to 40.5, 20.7 to 45.2% and 13.8 to 42.9% in different villages of Faridkot, Fazilka and Muktsar districts, respectively. Bt hybrid RCH 773 BG II and RCH 776 BG II occupied the major area in the cotton-growing region in these districts. The average MLS and CLCuD in district Faridkot were observed to be 13.0% and 29.0% during the mid and late-season, respectively **(Table 1a).**

At Faridkot research farm, the disease incidence and severity were observed on the hybrid PAU Bt 1, PAU Bt 2, PAU Bt 3, F 1861, F 846, F 1378, F 2164, F 2383, F 505, F 1054, F 2381 F2228, RST 9, HS 6, RCH 773, RCH 776, ACH 177, US 51, NCS 9013. The severity of CLCuD was observed at 60 DAS (PDI 7.5%) and it reached its peak at 150 DAS (45.3%) **(Table 1b).**

Blocks: Bathinda, Maur, Talwandi Sabo and Sangat (Punjab)

The field survey was conducted to record the incidence and severity of the cotton diseases by PAU Regional station **Bathinda** thrice at regular intervals in farmer's fields in three cotton-growing districts of Punjab and five times at research farms. The data from farmers' fields in the district (Blocks: Bathinda, Maur, Talwandi Sabo and Sangat) were recorded from cotton hybrids (RCH773, RCH776, US-51, US-81, US-71, RCH-926, RCH-653, SP-7172, NCS-495 and undescriptive hybrids like Gujarati Bullet, Pink Rakshak (4G), Manak -2 Plus(4G). During the Kharif season of 2022, the severity of the CLCuD was found to be higher in the cotton fields of the Bathinda district of Punjab as compared to the *Kharif* 2021. An initial incidence of CLCuD was noticed in the farmer's field in the village Kotbhara (Maur Block) (Bathinda District) in RCH 773 BG II in the first week of June 2022. In an experimental research trial of cotton, CLCuD was noticed on June 01, 2022, at RRS Bathinda. The incidence and the severity of CLCuD were found to be comparatively higher in *Kharif* 2022 as compared to *Kharif* 2021. The highest average CLCuD incidence (93.7%) was recorded in the Sangat block. The average CLCuD incidence in district Faridkot was observed to be 31.5% and 84.4% during mid and late-season, respectively **(Table 1a).**

Root rot incidence was usually noticed in the scattered isolated spots in very few farmer's fields after the first irrigation. The incidence of the fungal foliar leaf spot caused by the fungi *viz. Myrothecium*/*Cercospora* spp. was noticed in the cotton crop both at the farmer's field and the experimental research trials after 100 DAS (Days after sowing). Although, the disease severity is comparatively low in *Kharif* 2022 as compared to *Kharif* 2021. Parawilt incidence was noticed in the few isolated plots in Block Talwandi Sabo, Maur and Sangat Block of the Bathinda district in the month of August-September. The internal boll rot was noticed in the cotton crop in July 2022 in the villages of Bhalaike, Jheryan wali, Raipur, Perron (Block-Jhunir) District Mansa and village Malkana (Block Talwandi Sabo) of District Bathinda. Later on, in September 2022, symptoms of external/internal boll rot were noticed in a scattered manner in the farmer's field. The incidence and severity of boll rot were comparatively low in 2022 as compared to the last year due to less rainfall **(Table 2a).**

At RRS research farm Bathinda, the disease incidence was recorded on the hybrid RCH-773, RCH776, US51, Ajeet 133. The CLCuD incidence (5.0, 1.7,3.3 and 1.7%) was observed on RCH-773, RCH-776, US-51 and Ajeet 133 during the first week of June and it reached its peak in Sept. (100.0, 96.7, 96.7 and 76.7%, respectively). Comparatively, the BLB (5.0-9.0%), and MLS (13.0-18.5%) were also observed on tested cultivars during September (**Table 2b**).

Sriganganagar and Hanumangarh (Rajasthan)

The farmer's field survey data on disease intensity of cotton leaf curl virus was recorded during *Kharif* 2022 by ARS Sriganganagar in the cotton-growing areas of Sriganganagar and adjoining areas of Hanumangarh districts of Rajasthan state. In the Sriganganagar district, PDI of leaf curl virus was found to be higher i. e. 34.5% in the village Madera, while the maximum disease incidence of

94% in the village Renuka, while in adjoining cotton areas of the Hanumangarh district, the highest intensity was 23.5% with a disease incidence of 81% in village Bolawali during the late season of the crop. In the Sriganganagar district, during the early season, the incidence and PDI of CLCuD were recorded to be in the range of 0.0-6.7%. During mid-season, the incidence and PDI of CLCuD were recorded to be in the range of 5.0-36.7% while, during late-season incidence and PDI were in the range of 11.7-46.7%. Whereas in the Hanumangarh district, the incidence and PDI of CLCuD were not recorded during the early season but during the mid-season, the incidence and PDI of CLCuD were in the range of 1.7-28.3 %. In the late season, the incidence and PDI of CLCuD were recorded to be in the range of 5.0-38.3%. The average CLCuD PDI in district Sriganganagar was observed at 1.6% during early, 18.1% during mid and late-season 27.2%. Whereas, in-district Hanumangarh, the average CLCuD PDI was observed at 0.0% during early, 15.1% during mid, and late-season 16.2%. Overall, in these districts, the average CLCuD incidence and PDI were recorded at 15.1% during the mid and 21.7% during the late season, respectively **(Table 3a).**

At the research farm of ARS SKRAU, Sriganganagar, the disease incidence, and PDI were recorded on all hybrids namely, RCH773, US 51, NCS9013, NSPL531, RS2013, RST-9, HS-6, F846, F2228, CSH 3075. The incidence and PDI of CLCuD were observed to be in the range of 45-99% and 10.8-48%, respectively from 60 DAS to 120 DAS. While the peak incidence and PDI of CLCuD were observed after 120 days after sowings and these were recorded as 100% and 38.4%, respectively (**Table 3b**).

Hisar, Fatehabad, Sirsa, Jind, Bhiwani and Palwal (Haryana)

The intensive field survey was conducted in major cotton-growing districts of Haryana (Hisar, Fatehabad, Sirsa, Jind, Bhiwani and Mahendergarh) for observation of different diseases in various cotton varieties/ hybrids. During the early season all diseases namely, CLCuD, sooty mold (SM), Myrothecium leaf spot (MLS), and root rot were not observed. During mid-season, the CLCuD, Myrothecium leaf spot (MLS) and root rot (RR) were observed to be in the range of 0.0-13.3%, 0.0-1.5% and 0.0-5%, respectively. During the late season, the CLCuD, SM, MLS and RR were observed to be in the range of 5-55.0%, 0.0-27.6%, 0.1-12.0% and 0.0-6.0%, respectively. The average PDI of CLCuD, SM, MLS and root rot in district Hisar during the mid-season was 5.6, 0.0%, 0.6%, and 1.4%, respectively. During the late season, the increased PDI of CLCuD, SM, MLS and RR was observed at 39.9, 12.0, 6.3 and 3.0%, respectively. In district Fatehabad, the average PDI of CLCuD, SM, MLS and root rot was observed during mid-season, 6.7%, 0.0%, 0.6% and 2.0%, while during late-season it was 39.9%, 10.4%, 4.6% and 3.3%, respectively. In district Sirsa, the average PDI of CLCuD, SM, MLS, and root rot during mid-season were observed 5.0%, 0.0%, 1.2% and 2.1%, while it was increased to 14.4%, 0.4%, 2.9% and 2.3% during the late season, respectively. In district Jind, the average PDI of CLCuD, SM, MLS and RR was observed 10.4%, 0.0%, 0.6% and 1.4% during mid-season and 41.9%, 9.8%, 4.3% and 3.2% during late-season, respectively. In district Bhiwani, the average PDI of CLCuD, SM, MLS and RR was observed to be 0%, 0%, 0.5% and 0.7% during mid-season and 5.2%, 0%, 0.4% and 1.1% during late-season, respectively. While in district Mahendergarh, the average PDI of CLCuD, SM, MLS and RR were recorded 0%, 0% 0.6% and 0.2% during mid-season and 24.2%, 5.4%, 3.1% and 2.1%, during late-season, respectively. Comparatively, the highest average CLCuD PDI (41.9%) was observed in Jind district followed by the Hisar district (39.9%) during the late season. Overall, in these districts, the highest CLCuD, SM, MLS and RR were recorded to be 24.2%, 5.4%, 3.1% and 2.1% during the late season**.** When comparing the disease incidence in the popular hybrids, the highest CLCuD, SM MLS and root rot were recorded in the hybrid RCH-776, US-51, RCH-602 and RCH-773 **(Table 4a)**.

At the research farm (HAU, Hisar) the disease incidence was recorded on the hybrid RCH-773, RCH-776, US51. The CLCuD, SM, MLS and root rot was observed in RCH-773, RCH-776 and US-51 with the PDI of 22.5, 0.0, 2.0 and 10.5%, respectively in July. While, its peak was observed in October and it was 65.3, 15.5, 18.5 and 6.5%, respectively **(Table 4b).**

CENTRAL ZONE

Path.1 (a): Observations on the occurrence of various diseases (in the farmer's field and research farms).

Nanded, Jalna, Parbhani and Aurangabad (Maharashtra).

Regular surveys were conducted by Cotton Research Station, VNMKV Nanded, in the farmers' fields in five cotton-growing districts of Maharashtra (Nanded, Jalna, Parbhani and Aurangabad, Hingoli). The data were recorded from cotton hybrids (Ajeet-328, Ajeet, 155, Rashi-659, Vitthal, Vitthal Magic, Supercot, Neo, Raja, Moksha, Jaadoo, Jai Ho, Supercot, Dhandev, Paras, Brahma and Mallika). In Nanded, during mid-season, *Alternaria* leaf spot (ALS) and bacterial leaf blight (BLB) were recorded in the range of 0.5-1.0% and 0-0.5%, respectively. During the late season, the grey mildew (GM) and Boll rot were recorded in the range of 35.5-40.5, and 0.5-10.3% in the Nanded district. When comparing the disease incidence in the popular hybrids, the highest grey mildew (40.5%) and Boll rot (10.3%) were recorded in the hybrid Moksha, Rashi in the Nanded district **(Table 5a).**

The ALB, BLB and GM were not observed during the early season in districts Parbhani and Aurangabad. However, the average incidence of BLB, GM and parawilt were recorded to be 0.5, 3.5 and 4.0, respectively in both districts. In Jalna, only Boll rot was observed during the late season (5.0%), respectively. Comparatively, the ALB, BLB, GM and Boll rot was found higher in the Aurangabad district during mid-season. Overall, in these districts, the highest PDI of ALS and BLB were recorded during the mid-season. The average PDI of GM was observed during the late season (39.6%) **(Table 5a).**

At the research farm (CRS Nanded), the disease incidence was recorded on the cotton BGII hybrids (RCH 659, RCH II, Jadoo BG II, NHH 44 BG II, NH 615, LRA 5166). The incidence of BLB was recorded during July and reached its maximum (5.8%) in September. However, the incidence of ALS was initiated in August and reached its maximum (4.8%) in October. The incidence of GM was observed in August but it reached its peak of 45.1% in December **(Table 5b).**

Akola and Buldhana district (Maharashtra)

The survey was conducted in the farmer's fields of Akola and Buldhana districts of Maharashtra and the data from farmers' fields were recorded from different cotton hybrids (First class BG II, Ajeet-155 Bt, Neo Bt BG II, Jadoo Bt, Bhakti). The three diseases namely BLB, GM and MLS were observed during the late season and their incidence was recorded in the range of 6.1-15.8%, 8.8-18.5% and 6.1-13.9%, respectively. The average PDI of BLB, GM and MLS in district Akola during the late season was 10.8, 12.8 and 9.3%, respectively. While, in district Buldhana, the average PDI of BLB, GM and MLS were observed 11.5, 12.6 and 11.6%, respectively. Overall, in these districts the average PDI of BLB, GM and MLS were 14.1, 12.5 and 12.9%, respectively. Comparatively, the BLB, GM and MLS were found higher in Buldhana. When comparing the disease incidence in the popular hybrids, the highest BLB (15.8%) in Bhakti and GM (14.6%) in Ajeet 155 were observed **(Table 6a).**

At research farm MPKV Akola, among eight cotton BGII hybrids, BLB was observed in five hybrids while GM was observed only in Ajeet 155 and Mallika Bt hybrids. The highest PDI of BLB (13.9%) in Mallika and GM in the hybrid Ajeet-5 was recorded during the boll-development stage. The average PDI of BLB and GM in all the cultivars was recorded to be 10.2 and 4.4%, respectively **(Table 6b).**

Surat, Bharuch and Narmada (Gujarat)

The survey was conducted on farmer's fields as well as in the Research farm at CRS Surat. In the case of farmer's fields, a roving survey was carried out on BG II hybrids. The Bacterial leaf blight (BLB) was observed as a major disease in the farmer's field. The data from farmers' fields were recorded from cotton hybrid (BG II) and Desi. Only BLB disease was observed during the flowering stage and the PDI of BLB was recorded in the range of 0.0-10%. During the boll developing stage, the

PDI of BLB was recorded in the range of 0.0-23%. Overall, in these districts, the average PDI of BLB ranged from 0.0 to 15.3 at the boll developing stage **(Table 7a).** At research farm CRS, Surat, the susceptible cultivars G Cot.18 showed the highest Bacterial leaf blight intensity to the tune of 0.0 to 50%. The average PDI of BLB ranged from 0.0-17% in all the cultivars **(Table 7b).**

Junagarh (Gujarat)

The survey conducted in major cotton-growing districts (Junagarh, Rajkot and Jamnagar) of Gujarat revealed that the disease Phoma was observed during the early season, while BLB, GM, *Corynespora* leaf spot (CoLS) during mid-season and CoLS, and ALB were observed during late-season in different cotton hybrids (G. Cot. Hy. -24 BG-II, ATM, Navab, Lado, RCH-Neo, Buyer 7576, RCH-659, Moneymaker, Modiji, Superb, Ajeet -5, Ajeet-155, Golgy-333, Varsha, Ankur-1155, Ankur jay). During the early season, the PDI of the Phoma leaf spot was observed to be in the range of 2.0-16.9%. In mid-season, the PDI of BLB and CoLS were observed in the range of 0.0-7.7 and 0.0-6.5%, respectively. Whereas, in the late season the *Corynespora* leaf spot (CoLS), GM and Alternaria leaf spot (ALS) were recorded in the range of 5.5-29.5%, 11.3-35.5% and 4.5-34.8% in Junagarh district, respectively. Compared to Junagarh and other districts, CoLS was higher in Rajkot. When comparing the PDI in the popular hybrids, the highest PDI of Phoma (6.5%) was recorded in Ajeet-5 during the early season and BLB (7.7%) in Golgy-333 during mid-season. During the late season, the highest PDI of ALS (34.8%) was observed in ATM, CoLS (29.5%) in Lado and GM (35.5%) in Lado. Phoma disease during the early season, BLB during mid-season and *Corynespora* during the late season were comparatively higher in Rajkot district. While grey mildew was observed towards the higher side in Junagarh district during the late season. The overall average PDI of Phoma during the early season was 7.7%. The PDI of BLB and CoLS in mid-season was 2.0%, 1.9%, and CoLS, GM and ALB during the late-season in all these districts were observed at 14.6%, 20.3% and 10.5%, respectively **(Table 8a).**

At the CRS JAU research farm, the observations were recorded on RCH-2, G Cot-18 and the incidence of BLB and Phoma were initiated during August, Boll rot, GM and CoLS during September. The highest incidence of boll rot (6.5%) was observed in the cultivars *viz*., G Cot-8 (BG-II) in October. However, the highest PDI of BLB (45%) in RCH-2 during September, the highest ALS (28.5%) in RCH-2 during November, CoLS (19.8%) in RCH-2 during October, the highest grey mildew (24.4) in G Cot-8 during November **(Table. 8b).**

Khandwa (Madhya Pradesh)

The survey conducted in major cotton-growing blocks of the district of Khandwa in Madhya Pradesh revealed that the bacterial leaf blight, Alternaria leaf spot and grey mildew were observed and were the problems in the region. The average PDI of bacterial leaf blight, Alternaria leaf spot and grey mildew were 2.1, 5.6 and 10.4%. BLB ranged from 0.0 to 8.5%, ALS from 0- 10% and grey mildew ranged from 0 to 22.5% during the late season. Grey mildew was severe as compared to the former disease **(Table 9a).**

At the research farm, the observations were recorded on different cultivars and the incidence of BLB and ALS was initiated during August, while the GM and wilt were initiated during September. The highest incidence of BLB was recorded during October while the ALB was recorded during November. The highest grey mildew was observed during November **(Table. 9b).**

SOUTH ZONE

Path.1 (a): Observations on the occurrence of various diseases (in the farmer's field and research farms)

Belagavi, Gadag, Haveri and Uttar Kannada (Dharwad, Karnataka)

Regular surveys were conducted by UAS, Dharwad in farmers' fields thrice at a regular interval in five cotton-growing districts of Karnataka (Belagavi, Dharwad, Gadag, Haveri and Uttar Kannada). The data were recorded from different popular cotton hybrids in these regions. During

the survey observations on several major diseases (ALS, BLB, GM, Boll rot and Rust) were recorded at different plant development stages. In mid-season, the PDI of ALS, BLB, GM and Boll rot were recorded. During the early season, these diseases were not observed. While, during mid-season PDI of ALS, BLB and GM were recorded in the range of 2.9-20.8%, 0.8-4.6% and 1.0-9.8%, respectively. The PDI of ALS, BLB, GM, Rust and Boll rot in the late season were recorded in the range of 11.8-32%, 1.0-7.5%, 5.0-15%, 2.8-22% and 6.6-18%, respectively. When compared to the PDI in the popular hybrids during the late season, the highest ALS was recorded in the hybrid MRC 7383 (30.1%) in Savanur of Haveri district. However, the highest GM (15%) was observed in Jaadu in Bvadagi in the Haveri district and the highest rust (22%) in the Dharwad district was observed in Ajeet 199 and Bhaskar cultivars (**Table 10a**).

In the Belagavi district, the highest average PDI of ALS, BLB, GM, Rust and Boll rot during the late-season recorded were 20.4, 3.4, 8.2, 9.2 and 16.4%, respectively followed by average PDI of ALS (9.4%), BLB (2.9%) and GM (2.9%) in mid-season. In the Dharwad district, the higher average PDI of ALS, BLB, GM, Rust and Boll rot recorded were 20.7, 6.5, 10.1, 19.3 and 14.58% in the late-season, respectively. The average PDI of ALS (11.7%), BLB (3.1%) and GM (4.4%) in mid-season was lower than the late season. In the Gadag district, the higher average PDI of ALS, BLB, GM, Rust and Boll rot were observed at 17.0, 2.0, 6.6, 7.9 and 9.5% in the late-season, respectively. This was followed by the average PDI of ALS (8.3%), and GM (4.5%) in mid-season. In the Haveri district, the average PDI of ALS, BLB, GM, Rust and Boll rot were recorded at 28.3, 3.6, 13.2, 15.2 and 11.3%, respectively in the late-season and it was followed by the average PDI of ALS (17.1%), and GM (7.2%) in mid-season. In Uttar Khannada district, the higher average PDI of ALS, BLB, GM, Rust and Boll rot were recorded 17.0, 4.9, 7.9, 5.3 and 11.4%, respectively in the late-season and this was followed by average PDI of ALS (6.1%), BLB (1.7%) and GM (3.6%) in mid-season. Comparatively, the higher PDI of ALS and GM were found in the Belagavi districts. Whereas the highest PDI of BLB, Rust and Boll rot was in Dharwad Dharwad district. Overall average PDI of ALS, BLB, GM, Rust and Boll rot in these districts was observed to be 20.7, 4.1, 9.2, 11.4 and 12.6%, respectively during the boll developing stage. **(Table 10a).**

At UAS Dharwad research farm, the incidence and PDI of root rot, boll rot, ALS, MLS, BLB GM and Rust were recorded on the hybrids (Neelam, Ajeet-199, Super cot, RCH-Magic, MRC-7351 Gold, MRC-7017, Moneymaker (KCH-100), RASI-659, Dr.Brent (MRC-7347), Jai Ankur, Jadoo, ATM(KCH311), MRC-7373(Dhandev), First class, DPC-7065(9135), Malini(NCS-9015), Jwala and Raja(NCS-954)). However, the incidence of wilt, Helminthosporium leaf spot (HLS), Cercospora leaf spot (CLS), anthracnose (ATN), CoLS, were not observed during the season at the Dharwad research farm. The incidences of root rot, ALS, BLB and GM were initiated in August, while boll rot incidence was observed in September. However, the highest PDI of ALS (18.8%) and BLB (17.5%) were recorded in Nov. while the GM (9.5%) was observed in October. However, the highest PDI of Rust (18.5%) was recorded in December month **(Table. 10b).**

Guntur, Krishna and Prakasam (Andhra Pradesh)

The survey was conducted in major cotton-growing districts (Guntur, Krishna and Karnool) of Andhra Pradesh for observation of different diseases and diseases namely Alternaria leaf spot (ALS), *Corynespora* leaf spot (CoLS), Cercospora leaf spot, Myrothecium leaf spot (MLS), bacterial blight (BB), root rot (RR), wilt, boll rot (BR), grey mildew (GM) and rust, wilt, Root rot, Rust and Boll rot in different cotton hybrids. Alternaria leaf spot (ALS), *Corynespora* leaf spot (CoLS), Cercospora leaf spot, Myrothecium leaf spot (MLS), bacterial blight (BB), root rot (RR), wilt, boll rot (BR), grey mildew (GM) and rust were recorded during the surveys (465983 ha) conducted from July to December 2022, in cotton growing mandals of Guntur(26554ha), Palnadu (109207ha), NTR (37499ha), Kurnool (262119ha) and Nandyal (30604ha) districts in Andhra Pradesh. The intensity of bacterial blight, Alternaria leaf spot, *Corynespora* leaf spot, bacterial blight, grey mildew and rust diseases in various hybrids and varieties of cotton trials conducted at RARS, Lam was also recorded. During the early stage of crop, BLB was not observed Traces of Alternaria and *Corynespora* leaf spots were observed

at Perecherla and Nandigama crossroads; less than 1% was noticed at Ganapavaram in Guntur /Palnadu district. Traces of Alternaria leaf spot was observed at Pamulapadu, Tatikonda, Nidumukkala, Jonnalagadda, Solasa, and Chirumamilla villages whereas 0.0 to 12.5 PDI was recorded for *Corynespora* leaf spot during mid-stage. Wilt incidence was recorded from 0.0 to 3.0%. Bacterial blight (0.0 to 12.9 PDI); ALS (0.0 to 2.5 PDI); CoLS (0.0 to 29.5 PDI); traces of root rot, boll rot (0.0 to 5.7%); GM (0.0 to 21.5 PDI and rust (0.0 to 41 PDI) were recorded during the late stage in Guntur/Palnadu district (**Table11a**).

Diseases were negligible during early and mid-stage in NTR / Krishna district. Alternaria leaf spot was from 0.0 to <1.0 PDI. The crop was free from diseases during the early stage in Kurnool/Nandyal district. *Corynespora* leaf spot was recorded from 0.0 to 25.0 PDI whereas grey mildew was between 0.0 to 2.5 PDI. Rust to the tune of 16.0 PDI was observed in Veepanagandla village and was nil in other villages surveyed. During the late stage, *Corynespora* leaf spot was recorded from 0.0 to 21.75 PDI; grey mildew was from 0.0 to 5.0 PDI; rust was from 0.0 to 2. 5 PDI and boll rot incidence was 0.0 to 3.0%. Traces of Cercospora leaf spot were observed in Tallacheruvu, Krosur, Bayyavaramand Velpur, Gogulapadu and Ambapuram villages and traces of anthracnose were observed at Bayyavaram village **(Table. 11a).**

The TSV incidence was nil to traces in Krishna, and Guntur from August to September, however, the incidence was recorded from 0 to upto 20% in Kurnool during September which decreased during October 0-10% and remained absent during December **(Table. 11b).**

Varieties and hybrids of cotton trials were free from diseases during August 2022; the low intensity of Alternaria leaf spot (3.75-5.25 PDI) and traces of *Corynespora* leaf spot was observed during September; ALS (0.0-4.2 PDI), *Corynespora* leaf spot (5.78 to 9.33 PDI), bacterial blight (0.0 to 8.25 PDI), grey mildew (0.0 to 10.5 PDI) and rust (0.0-3.5 PDI), boll rot (0-1.0%) were recorded during October; boll rot (1.0 to 2.0%), *Corynespora* leaf spot (9.7 to 10.25 PDI), bacterial blight (0.0 to 14.0 PDI), grey mildew (0.0 to 4.6 PDI) and rust (6.0 to 41.0 PDI) during November; traces of bacterial blight, boll rot (1.0-3.0%), *Corynespora* leaf spot (13.0-32.5 PDI), grey mildew (traces to 20.5 PDI) and rust (24.5-33.5 PDI) were observed during December 2022 at Regional Agricultural Research Station, Lam, Guntur. Bacterial blight including black arm and boll rot symptoms were observed in H x B interspecific hybrids only **(Table. 11c).**

Coimbatore, Dindigul, Virudhnagar, Tutukurin, Tirunelveli, Trichy, Salem, Perambalur (Tamil Nadu)

The roving survey was carried out in eight cotton growing districts of Tamil Nadu viz., Coimbatore, Dindugal, Virudhunager, Tutukurin, Tirunelveli, Tirupur, Salem and Perambulur to assess the incidence of major diseases of cotton during three crop growth periods viz., seedling stage (20-30 DAS), flowering stage (60-80 DAS) and boll development stage (120 - 150 DAS) (**Table 12a**). In the surveyed villages most of the farmers are growing hybrids. During the seedling stage, the incidence of collar rot was recorded in all the villages surveyed. The mean collar rot incidence was 4.7, 4.3, 4.9, 4.1, 5.0,4.3, 4.5 and 5.4% in Coimbatore, Dindugal, Virudhunager, Tutukurin, Tirunelveli, Tirupur, Salem and Perambulur, respectively. In cotton during the flowering period the diseases viz., ALB, BB, GM and RR were recorded in surveyed villages. The incidence of ALB was observed in all the villages surveyed. The highest average ALB PDI (13.2%) was recorded in the Salem district. The ALB PDI 6.6, 12.8, 7.1, 7.0, 8.3, 9.1 and 10.5% were found in the remaining seven districts viz., Coimbatore, Dindugal, Virudhunager, Tutukurin, Tirunelveli, Tirupur, and Perambulur, respectively. Among the eight districts surveyed, the bacterial blight incidence was not observed in districts viz., Virudhunagar, Tutukurin. BB incidence of Coimbatore, Dindigul, Tirunelveli Tirupur, Salem and Perambulur districts were 6.4, 5.0, 5.3, 3.9. 15.9 and 11.6%, respectively. The mean BB incidence was found to be high (15.9% PDI) in Salem district followed by Perambulur district which showed 11.6%. GM incidence of Coimbatore, Dindugal, Tirunelveli, Tirupur, Salem and Perambulur districts were 9.5, 8.8, 3.1, 4.2, 14.9 and 13.5%, respectively. The highest GM incidence of 14.9% was found

in Salem district and it was not recorded in the surveyed villages of Virudhunagar and Tirinelvli districts. The root rot incidence of surveyed districts ranged from 4.0 – 9.9%. The mean incidence of root rot was found to be 4.5, 7.3, 8.7, 4.0, 9.9, 4.9, 6.8 and 6.6% in Coimbatore, Dindugal, Virudhunager, Tutukurin, Tirunelveli, Tirupur, Salem and Perambulur, respectively. The highest average root rot incidence of 9.9 % was observed in Tirunelveli district.

All the diseases which infected during the flowering stage were also recorded during the boll development stage. The intensity/severity of the diseases showed similar trends in all the locations similar to that of the flowering stage, but the intensity of the diseases was slightly increased due to conducive microclimatic conditions for the pathogen development. During the later stage of the crop growth, average ALB incidence in Coimbatore, Dindugal, Virudhunager, Tutukurin, Tirunelveli, Tirupur, Salem and Perambulur were 7.0, 13.6, 7.9, 8.0, 9.0, 9.8,14.0 and 11.6%, respectively. BLB incidence was recorded as 6.9, 6.1, 10.0, 6.4, 5.9, 16.3 and 12.3% in Coimbatore, Dindugal, Tutukurin, Tirunelveli, Tirupur, Salem and Perambulur district, respectively during the boll development stage. During the later stage of the crop growth, the mean grey mildew incidence was 10.1, 9.4, 3.2, 4.3, 15.7 and 14.9% in the districts Coimbatore, Dindugal, Tutukurin, Tirupur, Salem and Perambulur, respectively. During the boll development stage, the average root rot incidence was observed to be 5.0, 8.0, 9.4, 4.4, 10.6, 7.4 and 7.0% in Coimbatore, Dindugal, Virudhunager, Tutukurin, Tirunelveli, Tirupur, Salem and Perambulur district, respectively. During this period boll rot disease was found in all the surveyed villages. The mean boll rot incidence of surveyed districts varied between 3.2 to 4.6% and the incidence of 4.4, 4.6, 4.3, 3.2, 3.9, 3.2 and 3.8% were found in Coimbatore, Dindugal, Virudhunager, Tutukurin, Tirunelveli, Tirupur, Salem and Perambulur, respectively (**Table 12a)**. Overall, the intensity of grey mildew was observed to be higher during this year.

At research farm TNAU, Coimbatore, the incidence of crown root, root rot, boll rot, ALS, CLS, MLS, BLB, GM and Rust were recorded on the hybrids (DCH32, RCHIIBGII, RCH 659 and varieties Co15 and Co17, MCU5, JaddooK12, K11). During the seedling stage, collar rot was observed in all the experimental fields. During August crown rot incidence of 3.3% incidence was recorded and the intensity of the disease increased and reached 6. 1% during October. The root incidence of 5.5% was observed during November and it increased to 15.0% during January. The incidence of ALS at the TNAU research farm initiated in September and ranged from 4.3- 20.5% and the highest incidence was recorded during November. Incidence of other leaf spot diseases viz., CLS and MLS ranged from 6.3- 8.3% and 4.0 – 8.3%, respectively. The initial incidence of 4.3% of bacterial blight was recorded during September and peak incidence reached up to 15.7% during the flowering to boll formation phase. The severity of grey mildew was high (25.7%) during December and January months at Coimbatore condition. The rust incidence was not found at the TNAU research farm during this year (**Table 12b**). Under a high-density planting system, the initial stage of establishment collar rot infection was observed. The diseases *viz.*, root rot, *Alternaria* leaf blight, grey mildew TSV were recorded in the crop grown under high-density planting. Compared to other diseases the incidence of Alternaria blight and TSV was found to be high in high-density planting. In hybrid cotton, the incidence of collar rot, *Alternaria* leaf blight, bacterial leaf blight, grey mildew and TSV were observed. The organically grown cotton crop was found to infect with the *Alternaria* leaf blight and *Cercospora* leaf spot bacterial blight diseases were observed. The severity of bacterial blight was found to be more in MCU 5.

Path.1 (b): Disease progress in relation to weather factors.

NORTH ZONE

The observations on the appearance and progress of Cotton leaf curl viral disease (CLCuD) were recorded at weekly intervals starting from 23th to 40th standard meteorological week (SMW) i.e., June to October at **Faridkot, Punjab**. CLCuD was first observed on all tested cultivars namely F846, HS6, RS921, RST9 in the 23thSMW (04-10 June) during this the whitefly population ranged from 0.4 to 0.6 per three leaves. It was found that CLCuD incidence increased up to 34th SMW and reached 100% in all the varieties. Max PDI was 63.5 followed by 63.2, 62.9, and 62.6% recorded in HS6, RST9,

F846 and RS921. The whitefly population remained above ETL during 27 to 30th SMW and near ETL level during 36-37 SMW **(Table-13a).** The range of the minimum and maximum temperature during the study period was 21.7 (40 SMW) to 29.1 °C (27 SMW) and 30.81 (39 SMW) to 44.0 °C (23 SMW). The mean minimum and maximum temperatures were 26.1 and 35.0 °C, respectively. Similarly, the average of the minimum and maximum relative humidity was ranging from 56 to 67 %. Total rainfall of 472.0 mm has been recorded from 20 rainy days. The mean sunshine duration was 6.0 hours whereas, the wind speed was 5.2 km/hour. Both the disease incidence and the PDI of CLCuD were negatively associated with the minimum, maximum and mean temperatures. The correlation of CLCuD DI and PDI with mean temperature was r=-0.564 and r=-0.587, respectively. The relative humidity was found to be highly favourable with the observed DI and PDI with a respective correlation coefficient of r=0.645 and r=0.691 (**Table 13b**).

The regression model (Y=199.507-6.266*X2120-3.335*X121+0.683*X133 +0.552*X140+ 0.409*X144 - 4.332*X153+ 0.431*X161+ 0.443*X162, R^2= 0.8230) developed by Monga et al. (2018) predicted has been validated with weather and disease data recorded at PAU Regional Research Station, Faridkot from 2014 to 2022. The predicted disease incidence was 76.5% against its observed value of 99.1% recorded during 33rd SMW in 2022 (**Fig.1**).

Susceptible variety RST-9 of cotton was sown on 19 May 2020 in a 545 square meter area at **ARS, Sriganganagar** following recommended package of practices and weekly progress of CLCuD was recorded. CLCuD first appeared in 23 Standard metrological weeks (4-10 June) after 35 days of sowing with an incidence of 1.9% during this the whitefly population was 7.6 per 3 leaves. However, in the subsequent period, the CLCuD incidence progressed faster reaching its maximum level of 100% during 29nd SMW (16th July). Data indicated that disease severity increased significantly from 1.0 % (23th SMW) to 49.4 (29th SMW). The whitefly population ranged from 7.6 to 172.4 per three leaves during the whole crop season and remained above ETL from 24th to 29th SMW. The overall relative humidity from June to July (vegetative phase) during this year was 58 to 73%. The average weekly temperature during this period of June to July remained at 35.8 to 44.8°C (Maximum), and 22.3 to 28.3°C (minimum) **(Table 14a).** The correlation analysis between weather factors and incidence and PDI showed a non-significant positive correlation with minimum temperature, and morning and evening RH. Whereas, maximum temperature and rainfall showed a significant negative correlation. Similarly, the whitefly population only positively correlated with morning RH and negative correlation with temperature **(Table. 14b).**

At **Hisar, Haryana,** CLCuD susceptible cultivar HS-6 was sown with a spacing of 67.5 x 30 cm. All the recommended agronomical practices were followed for raising the crop variety HS-6. The observations on disease progress were recorded at an interval of 7 days till the second week of October under field conditions. CLCuD appeared in the 22nd SMW (28- May -3 June) (4.3% incidence) during this the whitefly population was 3.3 per 3 leaves. The CLCuD incidence was observed during 22nd SMW (28 May to 3 June). The incidence increased from 4.3 to 86.4% on the 42nd SMW (15-21 October). The percent disease index increased from 3.3% to up to 66.6% on 42nd SMW, during this period the average whitefly population varied from 3.3 to 30 per three leaves. The whitefly population remained near or above ETL during 28-38 SMW **(Table 15a).** The correlation between weekly weather parameters with incidence and PDI showed the highest significant positive correlation with morning and evening relative humidity, and whitefly population. However, other weather factors such as maximum & minimum temperature, and sunshine hours showed a significant negative correlation with PDI. In the case of the whitefly population, rainfall relative humidity was significantly and positively correlated, while maximum temperature and sunshine hours were negatively correlated. Whitefly population was positively correlated with CLCuD disease incidence and PDI though it was non-significant (**Table. 15b**).

CLCuD susceptible cultivar HS-6 was sown on 01 May 2022 with a spacing of 67.5 x 30 cm at **ICAR-CICR RS Sirsa, Haryana**. All the recommended agronomical practices were followed for raising the crop variety HS-6. The leaf curl virus disease at ICAR-CICR Regional Station, **Sirsa, Haryana** was initiated in 21st SMW (21-27 May) on cultivar HS-6 (at 21 DAS) during this period the whitefly population was 1.5 per 3 leaves. The incidence reached its maximum i.e., 100% during 29th SMW (16-

22 July). A whitefly incidence ranged from 0.5 per 3 leaves up to 71.2 whiteflies per 3 leaves during the season. The whitefly population remained around and above ETL between 26 to 31st SMW. The CLCuD PDI reached 91 % in the 37th SMW (10-16 September). The maximum temperature ranged from 32.0 to 45.1^{0}C, whereas the minimum temperature was 24.5 to 28.4^{0}C. Relative humidity morning and evening ranged between 28.7 – 80.7 and 37.4-90.3%, respectively. The total rainfall received during this period was 401.7 mm in 18 days from 16 to 37 SMW (**Table 16a**).

The analysis of the correlation coefficient between weather data, whitefly population, and CLCuD (incidence & PDI) revealed that minimum and maximum RH and CLCuD incidence and PDI were significantly positively correlated (0.896, 0.789 and 0.887, 0.655). On the other hand, minimum, and maximum relative humidity and whitefly population showed a significant positive correlation with disease incidence. The maximum temperature showed a significant negative correlation with CLCuD and whitefly. Whereas maximum & minimum temperatures showed a significant negative correlation with CLCuD incidence and PDI as well as with the whitefly population. The correlation between whitefly adult (WFA) and CLCuD incidence showed a significant positive correlation (0.484), respectively **(Table 16b).**

CENTRAL ZONE

The first incidence of Bacterial blight in RCH BGII hybrid was noticed during 30th and 32nd SMW at **Nanded** (RCH 2, LRA-5166, respectively) and PDI was found in the range of 0.5 to 9.0%, while the incidence of *Alternaria* leaf spot (ALS) was observed during 33dr SMW and PDI was ranged from 0.5 to 9.0%. The grey mildew was observed during 35th SMW, and the PDI ranged from 0.5 to 65%. The highest PDI (9.0, 9.0 and 65.0%) of BLB, ALS and grey mildew (GM) were recorded during 41st, 43rd and 50th SMW in RCH 2 BG II cultivar, respectively **(Table 17a).**

The non-significant and positive correlation of BLB, ALS and GM were recorded with maximum and minimum temperatures in RCH 2 BG II cultivar. Whereas, a non-significant negative correlation between these diseases was found with rainfall, and relative humidity **(Table 17b).**

The study on disease progression about the weather factors was undertaken on cultivated susceptible *G. hirsutum* variety LRA-5166, hybrid Bhakti Bt at **PDKV, Akola**. The weekly observations on major foliar diseases viz. Bacterial leaf blight, *Myrothecium* leaf spot (MLS) and grey mildew were recorded on randomly selected 10 plants by using a 0-4 disease rating scale. Observations were recorded on the initiation of major diseases such as BLB (2.2%) MLS (1.7%) and GM (2.2%) in 38th, 40th and 41st SMW. The BLB incidence reached its maximum (18.9%) during 44th and 45th SMW and during that period the maximum and minimum temperature was 32.2°C along with maximum relative humidity ranging between the range of 72-74%. The MLS incidence reached its maximum (18.9%) on cultivar LRA 5166 during 45th and 46th SMW. However, Grey Mildew was recorded at maximum (15.6%) on cultivar Bhakti Bt during 47th and 48th SMW when the maximum temperature and relative humidity were around 30°C and 70%, respectively **(Table 18a).**

All the weather parameters like rainfall, temperature, and relative humidity were negative but had a significant correlation with bacterial leaf blight at 5% level of significance on LRA-5166 and Bhakti Bt cotton. The sunshine hours/BSH showed significant and positive correlations with BLB in both the cultivars LRA-5166 and Bhakti Bt. (**Table 18b**).

The bacterial blight disease progress during the season was recorded on G. Cot. Hy.12 Non-Bt at **MCRS-NAU Surat (Gujarat)**. The incidence of Bacterial leaf blight disease was noticed from 29th SMW (16-22 July), thereafter it continuously increased and reached its maximum (45.5%) during 42nd SMW (15-21 October). Thereafter, the BLB decreased up to 4.0% in 51st SMW **(Table 19a).** Incidence of Bacterial leaf blight had a positive correlation with the maximum temperature and sunshine hours while minimum temperature, morning humidity, rainfall and rainy days had a negative correlation with disease development **(Table 19b)**.

The incidence and disease progress of bacterial leaf blight disease (BLB), Alternaria leaf spot, *Corynespora* leaf spot and grey mildew were recorded at **CRS JAU, Junagarh.** BLB was first noticed

from the 29th SMW (16-22 July) and thereafter the incidence remains at up and down and its peak disease intensity was observed in the 46th SMW (37% PDI). *Alternaria* leaf spot disease incidence was observed in the 45th SMW with the maximum PDI in 50th SMW (27%). The *Corynespora* leaf spot was first noticed this year in the 34th SMW and reached its maximum PDI in the 38th SMW (22.5%). Subsequently, the incidence of ALS and CoLS was reduced gradually up to 52nd and 47th SMW. The grey mildew was first noticed in 43rd SMW and reached its maximum PDI in 44th SMW (45.5%) and thereafter it gradually decreased up to 1.0% in 52nd SMW (**Table 20a**).

Correlation coefficient studies for bacterial leaf blight disease incidence revealed a positive correlation with maximum temperature and sunshine hours however the BLB incidence was negatively correlated at 1% level of significance with relative humidity (morning and evening), and rainfall. The ALB incidence showed a significant negative correlation with minimum temperature, while ALB showed a positive correlation with relative humidity and sunshine hours. Grey mildew disease had a positive significant correlation with maximum temperature, while a non-significant positive correlation with minimum temperature and sunshine hours and rainfall had a negative correlation. The correlation between PDI of CoLS and maximum, minimum temperature, morning relative humidity and sunshine hours showed a positive correlation, whereas rainfall and evening RH showed a negative correlation **(Table 20b).**

The bacterial blight, Alternaria leaf blight and grey mildew disease progress during the season was recorded on JK-4 at **RARS-RVSKV Khandwa (Madhya Pradesh)**. The susceptible cultivar JK-4 was sown on 29 July 2022. Bacterial blight was first observed in traces during 32-33 SMW (06-19August), which gradually increased and reached up to 10.3% during 37th SMW (10-16 Sept). The Alternaria leaf blight disease was observed in the research farm during 35 SMW in traces and reached up to 35.2% percent during 47 SMW (19-25 Nov). Grey mildew was first noticed with 5.67% incidence in 42 SMW (15.-Oct. 2022) and the incidence of grey mildew increased up to 15.57% in 46 SMW (12-18 November) with a maximum grade 3.0%. **(Table 21a).** Myrothecium incidence was not noticed in the research farm during this year. The incidence of Bacterial leaf blight had a positive correlation with the morning relative humidity and rainfall and a negative correlation with temperature and evening humidity. Alternaria blight and grey mildew showed a positive but non-significant correlation with the all-weather parameters recorded during the season **(Table 21b)**.

SOUTH ZONE

At the research station **of UAS, Dharwad**, the observation of diseases namely *Alternaria* leaf blight, BLB, Grey mildew and rust diseases were recorded. ALB was observed during the 33rd and 34th SMW on the cultivars namely varieties Abhaditha, Jayadhar and hybrids Ajeet 155 Bt and First Class Bt and it reached on its peak during 42nd to 45th SMW. The incidence of Bacterial blight was observed in the cultivar Abadhitha in 41th and Ajeet 155 and First class Bt in 43rd SMW. The BLB reached to its highest 9.7, 7.8 and 9.8% in Abhaditha, and hybrids Ajeet 155 Bt and First Class Bt during 44th, 45th and 46th SMW, respectively. The incidence of grey mildew diseases appeared in 34th, 39th and 41th SMW on Jayadhar, hybrids Ajeet 155 Bt First class and Abhaditha, respectively. The highest grey mildew (26.8%) was recorded in variety Javadhar during 43rd SMW. The incidence of rust was also observed during 44th to 46th SMW on all cultivars. The maximum incidence for all diseases was noticed between the 42th to 46th SMW (from October to November) **(Table 22a)**. A significant positive correlation was observed between the maximum temperature and ALB, BLB, GM and rust disease incidence in all the genotypes. A significant negative correlation was observed between maximum temperature with all the diseases in all the genotypes like Abhadita, Jayadhar, Ajeeth Bt and First class Bt while other weather parameters showed a negative correlation **(Table 22b).**

At the research farm of **Lam, Guntur (Andhra Pradesh)** disease progress was observed on BG II cotton hybrids, Jaadoo and RCH 2, and cotton varieties L 1060 and NDLH 1938, which were sown on 19 July 2022 in an area of 500 sq. m. each. Weekly observations were recorded on the percent intensity of *Corynespora* leaf spot, grey mildew and rust diseases after the appearance of the disease (**Table 23 a & 23b**). *Corynespora* leaf spot was observed in 37th SMW during 2nd week of

September 2022 when the mean maximum temperature was 29.8°C; mean minimum temperature was 24.8°C; mean morning relative humidity of 99.1% (RH morning/I); mean evening relative humidity of 74.4% (RH Evening/II); rainfall was 44.0 mm in two rainy days; sunshine hours were 6.7; wind speed 10.47kmph and evaporation was 5.7mm. *Corynespora* leaf spot attained a maximum PDI of 39.0 on L 1030 during 47th SMW i.e., 3rd week of November 2022, during which the mean maximum temperature was 28.24°C; mean minimum temperature was 17.8°C; mean RH I of 100%; mean RH II of 74.4%; rainfall was 1.10; sunshine hours were 7.2; wind speed 4.8 km/hour and evaporation was 6.3 mm. Significant negative with minimum temperature, RH I, RH II, Rf, Rd and wind speed was recorded. NDLH 1938, RCH 2 BG II and Jaadoo BG II, recorded the highest PDI of 31.5, 30.0 and 31.5, respectively.

Grey mildew disease appeared in 43rd SMW during 4th week of September 2022 on Jaadoo BG II when the mean maximum temperature was 30.4°C; mean minimum temperature was 20.3°C; mean RH I was 98.1%; mean RH II was 65.3%, rainfall was 5.6 mm in one rainy day; sunshine hours were 9.2; wind speed was 4.60 km/hour and evaporation was 4.43mm. The disease progressed and reached PDI of 27.0 during 45th SMW i.e., 2nd week of November 2022 during which the mean maximum temperature was 30.2 ^{o}C; mean minimum temperature was 20.4°C; mean RH I was 95.0%; the mean RH II was 66.43%; rainfall was 1.1 mm, sunshine hours were 8.07, wind speed 3.28 km/hour and evaporation was 4.43mm (**Table 23 a & 23b**).

Rust disease appeared in 43rd SMW during 4th week of September 2022 on Jaadoo BG II when the mean maximum temperature was 30.4°C; mean minimum temperature was 20.3 °C; mean RH I was 98.14%; mean RH II was 65.29%, rainfall was 5.6mm in one rainy day; sunshine hours were 9.2; wind speed was 4.6 km/hour and evaporation was 4.4 mm. The disease progressed and reached PDI of 37.8, during 51st SMW i.e., 3rd week of December 2022 during which the mean maximum temperature was 28.0°C; mean minimum temperature was 16.9°C, mean RH I was 100% mean RH II of 76.9%, rainfall was nil, sunshine hours were 7.0, wind speed 2.7 km/hour and evaporation was 3.71 mm. NDLH 1938, d L 1060 and RCH 2 BG II recorded 33.8, 33.5 and 30.0 PDI, respectively (**Table 23 a & 23b**).

Multiple regression analysis revealed that maximum temperature, RH I and wind speed significantly influenced the progress of *Corynespora* leaf spot in both varieties and BG II hybrids whereas minimum temperatures also significantly influenced in L 1060 variety, during kharif 2022 (**Table 23c**).

Y=448.2022-9.04854 Max T-0.76081 Min T-1.27535 RH I-4.32181 W (L 1060; R2 = 0.875)

Y=437.441-9.484 Max T-1.18 RH I-5.54 W (NDLH 1938; R2 = 0.813)

Y=408.7615-9.21765 Max T-0.98325 RH I-5.22988 W (Jaadoo BG II, R2 = 0.749)

Y=398.136-8.5503 Max T-1.094 RH I-5.1323 W (RCH 2 BG II, R2 = 0.829)

RH II, rainfall, and no. of rainy days showed partial influence in L 1060 and Jaadoo BG II whereas minimum temperature expressed partial influence in NDLH 1938 variety and RCH 2 BG II.

A significant negative correlation between grey mildew incidence with RH I and a positive correlation with wind speed was observed in Jaadoo BG; a significant negative correlation with RH I and a positive correlation with evaporation was observed in L 1060 whereas a significant negative correlation with RH I, RH II and positive correlation with wind speed and evaporation was observed in NDLH 1938. Multiple regression analysis revealed that RH I, rainy days, wind speed and evaporation significantly influenced the progress of grey mildew during Kharif 2022in Jaadoo BG II; minimum temperature, RH I and Rf exhibited significant influence in both varieties whereas maximum temperature, SSH and evaporation also were significant in case of L 1060 variety. Evaporation showed partial influence in NDLH 1938 (**Table 23d**).

Y=136.707-1.6436 RH I-7.349 Rd +18.929 W-6.761 E (Jaadoo BG II, R2=0.991)

Y = 169.474-3.0369Max T + 0.542Min T-0.971RH I-0.212Rf-1.073 S+4.919 +0.792E (L 1060, R2=0.999)

Y=038.049+0.306 Min T -0.384 RH I-0.103 Rf (NDLH 1938, R2=0.804)

A significant negative correlation of rust incidence with maximum, minimum temperatures, Rf and Rd was recorded in hybrids whereas a significant negative correlation of PDI with maximum, minimum temperatures, RH II, Rf and Rd and a positive correlation with SSH was recorded in varieties. Multiple regression analysis revealed that maximum, and minimum temperatures significantly influenced the progress of rust in all the entries. Rf and Rd influenced partially in all the entries whereas SSH also expressed partial influence in the case of L 1060, NDLH 1938 and RCH 2 BG II (**Table 23e**).

Y= 548.733-15.246Max T-3.939Min T (Jaadoo BG II, R2 = 0.935)

Y= 404.602-10.2932Max T-4.201Min T (RCH 2 BG II, R2 = 0.916)

Y = 450.830 -12.122 Max T-3.707Min T (L 1060, R2 = 0.937)

Y = 481.744-13.2187Max T-3.65Min T (NDLH 1938, R2 = 0.941)

At the research station **TNAU, Coimbatore (Tamil Nadu),** the disease incidence and progress of disease development in relation to weather variables were studied in hybrids RCH 659 and the varieties CO17, K12 K11. Sowing of selected cultivars was taken with above hybrids/ varieties on 24 August 2022 and the progress of diseases viz. ALB, TSV, GM and crown and root rot (CR / RR) diseases were studied. Observations were recorded on the above diseases at weekly intervals and weekly weather data were also recorded. The disease incidence was correlated with weather parameters. ALB incidence was observed in all the varieties and the hybrids. In the variety CO17 ALB incidence started during 39th SMW at Coimbatore, it gradually increased and attained the peak of 20.5% (PDI) during 49th SMW. Later on, the severity of the disease showed a decreasing trend. In the hybrid RCH 659 during 49th SMW, ALB incidence of 14.5% PDI was recorded. During this period the maximum, and minimum temperatures of 29.1 ^{0}C and 21.1 ^{0}C and RH 85% were recorded. Alternaria leaf blight incidence was negatively correlated with maximum temperature and positively correlated with RH (morning) and sunshine hours. ALB incidence can be predicted by using the following equation. From the equation, it was inferred that the maximum temperature and RH have a major influence on ALB incidence. ALB incidence = 72.84 - 1.458 Max T - 0.983 Mini T + 0.118 Morn RH – 0.192 Eve RH + 1.859, R2 = 0.850 (**Table 24a, b**).

Tobacco Streak Virus disease was recorded in the hybrids RCH 659, Jadoo and the variety CO17. Both hybrids and the varieties' TSV incidence initiated during 39th SMW with the and reached the maximum during 49th SMW. Initially, TSV incidence of 1.0, 1.0 and 1. 5% was recorded in RCH 659, CO 17 and Jadoo during 39th SMW. 12.5, 10.0 and 15.0% TSV incidence was found in RCH 659, CO 17 and Jadoo during 49th SMW. TSV incidence was negatively correlated with the maximum temperature, wind speed, rainfall and sunshine hours and positively correlated with the RH (morning). TSV prediction equation is represented by the following equation and the equation depicted that the TSV incidence was influenced by maximum temperature and RH (morning).

TSV incidence = 100.479 – 2.300 Max T -1.371 Mini T + 0.219 Morn RH -0.232 Eve RH + 3.702; R2 = 0.599 (**Table 24a, b, c**).

The incidence of GM was recorded in all the hybrids and varieties. The disease infection started during 42nd SMW (1-21 October) and reached its peak of 17.3% PDI in RCH 659 during the 49th SMW (first week of December). GM incidence was negatively correlated with the maximum temperature, wind speed and rainfall and positively correlated with the RH (morning) and sunshine hours. GM incidence can be predicted through the following equation and from this it was inferred that GM incidence was influenced by maximum temperature and RH (morning). GM incidence = 10.953 – 0.232 Max T + 0.33 Mini T + 0.328 Morn RH - 0.221 Eve RH +2.538, R2 = 0.132 (**Table 24a, b, c**).

The incidence of collar rot was observed in all the varieties and hybrids. The disease was found to infect the crop from the seedling stage up to 40 - 50 DAS. In highest collar rot incidence of 6. 5 and 7.0% in CO17 and Jadoo was observed during 40th SMW. Root rot also infected all the varieties/hybrid during the flowering to boll maturity stage and its intensity ranged from 3.0 to 12. 5 percent in Jadoo and 2.7- 6.0 percent in CO17. Collar/root rot incidence was negatively correlated with the maximum temperature, sunshine hours and rainfall positively correlated with the RH (morning) (**Table 24a, b, c**). The correlation analysis between environmental variables (maximum &

minimum temperature, morning and evening RH, wind speed and rainfall) and PDI of all diseases showed a negative correlation whereas only sunshine hours were positively correlated with all PDI of all tested diseases.

Path.1 (c) Studies on the variability in *Alternaria* causing leaf spot in cotton.

During the survey for cotton diseases, *Alternaria* leaf spot samples were collected from farmers' fields and experimental plots **at UAS, Dharwad** and observed for the presence of *Alternaria*. Based on the spore structure the species was identified as *Alternaria macrospora*. Morphological studies for the cultures of *Alternaria* collected from the Coimbatore region revealed that the colony was characterized by black mycelial growth, with concentric rings on the dorsal side of the plate. The *Alternaria* cultures were differentiated and characterized based on colony colour, growth, sporulation and virulence (T**able 25)**

Path 1 (d): Survey and Epidemiology of TSV

During the surveys conducted in Cotton growing districts viz., Guntur, Krishna and Kurnool and Tobacco Streak Virus disease was recorded from July to December. The incidence in different hybrids varied from 0% to 30.0% at farmer fields (**Table 11b, c**). The progress of TSV at the research farm on RCH2, Jaadoo BT hybrids and L100 and NDLH 1938 was observed from 33rd to 2nd SMW and it ranged from 0.5 to 12.6% (**Table 26**).

The study on TSV progress at Coimbatore inferred that the TSV incidence could be rated as 'Medium or Moderate' as the percentage incidence. The progress of TSV incidence was recorded in every five villages of Coimbatore and Dindugal district and TNAU farm from October 2022 – January 2023. In the farmer's field of Coimbatore district, TSV incidence of 2.0 percent was observed during October 2022 and increased to 7.5 percent during December 2023. In the Dindugal district, TSV incidence of 7.0% was recorded in October 2022 and the maximum incidence of 18. 7% was noticed during December 2022. In TNAU research farm TSV incidence of 5.3 - 15.5% was recorded. The TSV incidence showed a decreasing trend during January 2023 in all the locations (**Table 27**).

Path 1 (e) Studies on variability of *Corynespora l*eaf spot

Infected leaf samples of cotton were collected from cotton fields in Rajasthan, Haryana, Punjab, and Gujarat in 2021 by Principal Investigator-AICRP on cotton (Plant Pathology), ICAR-CICR Regional Station, Sirsa. Diseased leaf tissue was cut into 5 mm bits taking portions of both healthy and diseased tissues. The bits were then surface sterilized with 0.1 percent Sodium Hypochlorite (NaOCl) and these bits were then placed on a Petri dish containing potato dextrose agar (PDA) medium and incubated at 28 ± 2°C for 2 to 3 days. Fine radiating mycelial growth was observed from the edge of the infected bits after incubation. The culture was further purified using a single spore isolation technique. The morphological variables of 14 purified cultures were evaluated such as color and pigmentation (invert side), and the growth rate of mycelia. The length, width of conidia, and number of septa per conidium were also done under a compound microscope (**Table 28**). All fungal cultures were identified as *Corynespora* spp. which showed variability in the growth and the conidial characteristic.

Similarly, four isolates of *Corynespora* spp. were characterized at CRS-Junagarh based on morphological, growth, sporulation and virulence characters (**Table 29**). Also, during the survey for cotton diseases, *Corynespora* leaf spot samples were collected from farmers' fields and experimental plots at RARS, Lam and observed for the presence of *Corynespora* (**Table-30**). Based on the spore structure the species was identified as *Corynespora cassiicola*. The fungus was cultured and maintained for molecular analysis.

Path. 2: Screening of AICRP entries for disease reaction

Path.2(a). Screening of AICCIP breeding lines for disease reaction

The breeding lines in various national and zonal trials were screened against important diseases in the area. In each screening trial, susceptible checks for the diseases were maintained and their reaction is presented at the end of each table where data from different locations of a trial is pooled. The reaction of a particular entry is considered valid provided there is either a susceptible or moderately susceptible reaction in the susceptible check.

The results of the National trials are given in Tables 31 to 34.

The results of Zonal trials (North Zone) are given in Tables - 35 to 37.

The results of Zonal trials (Central Zone) are given in Tables - 38 to 40

The results of Zonal trials (South Zone) are given in Tables - 41 to 44

Path.2 (b): Confirmation and maintenance of disease-resistant lines.

NORTH ZONE

ARS PAU, Faridkot: Six entries were evaluated under field conditions from 2020 to 2022 with CLCuD susceptible checks. The three entries RS 2909, F 2687, RAH 1076 showed a highly resistant (HR) to resistant reaction (R) against CLCuD compared to the checks (susceptible checks- F 2228, F 846 and RST 9 (S) **(Table 45).** These entries can further be evaluated for confirmation under artificial inoculation/disease-screening nursery conditions.

CENTRAL ZONE

CRS JAU, Junagarh & CRS NAU, Surat: Entries were evaluated for confirmation of resistance against Bacterial Leaf Blight (BLB) and Alternaria leaf blight (ALB) under field conditions at CRS JAU, Junagarh for the last four and three years. These entries were also evaluated at CRS NAU, Surat and UAS Dharwad for further confirmation & under artificial screening conditions. The entries namely GJHV 557, GISV 323 continuously showed resistant reactions against BLB and ALS since 2019 both under field and artificial epiphytotic conditions at Junagarh and Surat. Whereas RAH 1409, BGDS 1047 showed resistance reaction ALS at CRS-JAU, Junagarh (**Table 46a to 46b**).

Similarly, seven entries evaluated against *Corynespora* leaf spot at CRS Junagarh, from 2021 to 2022 under field conditions and at **CRS NAU, Surat** under field and artificial epiphytotic conditions showed inconsistent resistance. Seven entries were evaluated against grey mildew at CRS Junagarh (**Table 46c, d**).

Seven entries including the susceptible checks were evaluated against **BLB and ALS at Junagarh** under field conditions and GJHV 548, RB 602, TSH 354, CPD 2003, GISV 328 and RAH 1081 showed resistant reactions during all four years **(Table 47a).** Similarly, entries were screened against *Corynespora* leaf spot and grey mildew diseases under field conditions but due to lower disease pressure the conclusion could not be drawn (**Table 47b**). Screening of other new entries against BLB, ALS and grey mildew is in the pipeline (**Table 48, 49**). These entries need to be confirmed under artificial epiphytotic conditions for final confirmation.

Among the ten entries including susceptible checks were screened **at MCRS Surat** against BLB and *Corynespora* leaf spot, and GSHH 15032 and GSHH 15035 showed resistant reaction against BLB during 2019-2022 both under field and artificial epiphytotic conditions (**Table 50a, b**). Screening of other new entries against BLB, ALS, and grey mildew are in pipeline (**Table 51**).

SOUTH ZONE

UAS Dharwad (Karnataka): Different breeding lines were evaluated against grey mildew and *Alternaria* leaf spot diseases under field and artificial inoculation conditions during the last years. The three genotypes of *G. barbadense* i.e., DB 40 and SCS-1206 exhibited a high degree of resistance to grey mildew both under field and artificial inoculation conditions. Similarly, one entry each of *G. arboretum* (SAV 1118), *G. barbadense* (DB 14) *G. hirsutum* (SCS 1206) showed multiple resistance reactions against GM & ALS disease (**Table 52a and 52b**).

At Lam farm Guntur, the 18 *G. hirsutum* entries are being evaluated against rust and *Corynespora* diseases under field and artificial epiphytotic conditions. CNH20-31, DHCC 1801 and DHCC-1902 showed resistant reactions against the *Corynespora* leaf spot highest PDI 39% and 48.8% in susceptible check under field and artificial epiphytotic conditions. While entries RAH 1083, CNH 19480, CNH 20-31 and Suraj showed continuous resistant reaction against rust compared to the susceptible check which showed a maximum of 49.5% PDI under artificial and 42.0% PDI under field conditions (**Table 53c**). Screening of other new entries against CoLS and grey mildew are in pipeline (**Table 53 b, c**).

Different entries of *G. hirsutum* and *G. barbadense* were evaluated against ALS at TNAU, Coimbatore under field conditions. Against Alternaria leaf spot, *G. hirsutum* entries GTHV18/17, CCH 15-1, GJHV 584, RAHC 1902 and TCH1875 and *G. barbadense* entry CCB 29 showed resistant reaction compared to the susceptible check (12.1 to 47.3% PDI) (**Table 55, 56**).

Overall, 19 entries were found to be resistant against regionally important diseases including four entries with multiple disease resistance. A summary of the resistant and multiple resistant entries is mentioned below in table 1.

Table 1. Resistant and multiple resistant entries of *Gossypium* species

Disease (No of entry.)	Entry Name	Species	Location
CLCuD (3)	RS 2909, F 2687, RAH 1076	*G. hirsutum*	ARS PAU, Faridkot
BLB & ALB (2)	GJHV 557, GISV 323	*G. hirsutum*	CRS-JAU, Junagarh & Surat & Dharwad
BLB (2)	GSHH 15032, GSHH 15035	*G. hirsutum*	CRS-NAU, Surat
GM (2)	SCS 1206	*G. hirsutum*	USA, Dharwad
	DB 40	*G. barbadense*	USA, Dharwad
GM & ALB (2)	SVA-1118	*G. arboreum*	USA, Dharwad
	DB 14	*G. barbadense*	USA, Dharwad
CoLS (2)	DHCC 1801, DHCC-1902	*G. hirsutum*	Lam, Guntur
Rust (3)	RAH 1083, CNH 19480, Suraj		Lam, Guntur
Rust & CoLS (1)	CNH 20-31	*G. hirsutum*	Lam, Guntur
ALS (2)	GJHV 584	*G. hirsutum*	TNAU, Coimbatore
	CCB 29	*G. barbadense*	TNAU, Coimbatore

Path.2 (c) Monitoring of resistance against CLCuD in cotton.

In this experiment, three tolerant and susceptible varieties against CLCuD and one each of tolerant and susceptible BGII Bt cotton hybrid were selected and sown at three locations to see how they react against CLCuD changes over the years. The PDI in the case of tolerant varieties/hybrids was much less compared to susceptible varieties/hybrids at Sriganganagar whereas it was Higher at Bhatinda and Hisar. The cumulative reaction results revealed that all the susceptible verities showed MS to HS reaction whereas the tolerant varieties showed S to HS reaction. The susceptible and tolerant

Bt hybrid showed susceptible and highly susceptible reactions except at HAU Hisar where both cultivars showed susceptible reactions (**Table 57**).

Path.3: Management of Diseases of cotton

Path. 3 (f): Management of sooty mold (Capnodium spp.) in cotton

For the management of sooty mold, field experiments were conducted at Faridkot, Hisar, and TNAU Coimbatore. Prophylactic spray treatments were applied when the whitefly/aphid crossed ETL under field conditions. The details of the treatment with doses are mentioned in **Table 58**.

The field trial conducted **at RRS PAU Faridkot** revealed that the incidence of sooty mold due to whitefly incidence ranged from 21.67 to 41.67%. The treatments results revealed that the maximum reduction was observed with Flonicamid spray followed by Propiconazole 25 EC @ 1 ml/Liter of water and Neem oil 1500 ppm@ 5 ml/Liter of water showed a maximum reduction of the sooty mold 15 days after 3rd spray **(Table 59).** Whereas, at **HAU Hisar,** the highest reduction in the sooty mold 15 days after 3rd spray was recorded with the spray treatment of Propiconazole 25 EC @ 1 ml/Liter of water followed by Flonicamid and Copper oxychloride (COC) 50 WP @ 2.5 g/Litre of water **(Table 60).**

At TNAU Coimbatore, a total of three sprays were given at fortnightly intervals and the observations were recorded on sooty mold incidence after each spray, and seed cotton yield was also recorded in the experimental. The sooty mold incidence ranged from 2.7 to 9.7% in the control plot 15 days after the third spray. The experimental results revealed that spraying of copper oxychloride (COC) 50 WP @ 2.25 g/Litre of water thrice at 15 days intervals reduced the sooty mold incidence by 72.2%. Propiconazole 25EC @ 1ml/Liter of water spray ranked second in reducing the sooty mold incidence (62.8%). Foliar spraying of liter Copper oxychloride (COC) 50 WP @ 2.25 g/Litre of water also recorded the highest seed cotton yield of 17.7 Q/ ha as against 12.3 Q/ ha in the control **(Table 61).**

Path. 3 (h): Evaluation of efficacy of bioagents against cotton diseases

The different bioagent treatments and their combinations (seed treatment, soil application and foliar spray) were evaluated against root rot, wilt, and bacterial fungal foliar spot disease at Akola and Surat **(Table 62).**

Among all treatments, the lowest PDI of *Alternaria* leaf blight **at Akola** was recorded in treatment T7 (Pyraclostrobin @ 0.1%), followed by T-6 (ST (carboxin + thiram @ 0.2%); 2 gm/kg seed) and T-3 (T1+ T2: ST+ SA of *Bacillus aryabhattai* ST: 10^8cfu/g @10g per kg of seed at the time of sowing + soil application @ 2.5 kg/ha (30 & 60 DAS). The lowest BLB incidence at Surat was recorded with T-5 (ST+ SA of *Pf* CICR; SA: 10^8cfu/g @10g per kg of seed at the time of sowing plus soil application @ 2.5 kg/ha (30 & 60 DAS) with FYM/compost) followed by T-3 and T2 whereas, at Akola the lowest BLB and grey mildew were recorded with T-7 followed by T-6 and T-5 (**Table 63**). The highest yield at Akola was recorded with treatments T-3, T-6 and T-7 whereas the highest SCY at Surat was achieved with the treatments T-5, T-7 and T-3 (**Table 63**).

Path.3(i). Integrated Management of CLCuD through its vector management

In this experiment, eight different IPM- and bio-modules were evaluated under field conditions for the management of CLCuD through its vector whitefly management. The treatment details for IPM modules and biomodules along with two controls (existing IPM module and biomodules using commercial bioinsecticide of *Lecanicillium lecanii*) are given in **Table 64.** In IPM and biomodules, the first two sprays of neem300 ppm @ 2.5 L/ha were applied at all the locations. The flonicamid 50WG @120g/ha was applied as the third chemical spray treatment in the existing IPM module and new IPM modules at Sirsa, Sriganganagar, and Hisar, however at Bathinda and

Faridkot diafenthiuron 50% WP @ 150 g/ha was applied. The fourth spray of spiromesifen 22.9 SC @ 500 g/ml was applied in existing IPM modules while the respective EPF formulation was applied in IPM and biomodules.

At **CICR RS Sirsa,** overall, the highest reduction in the nymphal population after the third spray of flonicamid in IPM and respective EPFs spray treatments in Biomodules was recorded in the existing IPM module followed by Biomodule 1, IPM module 1 and Biomodule 2 **(Table 65a).** At Sirsa, the highest reduction in the whitefly population (adults/3 leaves) was recorded in IPM module 3, followed by IPM module 1, however, IPM and biomodules were at par with each other. Additionally, the highest reduction in the thrips population after the third spray treatment was recorded with the existing IPM module followed by IPM modules 1 (44.9%) and 3 (41.1%) (**Table 65b**). The highest reduction in CLCuD PDI at 120 DAS was observed in the existing module followed by IPM module 2 and IPM module 3. The reduction in CLCuD in IPM and Biomodules was ranged from 32.6 to 41.1% **(Table 65d).** The effect of IPM and biomodules on the natural enemy population indicated that the population of natural enemies was highest in biomodules compared to IPM modules.

At HAU Hisar, overall, the highest reduction in the whitefly adult population after 5th spray treatment was recorded in the existing IPM module, followed by Biomodule 1 and IPM module 3. The highest reduction in the whitefly nymphal population was recorded in Biomodule 1 followed by the existing IPM module and Biomodule 2 **(Table 66a-d).** The lowest CLCuD PDI was recorded with IPM modules 3, 2, and IPM module 1. However, there was not much difference between IPM and biomodules in terms of CLCuD PDI and the reduction in CLCuD PDI ranged from 2.4 to 8% **(Table 66e).**

At ARS Sriganganagar, the highest reduction in the nymphal population at 5 days after the fourth spray was recorded in IPM module -2 followed by the existing IPM module and Biomodule 3 (**Table 67a, b**). The highest reduction in whitefly (per 3 leaves) 5 days after the 5th spray of **spiromesifen** in exiting IPM and respective EPFs in biomodules was observed in the in IPM module -2 followed by the existing IPM module and Biomodule 1 **(Table 67c, d).** Whereas, the lowest CLCuD PDI at 115 DAS was observed in Biomodule 1 followed by the existing IPM module, IPM module 1. The reduction in CLCuD PDI ranged from 0.2 to 6.4%. The highest seed cotton yields were recorded in Biomodule 1, followed by the existing IPM module and IPM module 3. However, the seed cotton yield and CLCuD PDI were at par with IPM and biomodules **(Table 67e).**

At ARS Bathinda, the highest reduction in whitefly (per 3 leaves) 7 days after the third spray (**Diafenthiuron** in IPM modules and respective EPFs in biomodules) was observed in the Biomodule 3, 4 followed by IPM module-2, IPM module 3 Biomodule 3 and Biomodule-4 **(Table 68a, b).** However, the highest reduction in the nymphal population was recorded in Biomodule 3 followed by the existing IPM module, IPM module 3, and IPM module 2 at 7 days after the fourth spray of spiromesifen in exiting IPM and respective EPFs in new IPM and biomodules (**Table 68c, d**). The lowest CLCuD PDI at 115 DAS was observed in the existing IPM module and Biomodule 1 followed by IPM modules 1, and Biomodule-1 **(Table 68e).**

At ARS Faridkot, the highest reduction in whitefly adults (per 3 leaves) at 7 days after the fourth spray in the existing IPM module (spiromesifen) followed by Biomodule 3, Biomodule 2 and Biomodule 1 **(Table 69a, b).** Whereas, the highest reduction in the nymphal population treatment was recorded in the existing IPM module followed by IPM module 3, Biomodule 3 at 7 days after the fourth spray (**Table 69b, c**). The CLCuD PDI at 115 DAS was observed lowest in the existing IPM module followed by new IPM modules 2, and Biomodule-4, without much difference between IPM and Biomodules **(Table 69e).**

Overall, the highest average reduction of whitefly adults (per 3 leaves) over control at 7 days after the last spray was observed in Biomodule 3, followed by IPM module 3 and Biomodule-4 (**Table 70a**). Similarly, the highest average reduction in nymphal population was recorded highest in the existing IPM module followed by Biomodule-3, IPM module-3, and. Biomodule -1. The reduction in nymphal population in IPM and biomodules were at par with other modules except Biomodule 4

(**Table 70b**). The average of CLCuD PDI at 115 DAS of all centers revealed that the lowest CLCuD was recorded in the IPM module 1 followed by new IPM modules 2, and the existing IPM module. The average CLCuD PDI at 115 DAS ranged from 45.5 to 49.1% compared to the control (56.0%) **(Table 70c**). There was an increase of 12.4 to 24% increase in seed cotton yield in IPM and Biomodules. The highest average seed cotton yield was recorded in the existing IPM module followed by IPM module-1, IPM module-2, IPM module-3 and Biomodule-1 (**Table 70d**).

Path 3(j): Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations

For the management of boll rot and foliar diseases caused location specific pathogens, 12 chemical treatments including fungicides, insecticides and control were evaluated under open field conditions (**Table 71**). Two to three prophylactic sprays were applied at the time of insect-pest infestation and the percent sooty mold was recorded in the treatments.

North Zone: At all the trials chemical sprays were applied at disease initiation and subsequently 1-2 sprays based on the need. The experiment was conducted at three locations including ARS PAU Bathinda and HAU, Hisar. **At Bathinda,** during the season the boll rot was observed only in treatments 10, 11 and 12 (1.7-8.3%) and the rest of the treatments were found effective in controlling boll rot. At Bathinda, the highest reduction in fungal foliar spot disease was recorded with T-1 (Kresoxim methyl 44.3% SC @ 1 ml/Litre of water) followed by 6 (Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1 ml/ litre of water) and T-8 (Captan 70 % + Hexaconazole 5 % WP @ 1.5 g/ litre of water) (**Table 72a). At HAU Hisar** the boll rot was recorded to be in the range of 3.4 to 8.5%. The highest reduction in the boll rot was recorded with T-4 (Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/Litre of water) followed by T-5 (Metiram 55% + Pyraclostrobin 5% WG @ 2 g/Litre of water) and T-6 (Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1 ml/ litre of water) (**Table 72b).**

Central Zone: A total of twelve treatments including control were evaluated in the field trial **at NAU Surat**. Among all the treatments, the highest reduction in the BLB and the boll rot was recorded with T-9 (Copper oxychloride 50 % WP @ 2.5 g) followed by 4 (Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/Litre of water) followed by T-5 (Metiram 55% + Pyraclostrobin 5% WG @ 2 g/Litre of water) in RCH 2 BG II hybrid. The highest seed cotton yield was recorded in the treatment T-9 (copper oxychloride 50%WP @2.5) followed by 4 (Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/Litre of water) followed by T-5 (Metiram 55% + Pyraclostrobin 5% WG @ 2 g/Litre of water) (**Table 73**).

At Nanded, the lowest Alternaria leaf blight was observed in the treatment-4 (Fluxapyroxad 167 g/L + Pyraclostrobin 333g/L SC) followed by T-5 (Metiram 55% + Pyraclostrobin 5%) and T-6 (Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC). The highest reduction in grey mildew was observed with the treatment by T-4 (Fluxapyroxad 167 g/L + Pyraclostrobin 333g/L SC) followed by T-5 (Metiram 55% + Pyraclostrobin 5% WG @ 2 g/Litre of water) and T-3 (Propineb 70% WP @ 2.5 g/Litre of water) and T-6 (Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC). The highest seed cotton yield was recorded in T4, T-1 and T3 (**Table 74**).

At CICR Nagpur, the lowest boll rot after the second spray was observed in the treatment T-3 (Propineb 70% WP @ 2.5 g/Litre of water), T4 (Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/Litre of water) and T-7 (copper sulphate 47.15% + Mancozeb 30% WDG (13.3%). The lowest *Corynespora* leaf spot was recorded with T-4 (Fluxapyroxad 167 g/L + Pyraclostrobin 333g/L SC (20.0%) followed by T-6 (Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1 ml/ litre of water) and T-2 (Propiconazole 25% EC (20.0%). The lowest grey mildew disease PDI was recorded in the treatment of T-4 (Fluxapyroxad 167 g/L + Pyraclostrobin 333g/L SC (13.0%) and T-1 (Kresoxim methyl 44.3% SC @ 1 ml/Litre of water) followed by T-2 (Propiconazole 25% EC @ 1 ml/Litre of water). The highest seed cotton yield was recorded in T-3 (Propineb 70% WP @ 2.5 g/Litre of water),

T-1 (Kresoxim methyl 44.3% SC @ 1 ml/Litre of water) and T-9 (Copper oxychloride 50 % WP @ 2.5 g) (**Table 75**).

South Zone: At Lam, Guntur: A Cotton hybrid, Jaadoo BG II was sown on 19.07.2022 with twelve treatments adopting randomized block design and replicated thrice. Uniform insecticidal sprays were given to control sucking pests and bollworms. In each plot 10 plants, at random, were tagged for recording disease data. Treatments were imposed after the disease initiation and subsequent spray was given when (PDI) crossed more than 10% PDI. *Corynespora* leaf spot PDI was non-significant in all the plots before spray. All the fungicide treatments significantly reduced *Corynespora* leaf spot (7.5 to 8.58 PDI) as against untreated control (25.17 PDI) after 2nd spray. Lowest PDI of 7.5 was recorded in Kresoxim-methyl 44.3% SC @1 ml/Litre of water (T1) followed by T3-Propineb70%WP @ 2.5 g/ L (7.92 PDI), T6-Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @1 ml/ L (8.25 PDI), T2-Propiconazole 25% EC @1 ml/L (8.33 PDI), T5-Metiram 55% + Pyraclostrobin 5% WG @2g/L (8.33 PDI), T8-Captan 70%+Hexaconazole 5% WP @1.5g/L (8.42 PDI), T9-Copper oxychloride 50 %WP @2.5g + Salicylic acid 200 ppm (8.42 PDI), T4-Fluxapyroxad 167 g/L + Pyraclostrobin 333 g/L SC @ 0.6ml/L (8.5 PDI) and T7-Copper sulphate 47.15%+Mancozeb 30% WDG) @ 5 g/ litre of water (7.58 PDI) which were statistically on par after 2nd spray (**Table 76**).

All the fungicide treatments significantly reduced grey mildew (6.67 to 7.58 PDI) as against untreated control (16.5 PDI) after 2nd spray. Lowest PDI of grey mildew (6.67%) was recorded in Captan 70%+Hexaconazole 5% WP @1.5g/L (T8) followed by T1-Kresoxim-methyl 44.3% SC @1 ml/Litre of water (7.17 PDI), T6-Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @1 ml/ L (7.17 PDI), T9-Copper oxychloride 50 %WP @2.5g + Salicylic acid 200 ppm (7.25 PDI), T4-Fluxapyroxad 167 g/L + Pyraclostrobin 333 g/L SC @ 0.6ml/L (7.33 PDI), T5-Metiram 55% + Pyraclostrobin 5% WG @2 g / L (7.33 PDI), T7-Copper sulphate 47.15%+Mancozeb 30% WDG) @ 5 g/ litre of water (7.5 PDI), T2-Propiconazole 25% EC @1 ml/L (7.58 PDI), T3-Propineb70%WP @ 2.5 g/ L (7.58 PDI), and which were statistically on par after 2nd spray.

All the fungicide treatments significantly reduced rust (8.67 to 10.83 PDI) as against untreated control (16.58 PDI) after 1st spray. The lowest PDI of 8.67 was recorded in Propineb 70%WP @ 2.5 g/ L (T3) followed by T2-Propiconazole 25% EC @1 ml/L (8.83 PDI), T1-Kresoxim-methyl 44.3% SC @1 ml/Litre of water (9.0 PDI), T9-Copper oxychloride 50 %WP @2.5g + Salicylic acid 200 ppm (9.92 PDI), T8-Captan 70%+ Hexaconazole 5% WP @1.5g/L (10.08 PDI), T4-Fluxapyroxad 167 g/L + Pyraclostrobin 333 g/L SC @ 0.6ml/L (10.58 PDI), T5-Metiram 55% + Pyraclostrobin 5% WG @2 g / L (10.58 PDI) and T6-Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @1 ml/ L (10.67 PDI) which were statistically on par and superior to other treatments after 2nd spray; T7-Copper sulphate 47.15%+Mancozeb 30% WDG) @ 5 g/ litre of water showed 10.83 PDI (**Table 76**). Treatment T4-Fluxapyroxad 167 g/L + Pyraclostrobin 333 g/L SC @ 0.6ml/L water recorded the lowest incidence of boll rot (0.51%) followed by 0.68% in T5-Metiram 55% + Pyraclostrobin 5% WG @2 g / L; 0.69% in T2-Propiconazole 25% EC @1 ml/L andT8-Captan 70%+Hexaconazole 5% WP @1.5g/L; 0.71% inT9-Copper oxychloride 50 %WP @2.5g + Salicylic acid 200 ppm; 0.76% in T1-Kresoxim-methyl 44.3% SC @1 ml/Litre of water and T7-Copper sulphate 47.15%+Mancozeb 30% WDG) @ 5 g/ litre of water,0.82% in T6-Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @1 ml/ L,; 0.87% in Propineb70%WP @ 2.5 g/ L (T3) as against control (1.84%) (**Table 76**).

The highest yield of 19.3 Q/ha was recorded in Kresoxim methyl 44.3% SC @1ml/L which was on par with Propiconazole 25%EC @ 1ml/L (19.1 Q/ha) and Propineb 70%WP @ 2.5g/L (18 Q/ha). Copper sulphate 47.15%+Mancozeb 30% WDG) @ 5 g/ litre of water (16.2 Q/ha), Fluxapyroxad 167g/L + Pyraclostrobin 333g/L SC @ 0.6l (16.04 Q/ha), Metiram 55% + Pyraclostrobin 5%WG @2g/L, (15 Q/ha), Copper oxychloride 50 %WP @2.5g + salicylic acid @0.1 g / L (14.8 Q/ha), Captan 70%+Hexaconazole 5% WP @1.5g/L (14.7 Q/ha), Azoxystrobin 18.2% w/w + Difenoconazole 11.5% w/w SC @ 1ml/L, (14.3Q/ha) were on par. The lowest yield of 7.1 Q/ha was recorded in untreated control as against 10.94q/ha in Flonicamid (60 & 90 DAS)/ Difenthiuron/ Diafenthiuron (110-120 DAS) (need-based application) and 10.21 Q/ha in Fluvalinate (**Table 76**).

At UAS Dharwad, the highest reduction in *Alternaria* leaf blight was recorded with Treatment T-4 (Fluxapyroxad 167 g/L + Pyraclostrobin 333 g/L SC (47.8%) followed by T-5 (Metiram 55% + Pyraclostrobin 5% WG (41.3%) and T-6 (Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC (34.0%). The highest reduction in the rust disease was also observed with Fluxapyroxad 167 g/L + Pyraclostrobin 333 g/L SC (53.9%) followed by Metiram 55% + Pyraclostrobin 5% WG (47.2%) and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC (40%). The highest reduction in the boll rot was achieved with the spray treatment of Fluxapyroxad 167 g/L + Pyraclostrobin 333 g/L SC (61.7%) followed by Metiram 55% + Pyraclostrobin 5% WG (54.7%) and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC (47.0%). The highest yield was recorded in Treatment T-4 (Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/Litre of water), T-5 (Metiram 55% + Pyraclostrobin 5% WG @ 2 g/Litre of water), and T-6 (Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1 ml/ litre of water) (**Table 77**).

At TNAU, Coimbatore: A field trial was conducted using RCH 659 during 2022 -23 to evaluate the CIB&RC recommended new fungicides against foliar and boll rot diseases in cotton. A total of two sprays were applied at 60 and 75 DAS and the Flonicamid @0.6 ml/ litre was applied at 110-120 DAS. The observations were recorded after each spray on Alternaria blight, grey mildew, bacterial blight and boll rot incidence. Seed cotton yield was also recorded in all the treated plots including the control plot. Spraying of Propineb70%WP @ 2.5 g/Litre of water (T-3) twice at 60 and 75 DAS recorded the lowest PDI of 6.2% as against 20.5% PDI in the control which accounted for 69.7% disease reduction. It was followed by Fluxapyroxad 167 g/L + Pyraclostrobin 333 g/L SC @ 0.6g/Litre of water (T-4) and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @1 ml/ litre of water (T-6) and Kresoxim-methyl 44.3% SC @1 ml/Litre of water (T-1) which reduced the ALB incidence by 64.3. 61.9 and 60.0 %respectively.

Among the nine different fungicides, two sprays with Kresoxim-methyl 44.3% SC @1 ml/Litre of water (T-1) at 60 and 75 DAS was found to be significantly superior against grey mildew by recording the lowest PDI of 8.5 and the highest disease reduction of 70.0%. This was followed by Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @1 ml/ litre of water (T-6) and Metiram 55% + Pyraclostrobin 5% WG @2 g / litre of water (T-5) which respectively reduced the grey mildew incidence by 61.8 and 60.0%, Spraying of COC 50 %WP @2.5g of water + Salicylic acid (200 ppm one spray at 60 DAS) reduced the grey mildew incidence only to the extent of 39.0% (**Table 78**).

Two sprays with copper sulphate 47.15%+Mancozeb 30% WDG) @5 g// litre of water at 60 and 75 DAS recorded the lowest PDI of 7.5 as against 15.0 PDI in the control. This accounted for the disease reduction of 50.0 percent It was followed by Fluxapyroxad 167 g/L + Pyraclostrobin 333 g/L SC @ 0.6g/Litre of water and COC 50 %WP @2.5g of water + Salicylic acid (200 ppm one spray at 60 DAS) which reduced the bacterial blight incidence by 47.0 and 46.0%, respectively. Among the different treatments spraying of Fluxapyroxad 167 g/L + Pyraclostrobin 333 g/L SC @ 0.6g/Litre of water (T-4) twice at 60 and 75 DAS was effective in controlling the boll rot incidence (3. 6%) with the highest disease reduction of 69.69%. Spraying of Metiram 55% + Pyraclostrobin 5% WG @2 g / litre of water (T-5) reduced the boll rot incidence by 62.6%. In the untreated control plot, boll rot incidence of 12.5% was recorded (**Table 78**).

The highest seed cotton yield of 19. 5 Q/ ha was recorded in Fluxapyroxad 167 g/L + Pyraclostrobin 333 g/L SC @ 0.6g/Litre of water spray and it was on par with Metiram 55% + Pyraclostrobin 5% WG @2 g / litre of water which gave seed cotton yield of 18.3 Q/ ha. Spraying of Propineb70%WP @ 2.5 g/Litre of water and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @1 ml/ litre of water recorded the yield of 17.5 and 17. 1 q/ ha respectively (**Table 78**).

Path 3 (K): Field evaluation (Rhizospheric fungi & chemicals etc.) for seed and soil-borne disease management

To evaluate the efficacy of rhizospheric fungi and chemicals on the incidence of seed and soil-borne diseases field experiment was conducted with 13 treatments and three replications using

RBD design under field conditions. Cultivar CICR Bt-6 was sown at ICAR-CICR RS on 8 May 2022. The treatments were given as per the technical programme including seed treatment, soil application and foliar spray (**Table 79**). The observations were also disease incidence especially root rot, plant height, number of monopodial and sympodial branches and seed cotton yield.

At CICR RS Sirsa, the lowest plant mortality at 60 days after sowing was recorded with the treatment T-6 *(Trichoderma asperellum* isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2 ml/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L)) followed by T-4 *(Trichoderma asperellum* isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2 ml/L), T-5 *(Trichoderma asperellum* isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2 ml/L + Mak Adjuvol mineral paraffin oil) @1.5% (15 ml/L)) and T-1 *(Trichoderma* spp. isolate (CICR-Rf-B/Th-11) as seed treatment @ 5 g/kg seed). However, at 120 days after sowing was recorded with the treatment T-6 followed by T-5 *(Trichoderma asperellum* isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2 ml/L + Mak Adjuvol mineral paraffin oil) @1.5% (15 ml/L)), T-3 *(Trichoderma asperellum* isolate (Rf-B/Th-11) as seed + soil treatment at sowing time) and T-4 *(Trichoderma asperellum* isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2 ml/L) **(Table 80).**

At RRS PAU, Bathinda, the cultivar PAU Bt-2 was sown 7 May 2022 and the treatments were provided as per the schedule (**Table 81**). The highest germination was recorded with T-5 (91.3%) and T-4 (90.0%) treatments. The lowest plant mortality at 60 days after sowing was recorded with the treatment T-1 to T-6 and thereafter plant mortality was not observed in all the treatments. At 120 DAS, the lowest BLB and fungal foliar spots were recorded in T-9 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @1.5% (15 ml/L) at 60 and 90 DAS) followed by T-10 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L) at 60 and 90 DAS) and T-8 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L at 60 and 90 DAS). The highest seed cotton yield was recorded in T-9, T-8 and T-10 **(Table 81).**

At HAU Hisar, the highest germination was recorded with T-6 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and foliar spray at 60 and 90 DAS @ 2 ml/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L)) (84.6%), T-9 (82.3) and T-10 (82.3%) treatments. The lowest fungal foliar spot diseases incidence was recorded with the treatment T-5 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2 ml/L + Mak Adjuvol mineral paraffin oil) @1.5% (15 ml/L)) followed by T-6 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2 ml/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L)) and T9 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @1.5% (15 ml/L) at 60 and 90 DAS). The highest seed cotton yield was recorded in T-5, T-4 and T-6 **(Table 82).**

At CRS Junagarh: G cot-8 (BGII) was sown on 22 June 2022. The results revealed a non-significant effect on germination at 7 DAS. However maximum germination was recorded in treatment (T3) *Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment @ 1 kg/acre with 100 kg well-decomposed FYM/Compost at sowing time. No plant mortality was observed at 30, 60, 90 DAS. Also, non-significant results were obtained on plant mortality at 120 DAS, however, minimum plant mortality (1.5%) was found in treatment T-9 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @1.5% (15 ml/L) followed by T-5 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and foliar spray at 60 and 90 DAS @ 2 ml/L + Mak Adjuvol (mineral paraffin oil) @0.75% (15 ml/L)) and T-10 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @1.5% (7.5 ml/L) at 60 and 90 DAS.

The disease intensity of fungal foliar disease was significantly lower (14.2%) in the treatment T-10 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @ 0.75%

(7.5 ml/L) at 60 and 90 DAS). It was statistically at par with treatments no T-9 and T-8. at 90 DAS. A similar trend was observed at 120 DAS. The results on plant growth parameters (Monopodial, sympodial branches, no. of boll, boll weight and yield) were found a non-significant effect for all treatments. However, the highest yield was recorded with the treatment T-3 followed by t-9 and T-1 (**Table 83**).

At CRS Nanded: RCH-2 (BGII) was sown on 26 June 2022 with 10 treatments. Among all other treatments, T8 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml + Mak Adjuvol @ 12 ml/L (mineral paraffin oil) @ 60 and 90 DAS) (97.2%), showed higher seed germination. However, the treatments T1 to T-9 were statistically at par with respect to seed germination compared to the control. Among the different treatments, compared to the control (12.1% mortality), the T8 (2.8%) resulted in lower mortality followed by T-4 *(Trichoderma* spp. isolate (ICCR-Rf- BTh-11) as seed + soil treatment at sowing time and foliar spray at 60 and 90 DAS @ 2ml/L) and T-T-3 *(Trichoderma* spp. isolate (ICCR-Rf- BTh-11) as seed + soil treatment at sowing time). Plant height in the treatment T3 (160.3 cm) was found superior than the other treatments. No. of bolls/plant, were highest in treatment T6 (59.67). A significantly higher reduction in Alternaria leaf spot was recorded in Treatment T8 (3%) followed by T4 (3.3%), T5 (3.6%), T7 (3.7%) compared to the control (7.8%). Significant reduction in grey mildew leaf spot was recorded with Treatment T8 (62.1%) followed by treatments T9 (59.5%) and T7 (58.4%) compared to the control (31.7 PDI). Among the different treatments, treatments T8 and T-7 recorded the highest seed cotton yield (12.33 Q/ha) which was followed by treatment T2 (12.3 Q/ha) and T3 (12.1 Q/ha). Untreated control recorded the lowest seed cotton yield (8.55 q/ha) (**Table 84**).

At UAS Dharwad, among all other treatments, the highest reduction in plant mortality was recorded with the treatment T-7 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml @ 60 and 90 DAS) followed by T8 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml + Mak Adjuvol @ 12 ml/L (mineral paraffin oil) @ 60 and 90 DAS) (97.2%) and T-5 *(Trichoderma* spp. isolate (ICCR-Rf- BTh-11) as seed + soil treatment at sowing time and foliar spray at 60 and 90 DAS @ 2ml/L + Mak Adjuvol (mineral paraffin oil) @ 12 ml/L of water). The results were similar in trend for Alternaria leaf blight, bacterial leaf blight and rust diseases. Among the different treatments, the highest seed cotton yield (18.8 Q/ha) was recorded with treatment T7, followed by T-8 (17.1 Q/ha) and T5 (16.5 Q/ha). Untreated control recorded the lowest seed cotton yield (10.8 Q/ha) (**Table 85**).

At Lam Guntur, a cotton hybrid, Jaadoo BG II was sown on 20 July 2022 by imposing the treatments at the time of sowing by adopting a randomized block design and replicating thrice. Uniform insecticidal sprays were given to control sucking pests and bollworms. Germination was observed in the range of 62.7 to 71.0% in different treatments at 7 DAS. Foliar sprays were applied at 60 and 90 DAS and diseases including *Corynespora* leaf spot at 60, 90 and 120 DAS, grey mildew, and rust at 120 DAS were scored and PDI was calculated (**Table 86**). The incidence of boll rot (%) was recorded in all the treatments. The highest germination of 71.0% was observed in T-3 (*Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time) followed by T-6 (*Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and foliar spray (FS) at 60 and 90 DAS @ 2/L + Mak Adjuvol (mineral paraffin oil) @ 0.75% (7.5 ml/L), 70.33%), T- 2 (*Trichoderma* spp. isolate (Rf-B/Th-11) as soil treatment @ 1 kg/acre with 100 kg well-decomposed FYM/Compost at sowing time 69.33%) and T-4 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L (T4-69.33%), T-5 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time, FS at 60 and 90 DAS @ 2/L + Mak Adjuvol mineral paraffin oil) @1.5% (15 ml/L) -68.67%), T-7 (Seed treatment with carboxin 37.5% + thiram 37.5% @ 3.5g/kg-67.33%) and T-1 *(Trichoderma* spp. isolate (CICR-Rf-B/Th-11) as seed treatment @ 5 g/kg seed 66.67%). Seed /soil treatments individually or in combination imposed at the time of sowing were found superior at 7 DAS (**Table 86**).

A similar trend was observed with respect to seedling vigour recorded at 30 DAS. The highest seedling vigor of 4805.7 was recorded in T-6 (*Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L + Mak Adjuvol (mineral paraffin oil)

@0.75% (7.5 ml/L)) followed by T-4 (*Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L , T-3 (*Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time), T-7 (seed treatment with carboxin 37.5% + thiram 37.5% @ 3.5g/kg), T-5 (*Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L + Mak Adjuvol mineral paraffin oil) @1.5% (15 ml/L), T-2 (*Trichoderma* spp. isolate (Rf-B/Th-11) as soil treatment @ 1 kg/acre with 100 kg well-decomposed FYM/Compost at sowing time) and T-1 *(Trichoderma* spp. isolate (CICR-Rf-B/Th-11) as seed treatment @ 5 g/kg seed) (**Table 86**).

There was no mortality of plants due to diseases at 30 DAS and 60 DAS. A population of 56 plants per plot was maintained in all the treatments after the removal of 10 plants per plot for recording seedling vigour in each treatment at 30 DAS. At 90 DAS continuous rains resulted in the loss of a few plants in border plots and mortality of plants was recorded. Mortality occurred to the tune of 1.7 % in T6, 3.36 in T7 and 0.56 in control at 90 DAS. Mortality was in the range of 0.0 to 7.28% at 120 DAS. The highest mortality of 7.3% occurred in seed treatment with carboxin 37.5% + thiram 37.5% @ 3.5g/kg (T7) followed by 3.92% in T6 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2 ml/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L), 1.68% in T1, T2, T3 and control (T-13); T5 recorded 0.56% mortality (**Table 86**).

All the treatments but for T12 (Mak Adjuvol (mineral paraffin oil) @ 0.75% (7.5 ml/L) only) significantly increased the plant height as against control (144.5cm). The highest plant height of 173.8cm was recorded in T-5 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L + Mak Adjuvol mineral paraffin oil) @1.5% (15 ml/L) followed by T-9 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @ 1.5% (15 ml/L) at 60 and 90 DAS), T-3 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time) and T-4 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L) (**Table 86**).

At 60 DAS *Corynespora* leaf spot (CoLS) was observed in the range of 9.0 to 14.5% PDI. The lowest PDI of CoLS (9.0%) was recorded in T-1 *(Trichoderma* spp. isolate (CICR-Rf-B/Th-11) as seed treatment @ 5 g/kg seed) followed by T-7 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L (T4 - 9.83 PDI), seed treatment with carboxin 37.5% + thiram 37.5% @ 3.5g/kg), T-6 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L), T-5 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L + Mak Adjuvol mineral paraffin oil) @1.5% (15 ml/L) and T-3 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time) were on par and superior to other treatments.

At 90 DAS all the treatments were on par against *Corynespora* leaf spot with PDI in the range of 7.0 to 9.1% as against 16.8 PDI in the untreated control. The lowest PDI of 6.83% was recorded in T-8 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L at 60 and 90 DAS) followed by T- 5 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L + Mak Adjuvol mineral paraffin oil) @1.5% (15 ml/L)), T-7 (Seed treatment with carboxin 37.5% + thiram 37.5% @ 3.5g/kg– 7.2 PDI), T- *Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L), T-4 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time, T-9 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @1.5% (15 ml/L) at 60 and 90 DAS– 7.5 PDI).

At 120 days after sowing, the lowest CoLS was recorded in T-9 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @ 1.5% (15 ml/L) at 60 and 90 DAS with 4.0% PDI), T-10 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L) at 60 and 90 DAS– 4.58% PDI) and T-6 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L + Mak

Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L) - 5.6% PDI) were on par and significantly superior to other treatments.

With respect to grey mildew lowest PDI of 1.25 was recorded in T-9 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @1.5% (15 ml/L) at 60 and 90 DAS (T9) followed by T-10 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L) at 60 and 90 DAS– 2.00 PDI) and T-8 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L at 60 and 90 DAS – 2.25 PDI), and these treatments were on par and significantly superior to all other treatments. The lowest PDI of rust was recorded in T-9 followed by T-10 and was superior to all other treatments. T-8, T-6 and T5 were on par.

The incidence of boll rot varied from 2.9 to 4.9% in different treatments. The lowest incidence of 2.9% was recorded in T-6 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L) followed by T-10 (Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L) at 60 and 90 DAS (3.12%) and T- 2 *(Trichoderma* spp. isolate (Rf-B/Th-11) as soil treatment @ 1 kg/acre with 100 kg well-decomposed FYM/Compost at sowing time (3.14%).

The highest seed cotton yield of 19 Q/ha was recorded in Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L at 60 and 90 DAS followed by Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @1.5% (15 ml/L) at 60 and 90 DAS (T9 -19.1 Q/ha), Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L) at 60 and 90 DAS (T10 - 18.4 Q/ha) and *Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L) (T6 - 16.8 Q/ha which were on par and significantly superior to other treatments (**Table 86**).

At TNAU Coimbatore: A field experiment was conducted with 10 treatments and three replications and the RBD design using the cultivar Jadoo during 2021- 2022. The treatments were given as per the technical programme and observation was recorded on germination and incidence of root rot, Alternaria blight and grey mildew. The highest germination of 87.0% was recorded in the treatment T5 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L + Mak Adjuvol (mineral paraffin oil) @ 12ml/L) followed by T4 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L). In the untreated control germination percentage of 72.0 %was observed (**Table. 87**).

Among the bioagent treatments, the treatment T5, *Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2/L + Mak Adjuvol (mineral paraffin oil) @ 12ml/L was found to be the best treatment in reducing root rot incidence of 15.8 as against 48.0 % in the control accounting to the disease reduction of 67.0 % and it was on par with the treatment T4 which reduced the root rot incidence by 65.0 percent The treatment T8, Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol@ 12ml/L (mineral paraffin oil) at 60 and 90 DAS and T7, controlled the disease incidence by 72.0 and 69.4 %. Treatment T7 reduced the ALB incidence by 60.6 percent and it was on par with treatment T8 which showed 58.0 % disease reduction. The bioagent treatments viz., T5 and T4 controlled ALB incidence to an extent of 45.5 and 43.9 %, respectively. In the control plot, the ALB incidence of 19.8 PDI was recorded. The fungicidal treatments viz., T7 and T8 reduced the grey mildew incidence by 61.0 and 60.0 %, respectively. The treatment T4 and T5 recorded GM incidence of 11.9 and 12.4 % respectively with disease reduction of 44.1 and 41.8%, respectively (**Table. 87**).

The highest plant height of 170 cm was recorded in treatment T5 *(Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2ml/L + Mak Adjuvol (mineral paraffin oil) @ 12ml/L) and the treatment T4 (*Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2ml/L) ranked next by recording the plant height of 167 cm Plants treated with the fungicidal treatments viz., T8 and T7 showed the plant

height of 161 and 158 cm respectively. The maximum seed cotton yield of 17.7 Q/ ha was recorded in the treatment T4 (*Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2ml/L) and it was on par with the treatments T5 T8 and T7 which recorded the seed cotton yield of 17.3, 17.1 and 17.0 Q/ha, respectively. In the untreated control plot seed, cotton yield of 11.7 q/ ha was recorded (**Table. 87**).

Path.4.: Crop loss estimation

Path.4. (e) Expt.1: Crop loss estimation due to CLCuD and distribution pattern of CLCuD in the north zone

Pooled data of Hisar, Faridkot and Rajasthan seed cotton yield reduction (Grade wise from 1-6 grade) due to CLCuD in different Bt hybrids varied from 7.4 to 60.8, 6.4 to 66.4, 0.8 to 76.5 and 12 to 73.1% in Bt hybrids US-51, RCH 773 BG II, NCS 9013 BGII and ACH177-7 BG II, respectively. Based on mixed grades it was 30.5, 29.4, 31.5 and 31.2%, in US-51, RCH 773 BG II, NCS 9013 BGII and ACH177-7 BG II, respectively. A similar trend was observed in the case of a reduction in the number of bolls but the reduction in boll weight varied with the cultivars and the respective CLCuD grades. Overall, the reduction in seed cotton yield concerning the 1-6 grades over health plants was recorded to be 6.6, 19.5, 35, 5, 58.1, and 69.2 compared to the previous year's SCY reduction 7.7, 13.7, 24.9, 34.7 and 43.6% under grades 1,2,3,4, and 5, respectively. Based on mixed grades the pooled SCY reduction at all the locations were recorded at 30.5, 29.4, 31.5, and 31.2% in US-51, RCH 773 BG II, NCS 9013 BGII and ACH177-2, respectively. However, in the previous year reduction under mixed grades, was 29.5, 22.0, 26.6 and 24.8% in US-51, RCH 773 BG II, NCS 9013 BGII and ACH177-2, respectively. Overall average SCY reduction under mixed infection during this year was 30.6% compared to the previous year's reduction (25.7%) (**Table 88-90**).

The experimental data recorded from the village Ludas, Hisar (Haryana) indicated that at farmers' fields, the mixed infection on these cultivars ranged from 48.7 to 58.9% (**Table 91**)

Path.4 (e) Expt.2: Distribution pattern of CLCuD on local popular BT hybrid at farmer's field.

In general, the CLCuD PDI was higher during 2022-23 compared to the previous year 2021-22 in the farmers' fields and the increase in the PDI was almost double. The maximum leaf curl disease PDI during the 2022 season was noted in Punjab at 41.9% compared to the previous year (19.2%) followed by Haryana (25.1%) compared to the previous year (12.4%) and Rajasthan (21.7%) compared to the previous year (11.4). In Punjab, the maximum CLCuD was noted in Fazilka followed by Bathinda, and Faridkot, and in Haryana, the maximum CLCuD was recorded in Fatehabad, Jind and Hisar. In Rajasthan, the Sriganganagar district showed maximum CLCuD followed by Hanumangarh. (**Table 92**).

Concluded Experiment:

Path.3 (f): Management of sooty mold (Capnodium spp.) in cotton

The experiment on the management of sooty mold (*Capnodium* spp.) in cotton caused by whitefly in the North Zone and by Aphids in the Central and South Zone under field conditions was conducted at different locations. The prophylactic sprays of six treatments including fungicides and insecticides were applied when the insect crossed the ETL and repeated once or twice at 15 days intervals. The experiment was initiated during 2020-21 at Faridkot, Hisar and Coimbatore and concluded this year (2022-23). After each spray, a reduction in the sooty mold was observed (**Table 93**).

Based on pooled results (2020-21, 2021-22 and 2022-23) of the experiments conducted **at RRS PAU Faridkot** under field conditions, all the treatments showed a numerical reduction of sooty mold over control. The highest reduction of sooty mould was recorded in treatment with the Flonicamid 50 WP (58.1%) 15 days after the third spray which was followed by neem oil (48.5%) and

propiconazole (45) which was at par with copper oxychloride (COC) 50 WP @ 2.5 g/Litre of water (44.1%) (**Table 94**). A**t HAU Hisar** under field conditions, all the treatments also showed a numerical reduction of sooty mold over control. The highest reduction of sooty mould was recorded in the treatment of propiconazole (67.9%) followed by copper oxychloride (COC) 50 WP @ 2.5 g/Litre of water (60.6%) and Flonicamid 50 WP (60.1%) at 15 days after the third spray (**Table 95**). The highest reduction in the whitefly population was recorded in the treatment of Flonicamid 50 WP followed by Neem oil spray. The highest pooled seed cotton yield was achieved with the Propiconazole 25 EC @ 1 ml/Liter of water followed by copper oxychloride (COC) 50 WP @ 2.5 g/Litre of water and Flonicamid spray treatment (**Table 96**).

At TNAU, Coimbatore, the effect of different treatments on the aphid population in cotton before spray, after 7 and 15 days of two subsequent sprays were recorded. The pooled data of the year 2020, 2021 and 2022 revealed that the lowest sooty mold was recorded with Propiconazole 25 EC @ 1 ml/Liter of water followed by copper oxychloride (COC) 50 WP @ 2.5 g/Litre of water and Mancozeb 50 WP @2.0 g /liter of water. The highest seed cotton yield was recorded with copper oxychloride (COC) 50 WP @ 2.5 g/Litre of water followed by Propiconazole 25 EC @ 1 ml/Liter of water and Flonicamid 50 WP (**Table 97**).

Overall conclusion:

In the North zone, for management of the sooty mold caused by whitefly (2020-21, 2021-22 and 2022-23), the prophylactic sprays (3 sprays at fortnightly intervals) of Propiconazole 25 EC @ 1 ml/liter of water or copper oxychloride (COC) 50 WP @ 2.5 g/Litre of water or Flonicamid (starting at whitefly population crossing ETL) may provide better results and higher seed cotton yield.

In the South Zone, the farmers of Tamil Nadu and South Agro Climatic Zone growing Bt cotton may be advised to spray copper oxychloride (COC) 50 WP @ 2.5 g/Litre of water or Propiconazole 25 EC @ 1 ml / and or Flonicamid 50 WP when aphid crosses ETL (Economic Threshold Level) and the second spray at 15 days interval after the first spray for effective and economical management of sooty mould.

Path. 3 (h): Evaluation of efficacy of bioagents against cotton diseases

The seven different bioagent treatments and their combinations (seed treatment, soil application and foliar spray) were evaluated against root rot, wilt, and bacterial fungal foliar spot disease at Akola and Surat from 2019-20 onwards **(Table 98).**

Among all treatments, the lowest PDI of *Alternaria* leaf blight **at Akola** was recorded lowest in the treatment T-7 (Pyraclostrobin @ 0.1%;), followed by T-3 (T1+ T2: ST+ SA of *Bacillus aryabhattai* ST: 10^8cfu/g @10g per kg of seed at the time of sowing SA: 2.5 kg/ha (30 & 60 DAS). T-6 (ST (Vitavax power @ 0.2%); 2 gm/kg seed) and T-3 (T1+ T2: ST+ SA of *Bacillus aryabhattai* ST: 10^8cfu/g @10g per kg of seed at the time of sowing SA: 2.5 kg/ha (30 & 60 DAS). The lowest BLB incidence was recorded with T-5 (ST+ SA of *Pf* CICR; SA: 10^8cfu/g @10g per kg of seed at the time of sowing; SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost) followed by T-3 and T2 whereas, the lowest BLB and grey mildew were recorded with T-7 followed by T-6 and T-5. The highest yield at Akola was recorded with treatments T-3, T-6 and T-7 (**Table 99**).

At MCRS Surat, the experiment was conducted for four years from 2019-20 to 2022-23. The pooled data revealed that among eight treatments the lowest PDI of *Alternaria* leaf blight was observed in the treatment T-3 followed by T-7 and T-2 while the lowest PDI of bacterial leaf blight was recorded with treatment T-5 followed by T-3 and T-2. The highest seed cotton yield was recorded with T-5 followed by T-3 and T-7. The highest seed cotton yield was recorded with the treatment T-5 (ST+ SA of *Pf* CICR; SA: 10^8cfu/g @10g per kg of seed at the time of sowing; SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost) followed by T-3 (T_1+T_2 ST: 10^8cfu/g @10g per kg of seed at

the time of sowing SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost) and T-7 (Foliar application of Pyraclostrobin @ 0.1%; gm/lit of water) (**Table 100**)

Overall conclusion:

At Akola in Central Zone the combined application of *Bacillus aryabhattai + Bacillus tequeilencis* (10^8cfu/g) as seed treatment @10g/kg of seed at the time of sowing + soil application @ 2.5 kg/ha (30 & 60 DAS) with FYM/compost, Chemical seed treatment (Carboxin 37.5+ Thiram37.5%WS @ 0.2%); 2 g/kg seed at the time of sowing and foliar application of Pyraclostrobin @ 0.1%; gm/lit of water found superior over other treatments for the management of ALB, BLB and Grey mildew diseases.

At Surat in Central Zone the ST+ SA of Pf CICR ; SA: 108cfu/g @10g per kg of seed at the time of sowing; SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost or combined application of *Bacillus aryabhattai + Bacillus tequeilencis* (10^8cfu/g) as seed treatment @10g per kg of seed at the time of sowing + soil application @ 2.5 kg/ha (30 & 60 DAS) with FYM/compost or foliar application of Pyraclostrobin @ 0.1%; gm/lit of water found superior over other treatments for the management of ALB and BLB diseases.

At Coimbatore in South Zone application of *Pf* CICR 10^8cfu/g @10g per kg of seed at the time of sowing plus soil application of *Pf* CICR@ 2.5 kg/ha (30 & 60 DAS) with FYM/compost) and or the combined application of *Bacillus aryabhattai + Bacillus tequeilencis* (10^8cfu/g) as seed treatment @10g per kg of seed at the time of sowing + soil application @ 2.5 kg/ha (30 & 60 DAS) with FYM/compost and or Foliar application of Pyraclostrobin @ 0.1%; gm/lit of water found superior over other treatments for the management of ALB and BLB.

Path.3(i). Integrated Management of CLCuD through its vector management (2020-21)

In this experiment, eight different IPM and bio-modules were evaluated under field conditions for the management of CLCuD through its vector whitefly management. The treatment details for IPM modules and biomodules along with two controls (existing IPM module and biomodules using commercial bioinsecticide of *Lecanicillium lecanii*) are mentioned in **Table 101**. The experiment was started in 2020-21 and concluded in the year 2022-23. In IPM and biomodules, the first two sprays of neem300 ppm @ 2.5 L/ha were applied at all the locations. The flonicamid 50WG @120g/ha was applied as the third chemical spray treatment in the existing IPM module and new IPM modules at Sirsa, Sriganganagar, and Hisar, however at Bathinda and Faridkot diafenthiuron 50% WP @ 150 g/ha was applied. Three EPFs namely CICRRS-Cj102 @5ml/L (*Cordyceps javanica*) CICRRS-Bb4511 @5ml/L (*Beauveria bassiana*), CICRRS-Ma1299 @5ml/L (*Metarhizium anisopliae*) were applied as a fourth foliar spray in IPM modules 1, 2, 3, and third & fourth spray in biomodules 1,2 and 3, respectively. The fourth spray of spiromesifen 22.9 SC @ 500 g/ml was applied in existing IPM modules while the respective EPF formulations were applied in IPM and biomodules.

Based on the pooled results (2020-21, 2021-22, 2022-23) of the experiment conducted at **CICR RS Sirsa**, the highest reduction in the nymphal population over control at 7 days after the third spray was recorded in the existing IPM module followed by Biomodule 1, and these modules were statistically at par with each other in terms of nymphal reduction. IPM modules- 1 to 3 were also at par with each other seven days after the third spray. Nymphal reduction in Biomodule 1 was followed by Biomodule 2 and Biomodule 3. However, the highest reduction in the nymphal population seven days after the fourth spray was recorded in the existing IPM module followed by Biomodule 1, IPM module 1 and Biomodule 2. The existing IPM module, IPM module 1 and Biomodule 1 were statistically at par with each other (**Table 102a -102b).** The highest reduction in the whitefly population (adults/3 leaves) over control at 7 days after the third spray was recorded in the existing IPM module, followed by IPM module 1, IPM module 2 and IPM module 3. These modules were statistically at par with each other in terms of whitefly adult population reduction.

However, the highest reduction in the whitefly population (adults/3 leaves) seven days after the fourth spray was recorded in IPM module 1 followed by Biomodule 3 and IPM module 2 and these modules were statistically at par with each other (**Table 103a -103b).** The lowest CLCuD PDI at 120 DAS was observed in the IPM existing module followed by IPM module 3. The highest reduction in CLCuD PDI at 120 DAS was observed in IPM module 3 followed by IPM existing module and Biomodule 3 with a nonsignificant difference among each other. Seed cotton yield was recorded maximum in Biomodule 2 followed by IPM existing module (**Table 104 & 105)**.

The pooled data (2020-21, 2021-22, 2022-23) of the experiment conducted at **ARS Bathinda**, revealed that the highest reduction in the nymphal population over control at 7 days after the third spray was recorded IPM module 3 followed by Bio-module 3, IPM existing module and these modules were statistically at par with each other in terms of nymphal reduction. However, the highest reduction in the nymphal population seven days after the fourth spray was recorded in the IPM existing module followed by Bio-module 3, Bio-module 4 and IPM module 3. The IPM modules and Bio-modules were statistically at par with each other in terms of nymphal reduction (**Table 106a -106b).** The highest reduction in the whitefly population (adults/3 leaves) over control at 7 days after the third spray was recorded in Bio-module 3 followed by IPM module 2 and IPM module 3. However, the highest reduction in the whitefly population (adults/3 leaves) seven days after the fourth spray was recorded in Bio-module 3, Bio-module 4, and IPM module 2 and these modules were statistically at par with each other (**Table 106c -106d).** The lowest PDI of CLCuD at 115 DAS was observed in IPM existing module followed by IPM module 1, IPM module 2, IPM module 3. However, the CLCuD PDI was statistically at part with IPM and Biomodules. Seed cotton yield was recorded as maximum in IPM existing module followed by IPM module 1, and IPM module 3 and it was at par with all IPM and Biomodules (**Table 107)**.

Based on the pooled results (2020-21, 2021-22, 2022-23) of the experiment conducted at **HAU Hisar**, it was found that the highest reduction in the nymphal population over control at 7 days after the third spray was recorded in IPM existing module followed by IPM module 2, IPM module 1, IPM module 3 and these modules were statistically at par with each other in terms of nymphal reduction. IPM modules as well as biomodules were also at par with each other for nymphal reduction seven days after the third spray. However, the highest reduction in the nymphal population seven days after the fourth spray was recorded in the IPM existing module followed by Bio-module 1, IPM module 3, and Bio-module 2. The IPM modules and biomodules were statistically at par with each other in terms of nymphal reduction (**Table 108a -108b).** The highest reduction in the whitefly population (adults/3 leaves) over control at 7 days after the third spray was recorded in IPM existing module followed by IPM module 3, Bio-module 3. However, the highest reduction in the whitefly population (adults/3 leaves) seven days after the fourth spray was recorded in IPM existing module, Bio-module 1, IPM module 3 and these modules were statistically at par with each other (**Table 109a -109b).** The lowest PDI of CLCuD at 115 DAS was observed in IPM existing module followed by IPM module 2, IPM module 3. The highest seed cotton yield was recorded in IPM existing module followed by IPM module 2, IPM module 1. SCY was on par with IPM and Biomodules (**Table 110)**.

Pooled results (2020-21, 2021-22, 2022-23) of the experiment conducted at **ARS Sriganganagar**, revealed that the reduction in the both nymphal and adult population was highest at 5 days after spray compared to 7 days. The highest reduction in the nymphal population over control at 5 days after the third spray was recorded in IPM module 2 followed by IPM existing module, IPM module 3. IPM modules- 1 to 3 and biomodules were also at par with each other seven days after the third spray. However, the highest reduction in the nymphal population seven days after the fourth spray was recorded in IPM module 2 followed by Bio-module 3, IPM existing module. The IPM modules and bio-modules were statistically at par with each other in terms of nymphal reduction (**Table 111a -111b).** The highest reduction in the whitefly population (adults/3 leaves) over control at 7 days after the third spray was recorded in IPM module 2 followed by IPM module 1, IPM existing module. However, the highest reduction in the whitefly population (adults/3 leaves) seven days after

the fourth spray was recorded in IPM existing module, Bio-module 1, and IPM module 2 and these modules were statistically at par with each other (**Table 112a -112b).** The lowest PDI of CLCuD at 115 DAS was observed in IPM existing module followed by IPM module 1, Bio-module 1, and Bio-module 4. The highest seed cotton yield was recorded in IPM existing module followed by Bio-module 2, IPM module 1. However, there was no statistical difference in the SCY among all the IPM and biomodules (**Table 113)**.

The pooled data (2020-21, 2021-22, 2022-23) of the experiment conducted **at ARS Faridkot**, revealed that the highest reduction in the nymphal population over control at 7 days after the third spray was recorded in IPM module 1 followed by the IPM module 3, IPM existing module and these modules were statistically at par with each other in terms of nymphal reduction. However, the highest reduction in the nymphal population seven days after the fourth spray was recorded in the IPM existing module followed by IPM module 3, Bio-module 3, IPM module 1. The IPM modules and biomodules were statistically at par with each other in terms of nymphal reduction (**Table 114a - 114b).** The highest reduction in the whitefly population (adults/3 leaves) over control at 7 days after the third spray was recorded in IPM module 1 followed by IPM module 3, IPM existing module and IPM module 2. However, the highest reduction in the whitefly population (adults/3 leaves) seven days after the fourth spray was recorded in IPM existing module followed by Bio-module 3, Bio-module 1, Bio-module 4 and these modules were statistically at par with each other (**Table 115a - 115d).** The lowest PDI of CLCuD at 115 DAS was observed in IPM existing module followed by IPM module 1, IPM module 2. The maximum seed cotton yield was recorded in IPM module 3 followed by IPM module 2, IPM module 1, and IPM existing module (**Table 116)**.

Overall, the highest average reduction in nymphal population over control at 7 days after the last spray was observed in the IPM existing module, followed by Bio-module 3, IPM module 2, Bio-module 1 and IPM module 1. The reduction in nymphal population in IPM and bio-modules were at par with other modules except Bio-module 4 (**Table 117a**). Similarly, the highest average reduction of whitefly adults (per 3 leaves) over control at 7 days after the last spray was observed in the IPM existing module, followed by Bio-module 3, Bio-module 1, and IPM module 3 (**Table 117b**). The average of CLCuD PDI at 115 DAS of all centers revealed that the lowest CLCuD was recorded in the IPM existing module followed by IPM module 1, IPM module 2. The average CLCuD PDI at 115 DAS ranged from 29.7 to 33.9% compared to the control (39.4%). The overall pooled reduction of the nymphal population in new IPM and Biomodules ranged from 34.9 to 47% and 34.3 to 41.3%, respectively over control, however, the pooled reduction in the adult population was recorded to be in the range of 38.8 to 53.6% and 39 to 45.5% (**Table 118**). Overall pooled CLCuD PDI in IPM and Biomodules was found to be 7.4 to 7.7 % and 5.5 to 5.8% lower in the new IPM and biomodules compared to control and existing IPM module (9.7%) (**Table 118**). There was an increase of 6.3 to 22.9% in seed cotton yield in IPM and Biomodules (1.2 to 4.4 Q/ha). Statistically, the pooled SCY of new IPM and biomodules were non-significant. The highest average seed cotton yield was recorded in **the existing IPM module followed by IPM module-1, IPM module-2, IPM module-3, and Biomodule-1** (**Table 118**).

Economics: ICBR

The ICBR calculated based on pooled seed cotton yield over the years and locations indicated that the input cost-benefit ratio among all the modules was highest in the existing IPM module and the ICBR ranged from 3.2 to 3.4 in new IPM modules and 2.9 to 3.0 in new biomodules (**Table 118b**).

Overall conclusion:

The overall pooled reduction of the nymphal population in new IPM and Biomodules ranged from 34.9 to 47% and 34.3 to 41.3%, respectively over control, however, the pooled reduction in the adult population was recorded to be in the range of 38.8 to 53.6% and 39 to 45.5% (Table 115 & 116). Overall pooled CLCuD PDI in IPM and Biomodules was found to be 7.4 to 7.7 % and 5.5 to 5.8%

lower in the new IPM and biomodules compared to the control and existing IPM module (9.7%). Overall, all the new IPM and Biomodules were superior to control and existing Biomodule (*L. lecanii* commercial formulation), however, no significant difference was observed within these modules.

Under the climatic conditions of **Bhatinda** existing IPM module (initial two sprays of neem followed by Diafenthiuron and Spiromesifen) followed by IPM module 2 (initial two sprays of neem followed by Diafenthiuron and CICRRS-Bb4511) in IPM farming system and Biomodule 2 (initial two sprays of neem followed by Diafenthiuron and CICRRS-Bb4511 and Biomodule 3 (initial two sprays of neem followed by Diafenthiuron and CICRRS-Bb4511) were found superior for managing the whitefly and CLCuD in the organic farming system.

Under the climatic conditions of **Faridkot** new IPM module 3, the existing IPM module in IPM farming system and Biomodule 1, Biomodule 3 were found superior for managing the whitefly CLCuD in the organic farming system, are found better for whitefly and CLCuD management.

Under the climatic conditions of **Hisar, Haryana,** existing IPM module, IPM module 3 and IPM module 1 in IPM farming system and Biomodule 1 and Biomodule 2 were found superior for managing the CLCuD and whitefly in IPM and organic farming system. **However, at Sirsa,** Haryana, the existing IPM module, Biomodule 1, IPM module 1, and Biomodule 2 were comparatively superior but on par with Biomodule 2 and IPM modules.

Under the climatic conditions of **Sriganganagar,** the existing IPM module, Biomodule 3, IPM module 1 and IPM module 2 & Biomodule 1 are found suitable for managing the CLCuD and whitefly in IPM and organic farming system.

Path 3(j): Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations

In this experiment, twelve different treatments of CIB&RC recommended new chemical pesticides and their combinations (Foliar spray) were evaluated for managing boll rot and foliar diseases (bacterial and fungal foliar spot) under field conditions**.** The treatment details of new chemical pesticides and their combinations are mentioned in **Table 119.**

North Zone: Based on the pooled results (2020-21, 2021-22 and 2022-23) of the experiment conducted at **ARS PAU Bathinda**, the highest FFS reduction was recorded with Kresoxim methyl 44.3% SC @ 1 ml/L followed by Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1 ml/L and Captan 70 % + Hexaconazole 5 % WP @ 1.5 g/L. The average seed cotton yield was also recorded highest with Kresoxim methyl 44.3% SC @ 1 ml/L (17.2 Q/ha) followed by Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1 ml/L (15.8 Q/ha) (Table 120). Based on the pooled results (2020-21, 2021-22 and 2022-23) of the experiment conducted at **HAU, Hisar,** the boll rot incidence after the third spray was observed to be in the range of 7.9 to 18.2% (Table 121a). The highest boll rot reduction after the third spray was recorded with Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L followed by Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L. However, the average seed cotton yield also recorded the highest with Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L (19.8 Q/ha) and Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L (19.8 Q/ha) (Table 121b).

Central Zone: Based on the pooled results (2020-21, 2021-22 and 2022-23) of the experiment conducted at **NAU Surat**, Copper oxychloride 50 % WP @ 2.5 g followed by Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L and Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L recorded with the highest reduction over control (54.3%, 47%, 40.1%) and minimum bacterial leaf blight infection (21.7%, 23.5%, 26.6% PDI) in comparison to control (45.0 % PDI). Similarly, minimum boll rot infection (13.1%, 14.1%, 15.7% PDI) in comparison to control (28.3 % PDI) and highest reduction over control (52.5%, 50.2%, 44.4%) was recorded with copper oxychloride 50 % WP @ 2.5 g followed by Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L and Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L. The highest seed cotton yield was also recorded in the treatment

Copper oxychloride 50 % WP @ 2.5 g (25.6 Q/ha) and Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L (25.6 Q/ha) followed by Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L (23.6 Q/ha), respectively (**Table 122**).

Based on the pooled results (2020-21, 2021-22 and 2022-23) of the experiment conducted at **Nanded**, the lowest Alternaria leaf blight PDI was observed in the treatment Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L (2.4% PDI) with highest ALB reduction (70.9%) followed by Metiram 55% + Pyraclostrobin 5% WG @ 2g/L (3.4% PDI) and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1ml/L (3.6% PDI). The lowest grey mildew PDI was observed with the treatment by Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6g/L (3.8% PDI) followed by Kresoxim methyl 44.3% SC @1ml/L (5.8% PDI). Bugs population was statistically at par with each other in all treatments except Flonicamid @80g/acre or Diafenthiuron or Diafenthiuron (neem-based application). The highest seed cotton yield was recorded in Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6g/L (13.1 Q/ha) followed by Kresoxim methyl 44.3% SC @ 1ml/L (11.6 Q/ha) and Metiram 55% + Pyraclostrobin 5% WG @ 2g/L (11.0 Q/ha) (**Table 123**).

Based on the pooled results (2020-21, 2021-22 and 2022-23) of the experiment conducted at **CICR Nagpur**, the lowest boll rot incidence after the second spray was observed in the treatment of copper oxychloride 50 % WP @ 2.5 g (8.4%) followed by copper sulphate 47.15% + Mancozeb 30% WDG @ 5g/L (13.4%) and Captan 70 % + Hexaconazole 5 % WP @ 1.5g/L (16.7%). The lowest *Corynespora* leaf spot disease PDI after the second spray was recorded in the treatment of Captan 70 % + Hexaconazole 5 % WP @ 1.5g/L (12.7%) followed by copper oxychloride 50 % WP @ 2.5 g/L (13.7%) (**Table 124a**). The lowest grey mildew PDI after the second spray was observed in Kresoxim methyl 44.3% SC @ 1 ml/L (3.7%) followed by Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L (5.3%) and Propiconazole 25% EC @ 1ml/L (6.8%). The highest seed cotton yield was recorded in Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L (19.8 Q/ha) and Propineb 70% WP @ 2.5g/L (17.9 Q/ha) (**Table 124b**).

South Zone: Based on the pooled results (2020-21, 2021-22 and 2022-23) of the experiment conducted at **Lam, Guntur**, *Corynespora* leaf spot PDI was non-significant before spray. The minimum *Corynespora* leaf spot PDI was recorded in Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L (6.6% PDI) with the highest reduction over control (80.8%) followed by Metiram 55% + Pyraclostrobin 5% WG @ 2g/L (6.9% PDI) after third spray. Grey mildew PDI and reduction over control were statistically at par with each other among all treatments except copper oxychloride 50 % WP @ 2.5 g, Flonicamid @80g/acre or Diafenthiuron or Diafenthiuron and Fluvalinate. However, the highest grey mildew reduction over control was recorded in copper sulphate 47.15% + Mancozeb 30% WDG @ 5g/L (74.5%) and Captan 70 % + Hexaconazole 5 % WP @ 1.5g/L (74.3%) after second spray (**Table 125a-125b**). The rust was significantly reduced by Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @0.6g/L (9.7% PDI) followed by Propineb 70% WP @ 2.5g/L (12.7% PDI) and Captan 70% + Hexaconazole 5% WP @ 1.5g/L (12.8% PDI), respectively. The lowest PDI boll rot of was observed in Kresoxim methyl 44.3% SC @ 1 ml/L (0.8%) followed by Fluxapyroxad 167g/L + Pyraclostrobin 333g/L SC @ 0.6g/L (1.1%), Captan 70% + Hexaconazole 5% WP @ 1.5g/L (1.2%) and Propiconazole 25% EC @ 1 ml/L (1.2%) as compared to control (3.1% PDI), respectively. The highest yield of 19.0 Q/ha was recorded with Kresoxim methyl 44.3% SC @ 1 ml/L followed by Propiconazole 25% EC @1ml/L (18.9 Q/ha), Propineb 70% WP @ 2.5g/L (18.6 Q/ha), respectively (**Table 125c**).

Based on the pooled results (2020-21, 2021-22 and 2022-23) of the experiment conducted at **UAS Dharwad**, the highest reduction in *Alternaria* leaf blight was recorded by Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L (46.7%) followed by Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L (39.8%) and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC (36.7%), whereas, the highest reduction in the rust disease was observed with Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L (43.4%) followed by Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L (37.8%) and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC (32.6%) **(Table 126a)**. The highest reduction in the boll rot was achieved with the spray treatment of Fluxapyroxad 167

g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L (52.9%) followed by Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L (46.9%) and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC (39.1%). The highest yield was recorded in the spray treatment of Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L (18.1 Q/ha) followed by Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L (18.0 Q/ha) and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC (16.1 Q/ha) (**Table 126b**).

Overall conclusion:

North Zone:

For management of fungal foliar spots (FFS) **at Bathinda, Punjab**, Kresoxim methyl 44.3% SC @ 1 ml/L, Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1 ml/L and Captan 70 % + Hexaconazole 5 % WP @ 1.5 g/L found superior over other treatments.

At Hisar, Haryana for boll rot management 2-3 sprays of Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L, Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L, Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1ml/L or propineb 70%WP @2.5 g/L found superior over other treatments.

Central Zone:

At Surat, Gujarat, for management of BLB Copper oxychloride 50 % WP @ 2.5 g, Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L and Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L were found superior over other treatments.

For Boll rot management at Surat, Gujarat, copper oxychloride 50 % WP @ 2.5 g/L, Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L and Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L were found superior over other treatments.

At Nanded, Maharashtra, for management of Alternaria Leaf blight, Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L, Metiram 55% + Pyraclostrobin 5% WG @ 2g/L and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1ml/L were found superior over other treatments. At Nanded, Maharashtra, for management of grey mildew Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6g/L, Kresoxim methyl 44.3% SC @1ml/L and Metiram 55% + Pyraclostrobin 5% WG @ 2g/L were found superior over other treatments.

At Nagpur, Maharashtra, for management of boll rot copper oxychloride 50 % WP @ 2.5 g/L, copper sulphate 47.15% + Mancozeb 30% WDG @ 5g/L and Captan 70 % + Hexaconazole 5 % WP @ 1.5g/L were found superior over other treatments. For management of Corynespora leaf spot disease at Nagpur, Maharashtra, Captan 70 % + Hexaconazole 5 % WP @ 1.5g/L, and copper oxychloride 50 % WP @ 2.5 g/L were found superior over other treatments. For management of grey mildew at Nagpur, Maharashtra, Kresoxim methyl 44.3% SC @ 1 ml/L, Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L and Propiconazole 25% EC @ 1ml/L were found superior over other treatments.

South Zone

At **Lam, Guntur**, Andhra Pradesh, for management of *Corynespora* leaf spot, Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/L SC @ 0.6 g/L, Metiram 55% + Pyraclostrobin 5% WG @ 2g/L and Propineb 70% WP @ 2.5g/L were found superior over other treatments. For management of Grey mildew at Guntur, Andhra Pradesh, Copper sulphate 47.15% + Mancozeb 30% WDG @ 5g/L, Captan 70 % + Hexaconazole 5 % WP @ 1.5g/L, Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC and Propineb 70% WP @ 2.5g/L (12.7% PDI) were found superior over other treatments. For management of rust disease at Guntur, Andhra Pradesh, Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @0.6g/L, Propineb 70% WP @ 2.5g/L or Captan 70% + Hexaconazole 5% WP @ 1.5g/L were found superior over other treatments. For management of boll rot at Guntur, Andhra Pradesh, Kresoxim methyl 44.3% SC @ 1 ml/L, Fluxapyroxad 167g/L + Pyraclostrobin 333g/L SC @ 0.6g/L,

Captan 70% + Hexaconazole 5% WP @ 1.5g/L and Propiconazole 25% EC @ 1 ml/L were found superior over other treatments.

At **UAS Dharwad**, Karnataka, for management of *Alternaria* leaf blight was recorded by Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L, Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC was found superior over other treatments. For management of rust disease at Dharwad, Karnataka, Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L, Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L (37.8%) and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC was found superior over other treatments. For management of boll rot at Dharwad, Karnataka, Fluxapyroxad 167 g/Litre + Pyraclostrobin 333 g/Litre SC @ 0.6 g/L, Metiram 55% + Pyraclostrobin 5% WG @ 2 g/L (46.9%) and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC was found superior over other treatments.

Agron. V: Technology for organic cotton production

Junagarh (G. Cot. 38): Percent disease intensity of bacterial leaf blight and *Alternaria* leaf spot for 1 to 11 treatments results were statistically nonsignificant. For the *Alternaria* leaf spot minimum disease intensity of 31.7% was recorded in treatments T4, T10, T7 and T5 whereas, maximum disease intensity was recorded in treatments T6, T1 and T2. The lowest BLB was recorded in the treatment T5, T7 and T11, and medium PDI of BLB was recorded for all treatments. However, all the treatments were nonsignificant. Wilt, Root rot and grey mildew were not observed during the season **(Table 127)**.

Surat (G. Cot. 20): In this experiment, a total of eleven different treatment combinations including control were evaluated against the Bacterial leaf blight, *Corynespora* leaf spot disease. Out of all treatments, in treatment T5, and combinations of these treatments T9, and T10, lower bacterial leaf blight severity was observed. Whereas in the case of *Corynespora* leaf spot disease, all the treatment combinations were disease-free from the infection (**Table. 128**).

Agron. Standardization of geometry for Bt varieties

Junagarh: Among different intercropping systems the lowest incidence of *Corynespora* disease severity was recorded in the Sole Bt cotton with a spacing of 120 X 45 cm followed by recommended intercropping Cotton and Sesamum one row each (1:1) with a spacing of 120 X 45 cm, Farmers practice having cotton and sesamum one row each (1:1) with a spacing of 150 x 30 cm ATM and Paired row planting of Bt cotton showed lowest disease severity (**Table 129**).

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Research Findings: AICRP on Cotton-Plant Pathology (2022-23)
Path.1. Observations on the occurrence of the diseases (in farmer's fields and research farms)

NORTH ZONE
Path1 (a): Observations on the occurrence of various diseases (in farmer's fields and research farms)

Table 1a: Observations on the occurrence of cotton diseases at farmer's fields in Faridkot, Fazilka, Muktsar area (Punjab)

Sr. No.	District/ Place	Variety/ Hybrid	Stage of sampling								
			Percent Disease Intensity (PDI)								
			Early season/Seedling (20-30 DAS)			Mid-season/Flowering (60-80 DAS)			Late/ Boll development (120-150 DAS)		
			BLB	FFLS	CLCuD	BLB	MLS	CLCuD	BLB	MLS	CLCuD
	Name of the District										
I.	**Faridkot**										
1	Gondara	RCH 776, RCH 926,	0	0	0	0	0	8.6	0	7.8	18.5
2	Kothe Chandbhan	RCH 773, RCH 776	0	0	0	0	0	11.9	0	2.5	26.3
3	Sewe wala	RCH 773, RCH 776	0	0	0	0	0	12.3	0	4.0	22.7
4	Chand Bhan	RCH 773, RCH 776, Sim Sim	0	0	0	0	0	15.2	0	2.5	37.1
5	Bishnandi	RCH 773, RCH 776	0	0	0	0	0	17.2	0	3.8	40.5
6	Karirwali	RCH 773, RCH 776, US 51	0	0	0	0	0	12.9	0	4.5	25.2
7	Pakka	RCH 773, RCH 776	0	0	0	0	0	13.8	0	6.3	28.6
8	Sukhan wala	RCH 773, RCH 776,	0	0	0	0	0	11.0	0	8.8	24.3
9	Sadik	RCH 773, RCH 776	0	0	0	0	0	14.2	0	3.8	33.8
10	Sandhwan	RCH 773, RCH 776	0	0	0	0	0	16.2	0	4.5	39.5
11	Kingra	RCH 773, RCH 776, Balraj	0	0	0	0	0	10.5	0	5.5	25.3
12	Bihle wala	RCH 773, RCH 776	0	0	0	0	0	11.7	0	7.0	26.7
		Average	**0**	**0**	**0**	**0**	**0**	**13.0**	**0**	**5.1**	**29.0**
II.	**Fazilka**										
1	Abohar	RCH 773, RCH 776, RCH 926, ACH177	0	0	0	0	0	12.9	0	3.8	39.5
2	Kundal	RCH 773, RCH 776, Balraj	0	0	0	0	0	13.8	0	4.0	30.5
3	Churian wala	RCH 926, RCH 776, RCH 653	0	0	0	0	0	17.6	0	6.5	40.0
4	Khiapan wali	RCH 926, RCH 653	0	0	0	0	0.6	9.5	0	7.0	20.7

5	Roop nagar	RCH 773, RCH 776, ACH 177, US 51	0	0	0	0	0	17.6	0	5.5	36.7
6	Panjkosi	RCH 773, RCH 776, RCH 653	0	0	0	0	0.5	15.4	0	6.0	33.3
7	Patre wala	RCH 773, RCH 653	0	0	0	0	0	11.3	0	7.5	25.0
8	Hari pura	RCH 773, RCH 926	0	0	0	0	0	18.1	0	9.5	28.6
9	Dangar khera	RCH 773, RCH 776, RCH 653, ACH 177	0	0	0	0	0	14.3	0	8.0	31.9
10	Balluana	RCH 773, RCH 776, RCH 653	0	0	0	0	0	20.3	0	3.8	42.9
11	Telu pura	RCH 773, RCH 776	0	0	0	0	0	19.1	0	2.5	45.2
12	Gobindgarh	RCH 773, RCH 776, ACH 177	0	0	0	0	0	12.9	0	6.0	38.6
13	Khuikhera	RCH 773, RCH 776, RCH 653	0	0	0	0	0	10.4	0	8.8	22.9
		Average	**0**	**0**	**0**	**0**	**0.1**	**14.9**	**0**	**6.1**	**33.5**
III.	**Muktsar**										
1	Muktsar	RCH 773, RCH 776	0	0	0	0	0	18.6	0	2.5	41.7
2	Balam garh	RCH 926, RCH 776, ACH 177	0	0	0	0	0	6.7	0	4.0	13.8
3	Ramgarh	RCH 773, RCH 776, RCH 653	0	0	0	0	0	16.8	0	6.5	27.6
4	Goniana	RCH 773, RCH 653, Balraj	0	0	0	0	0	9.1	0	7.5	20.5
5	Bhagsar	RCH 926, RCH 776, ACH 177	0	0	0	0	0	8.3	0	8.0	19.5
6	Sherewala	RCH 773, RCH 776	0	0	0	0	0	16.7	0	5.0	31.9
7	Enakhera	RCH 773, RCH 776, US 51	0	0	0	0	0	15.2	0	7.5	29.5
8	Kabarwala	RCH 773, RCH 776	0	0	0	0	0	11.5	0	8.8	26.7
9	LubaniaWali	RCH 773, RCH 776	0	0	0	0	0	17.1		4.5	42.9
10	Rahurianwali	RCH 773, RCH 776, Balraj, Simsim	0	0	0	0	0	12.4	0	3.8	27.6
		Average	**0**	**0**	**0**	**0**	**0**	**13.2**	**0**	**5.8**	**28.2**
		Overall average	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**13.7**	**0**	**5.6**	**30.2**

Table1b: Observations on the occurrence of cotton diseases at research farm (RRS-PAU Faridkot)

Days after sowing	Bt hybrids/ Varieties	CLCuD (PDI)
60	PAU Bt 1, PAU Bt 2, PAU Bt 3, F 1861, F 846, F 1378, F 2164, F 2383, F 505, F 1054, F 2381 F2228, RST 9, HS 6, RCH 773, RCH 776, ACH 177, US 51, NCS 9013	7.5
75		14.7
90		32.1
105		41.5
120		45.3
Average		**28.2**

Table 2a: Observations on the occurrence of cotton diseases at farmer's fields in Bathinda, Maur, Talwandi sabo, Sangat, Nathana & Rampura (Punjab)

Sr. No.	District/ Block/ Place surveyed	Variety/ Hybrid	Stage of sampling																	
			Percent Disease Intensity (PDI)																	
			May- June						July -August						September -October					
			Early season/Seedling (20-30 DAS)						Mid-season/Flowering (60-80 DAS)						Late/ Boll development (120-150 DAS)					
			CLCuD	FFLS	BLB	Root rot (%)	Parawilt (%)	Boll rot (%)	CLCuD	FFLS/MLS	BLB	Root rot (%)	Parawilt (%)	Boll rot (%)	CLCuD (Incidence %)	FFS/MLS	BLB	Root rot (%)	Parawilt (%)	Boll rot (%)
	Bathinda District																			
Block -Bathinda																				
1	Chak Ruldu Singh Wala	RCH 773	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0	0.0	0.0	0.0	0.0	90.0	2.5	0.0	0.0	0.0	0.0
2	Ghudda	RCH 776, US51	4.2	0.0	0.0	0.0	0.0	0-2	17.5	0.0	0.0	0-2	0.0	0.0	64.2	1.4	0.0	0.0	0.0	0-2
3	Kotshamir	RCH 776	10.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	95.0	2.2	Traces	0.0	0.0	0.0
4	Bathinda	RCH 776, RCH 773	7.5	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0	0-2	0-5	0.0	85.8	2.3	0.9	0.0	0.0	0-2
5	Jodhpur Romana	RCH 773	0.0	0.0	0.0	0.0	0.0	0.0	11.7	0.0	0.0	0.0	0-5	0-2	96.7	1.7	0.7	0.0	0.0	0-3
		Average	**4.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**20.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**86.3**	**2.0**	**0.4**	**0.0**	**0.0**	**0.0**
Block-Maur																				
6	Bhai Bakhtaur	Pink Rakshak (4G), Manak -2 Plus(4G), NCS 495, RCH 773	10.4	0.0	0.0	0.0	0.0	0.0	31.7	0.2	0.0	0.0	0.0	0.0	79.6	2.8	0.9	0.0	0.0	0.0
7	Raikhana	RCH 773, RCH 776	4.2	0.0	0.0	0.0	0.0	0.0	13.4	0.0	0.0	0-2	0-5	0.0	75.0	1.7	Traces	0.0	0.0	0.0
8	Mansakhurd	RCH 773, RCH 650	6.7	0.0	0.0	0.0	0.0	0.0	32.5	0.0	0.0	0.0	0-2	0.0	75.0	4.3	2.3	0.0	0.0	0-2

9	Manakkhana	RCH 773, RCH 776	5.0	0.0	0.0	0.0	0.0	0.0	38.4	Traces	0.0	0.0	0.0	0-2	72.5	3.1	0.9	0.0	0.0	0-5
10	Chanarthal	NCS 495, RCH 650	5.8	0.0	0.0	0.0	0.0	0-2	26.7	0.0	0.0	0.0	0.0	0.0	75.0	0.9	0.7	0.0	0.0	0.0
11	Yatri	Pink Rakshak (4G), Pink MahaRakshak (5G), RCH 773	15.0	0.0	0.0	0.0	0.0	0-2	48.3	0.0	0.0	0.0	0.1	0-5	81.1	4.8	1.8	0.0	0.0	0.0
12	Jodhpur Pakhar	RCH 773	0.0	0.0	0.0	0.0	0.0	0.0	38.3	0.0	0.0	0.0	0-2	0.0	95.0	5.0	2.5	0.0	0.0	0-2
13	Maesar Khana	RCH 773	0.0	0.0	0.0	0.0	0.0	0.0	46.7	0.0	0.0	0.0	0.0	0.0	98.3	1.7	3.0	0.0	0.0	0.0
14	Ramnagar	RCH 776, NCS495	5.8	0.0	0.0	0.0	0.0	0.0	27.5	0.0	0.0	0.0	0.0	0.0	84.2	5.9	2.1	0.0	0.0	0.0
13	Sandoha	US 81	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	95.0	4.5	1.7	0.0	0.0	0.0
14	Chathewala	RCH 776	0.0	0.0	0.0	0.0	0.0	0.0	38.3	0.0	0.0	0.0	0.0	0.0	91.7	6.1	4.0	0.0	0.0	0.0
15	Natt	RCH 776	6.7	0.0	0.0	0.0	0.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	75.0	6.8	1.2	0.0	0.0	0.0
16	Burj Sema	RCH 773	5.0	0.0	0.0	0.0	0.0	0-5	53.3	0.0	0.0	0.0	0.0	0.0	95.0	4.5	2.5	0.0	0.0	0.0
17	Kotfatta	RCH 773	0.0	0.0	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0	0.0	0.0	96.7	8.7	3.0	0.0	0.0	0.0
18	Kotbhara	RCH 776	8.3	0.0	0.0	0.0	0.0	0.0	36.7	0.0	0.0	0.0	0.0	0.0	90.0	11.3	4.5	0.0	0.0	0.0
19	Ramgarh Bhoonder	RCH 776	3.3	0.0	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0	0.0	0.0	96.7	12.3	4.0	0.0	0.0	0.0
20	Ram Nagar	NCS 495, Gujarati Bullet	11.7	0.0	0.0	0.0	0.0	0.0	49.2	0.0	0.0	0.0	0.0	0.0	85.0	5.8	3.8	0.0	0.0	0.0
21	Rajgarh Khubbe	RCH 773, RCH 776	10.9	0.0	0.0	0.0	0.0	0.0	39.2	0.0	0.0	0.0	0-2	0.0	76.7	7.7	3.3	0.0	0.0	0.0
22	Sandoha	RCH 773	5.0	0.0	0.0	0.0	0.0	0.0	58.3	0.0	0.0	0.0	0.0	0.0	96.7	2.2	0.7	0.0	0.0	0.0
		Average	**5.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**37.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**86.0**	**5.3**	**2.4**	**0.0**	**0.0**	**0.0**
Block – Talwandi Sabo																				
25	Nasibpura	RCH 773	8.3	0.0	0.0	0.0	0.0	0.0	41.7	0.0	0.0	0.0	0.0	0-5	88.3	4.0	1.2	0.0	0.0	0-5
26	Shekhpura	RCH 773, RCH 650, US 51	6.7	0.0	0.0	0.0	0.0	3.5	37.8	1.7	0.0	0.0	0-2	0.0	78.9	9.1	2.7	0.0	0.0	3.5

27	Jewan singh wala	RCH 776, US 81	6.7	0.0	0.0	0.0	0.0	0.0	33.4	0.0	0.0	0.0	0.0	0.0	91.7	11.8	6.8	0.0	0.0	0.0
28	Bhagi bander	RCH 776, SP 7172	2.5	0.0	0.0	0.0	0-2	0.0	24.2	0.0	0.0	0.0	0.0	0.0	90.9	8.0	3.4	0.0	0.0	0.0
29	Jaga Ram Tirth	RCH 776, US 71	5.8	0.0	0.0	0.0	0.0	0.0	31.7	0.0	0.0	0.0	0.0	0.0	93.4	5.4	2.1	0.0	0.0	0.0
		Average	**6.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.7**	**33.7**	**0.3**	**0.0**	**0.0**	**0.0**	**0.0**	**88.6**	**7.7**	**3.2**	**0.0**	**0.0**	**0.9**
Block – Sangat																				
30	Sangat Mandi	RCH 773, NCS 495	5.8	0.0	0.0	0.0	0.0	0-2	33.4	0.0	0.0	0.0	0-2	0.0	91.7	1.9	3.3	0.0	0.0	0-2
31	Singho	RCH 773	10.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	96.7	4.0	2.2	0.0	0.0	0.0
32	Gursar Sainewala	RCH 773, RCH 776	7.5	0.0	0.0	0.0	0.0	0.0	25.9	0.0	0.0	0.0	0.0	0.0	92.5	7.8	3.8	0.0	0.0	0.0
33	ChakRuldu Singh Wala	RCH 773, RCH 776	2.5	0.0	0.0	0.0	0.0	0.0	28.4	0.0	0.0	0.0	0.0	0.0	92.5	3.3	0.4	0.0	0.0	0.0
34	Sangat	RCH 773	6.7	0.0	0.0	0.0	0.0	0.0	36.7	0.0	0.0	0.0	0.0	0.0	95.0	3.0	0.2	0.0	0.0	0.0
		Average	**6.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**31.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**93.7**	**4.0**	**2.0**	**0.0**	**0.0**	**0.0**
Block -Nathana																				
35	Bhuchookhurd	RCH 773	3.3	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	91.7	2.7	0.7	0.0	0.0	0.0
36	Chak Fateh Singh Wala	RCH 773	5.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0-2	0.0	90.0	8.3	4.0	0.0	0.0	0.0
37	Chak Ram Singh Wala	RCH 773	6.7	0.0	0.0	0.0	0.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0	88.3	1.2	Traces	0.0	0.0	0.0
38	Nathana	US 51	8.3	0.0	0.0	0.0	0.0	0.0	26.7	0.0	0.0	0.0	0.0	0.0	50.0	1.7	0.2	0.0	0.0	0.0
39	Bibiwala	RCH 773, RCH 776	10.9	0.0	0.0	0.0	0.0	0-2	38.4	0.0	0.0	0.0	0.0	0.0	89.2	3.8	1.7	0.0	0.0	0-5
		Average	**6.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**30.7**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**81.8**	**3.5**	**1.6**	**0.0**	**0.0**	**0.0**
Block -Rampura																				
40	Khokhar	RCH 773	3.3	0.0	0.0	0.0	0.0	0.0	26.7	0.0	0.0	0.0	0.0	0.0	88.3	1.7	Traces	0.0	0.0	0.0
41	Ramnagar (Bhullar Dhani)	RCH 776	5.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	66.7	2.5	0.2	0.0	0.0	0-2
42	Dhadde	RCH 776, US 71	5.0	0.0	0.0	0.0	0.0	0.0	33.4	0.0	0.0	0.0	0.0	0.0	54.2	1.7	0.2	0.0	0.0	0.0
43	Rampura	RCH 776	6.7	0.0	0.0	0.0	0.0	0-2	41.7	0.0	0.0	0.0	0.0	0.0	90.0	1.8	Traces	0.0	0.0	0.0

44	Bhunder	RCH 776, US 71	6.7	0.0	0.0	0.0	0.0	0.0	47.5	0.0	0.0	0.0	0.0	0.0	51.7	2.8	0.9	0.0	0.0	0.0
		Average	**5.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**34.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**70.2**	**2.1**	**0.4**	**0.0**	**0.0**	**0.0**
		Overall average	**5.7**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**31.5**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**84.4**	**4.1**	**1.7**	**0.0**	**0.0**	**0.1**

Table 2b: Observations on the occurrence of cotton diseases at the research farm of ARS PAU Bathinda (Punjab)

DAS	Date/Month	Mean Percent Disease Intensity (PDI)											
		BLB				CLCuD				MLS			
		RCH 773	RCH 776	US 51	Ajeet 133	RCH 773	RCH 776	US 51	Ajeet 133	RCH 773	RCH 776	US 51	Ajeet 133
60	June-08	1.2	1.2	1.0	0.7	5.0	1.7	3.3	1.7	2.2	2.5	1.7	1.5
75	June-23	2.5	2.3	2.7	1.2	35.0	31.7	36.7	18.3	13.0	7.3	4.0	2.5
90	July-08	5.0	3.0	4.0	2.7	50.0	50.0	50.0	36.7	15.0	8.7	7.3	4.0
105	July-23	6.8	4.5	5.5	3.0	68.3	68.3	71.7	48.3	16.0	11.3	8.7	7.3
120	Aug-08	7.0	5.0	6.5	4.0	90.0	75.0	81.7	53.3	16.3	14.0	13.0	8.7
135	Aug-23	7.5	5.2	7.0	4.5	100.0	93.3	93.3	65.0	17.0	14.3	14.3	11.3
150	Sep-08	9.0	6.5	8.0	5.0	100.0	96.7	96.7	76.7	18.5	15.0	15.7	13.0
	Average	**5.6**	**4.0**	**5.0**	**3.0**	**64.0**	**59.5**	**61.9**	**42.9**	**14.0**	**10.5**	**9.2**	**6.9**

Table 3a: Observations on the occurrence of CLCuD at farmer's fields in Sriganganagar and Hanumangarh (Rajasthan)

S.No.	Districts/ Locations surveyed	Bt hybrids/ varieties	Stage of sampling								
			CLCuD-Percent Disease Intensity (PDI)								
			Early season/Seedling (20-30 DAS)			Mid-season/Flowering (60-80 DAS)			Late season/Boll development (120-150 DAS)		
			Incidence (%)	PDI	Disease Range	Incidence (%)	PDI	Disease Range	Incidence (%)	PDI	Disease Range
	District: Sriganganagar										
1	Kaliyan	**RCH773**	15.0	2.5	0.0-5.0	54.0	16.9	15.0-28.3	80.0	29.9	20.0-36.7
2	Khatlabana	**RCH 776**	12.0	2.0	0.0-3.3	78.0	27.2	20.0-36.7	87.0	32.6	23.3-46.7
3	Fatuhi	**RCH 926**	9.0	1.5	0.0-5.0	50.0	18.1	8.3-26.7	86.0	28.5	20.0-35.0
4	Khakha	**ACH 177**	23.0	3.8	0.0-6.7	58.0	23.2	10.0-33.3	92.0	33.7	20.0-41.7
5	Renuka	**NCS 9013**	16.0	2.7	0.0-6.7	55.0	20.4	5.0-21.7	94.0	30.9	13.3-26.7
6	Madera	**RCH 650**	18.0	3.0	0.0-6.7	52.0	20.2	6.7-33.3	77.0	**34.1**	15.0-33.3
7	Budharwali	**SP7172**	0.0	0.0	-	61.0	13.8	8.3-25.0	71.0	20.5	10.0-33.3
8	Patli	**Ankur**	0.0	0.0	-	40.0	15.6	10.0-25.0	82.0	21.3	11.7-31.7
9	30KSD	**Ajay**	0.0	0.0	-	67.0	15.1	8.3-25.0	81.0	22.4	11.7-30.0
10	Gadarkheda	**Balraj**	0.0	0.0	-	64.0	10.5	6.7-21.7	75.0	19.8	10.0-36.7
		Average	**9.3**	**1.6**	**0.0-6.7**	**57.9**	**18.1**	**5.0-36.67**	**82.5**	**27.2**	**11.7-46.7**
	District: Hanumangarh										
11	Bolanwali	**RCH773**	0.0	0.0	-	52.0	20.2	11.7-26.7	81.0	**23.5**	20.0-38.3
12	Nagrana	**RCH 776**	0.0	0.0	-	41.0	8.3	3.3-18.3	75.0	14.4	10.0-20.0
13	Bhagatpura	**RCH 926**	0.0	0.0	-	62.0	12.8	10.0-21.7	72.0	15.8	15.0-33.3
14	Deengarh	**ACH 177**	0.0	0.0	-	67.0	13.3	3.3-18.3	74.0	17.2	11.7-23.3
15	Haripura	**NCS 9013**	0.0	0.0	-	63.0	12.5	6.7-16.7	76.0	18.3	13.3-36.7
16	2HRP	**RCH 650**	0.0	0.0	-	66.0	12.4	3.3-26.3	78.0	17.7	13.3-30.0
17	Jandwali	**SP7172**	0.0	0.0	-	54.0	10.9	8.3-16.7	67.0	14.5	10.0-23.3
18	Rodawali	**Sim-Sim**	0.0	0.0	-	57.0	11.3	6.7-28.3	66.0	12.6	8.3-25.0
19	Nathwana	**Pass Pass**	0.0	0.0	-	60.0	14.8	5.0-20.0	72.0	15.8	8.3-30.0
20	Munda	**Balwan**	0.0	0.0	-	50.0	4.1	1.7-10.0	59.0	12.1	5.0-21.7
		Average	**0.0**	**0.0**		**57.2**	**12.1**	**1.7-28.3**	**72.0**	**16.2**	**5.0-38.3**
	Overall average		**4.6**			**57.6**	**15.1**	**1.7-36.7**	**77.2**	**21.7**	

Table 3b: Observations on the occurrence of CLCuD at ARS-SKRAU Sriganganagar (Rajasthan)

Bt hybrids/varieties	CLCuD -Percent Disease Intensity (PDI)															
	60 DAS			75 DAS			90 DAS			105 DAS			120 DAS			Average
	Incidence (%)	PDI	Disease Range	Incidence (%)	PDI	Disease Range	Incidence (%)	PDI	Disease Range	Incidence (%)	PDI	Disease Range	Incidence (%)	PDI	Disease Range	PDI
RCH773, US 51, NCS9013, NSPL531, RS2013, RST-9, HS-6, F846, F2228, CSH 3075	45	10.8	3.3 - 16.6	74	22.4	11.6 - 30.0	96	29.7	15.0 - 41.6	99	36.2	23.3 - 46.6	100	38.4	25.0 - 48.3	**27.5**

Table 4a: Observations on the occurrence of cotton diseases at Farmers fields in Hisar, Fatehabad, Sirsa, Jind, Bhiwani and Mahendergarh districts (Haryana)

Sr. No.	District/Village	Bt hybrids	Stage of Sampling							
			Per cent Disease Intensity (PDI)							
			Mid-Season/ Flowering (60-80 DAS)				Late/Boll development (120-150 DAS)			
I	**Hisar**		**CLCuD**	**SM**	**MLS**	**RR**	**CLCuD**	**SM**	**MLS**	**RR**
1	Kallar Bhaini	RCH-773, US-51	1.6	0	0.0	0.7	36.7	8.0	6.2	2.6
2	Khedar	BIO -6688, RCH-773	1.6	0	0.1	1.6	38.3	13.0	4.8	2.4
3	Kherampur	RCH-776, US-51,	3.3	0	0.8	1.0	41.7	10.2	5.2	2.2
4	Bojraj	US 91, RCH 776,	8.3	0	1.0	2.0	43.3	15.8	2.0	3.1
5	Nalwa	RCH 773, US 51	5.0	0	0.5	1.0	41.7	9.2	6.2	4.2
6	Dhansu	RCH 650, 773	13.3	0	1.0	2.0	45.0	27.6	5.0	2.2
7	Badhawad,	Us-91, RCH 773	5.0	0	1.0	1.0	36.7	7.3	9.2	3.2
8	Balawas	US-51, Krishana 555	1.6	0	0.3	1.5	40.0	10.8	2.4	2.5
9	Mehalsara	Rch-773, US 51	6.7	0	0.2	1.2	43.3	15.5	4.2	2.3
10	Sarangpur	RCH 776, US 51	3.3	0	0.1	2.6	41.7	7.0	12.0	3.5
11	Dhamana	Rch-773, BIO 6488	5.0	0	0.8	1.8	36.7	5.5	6.2	1.8
12	Umra	RCH 776, US 51	6.7	0	0.5	1.0	43.3	15.2	2.4	2.2
13	Bhagana	RCH-773, BIO 6317	3.3	0	0.7	0.9	38.3	8.5	10.5	5.2
14	Khara kheri	BIO 6488, US 51	8.3	0	0.2	1.4	36.7	6.4	7.5	2.5
15	Ludas	RCH -773,776	11.6	0	1.0	1.6	35.0	20.5	11.2	5.2
		Average	**5.6**	**0**	**0.6**	**1.4**	**39.9**	**12.0**	**6.3**	**3.0**
II	**Fatehabad**									
1	Dhand	US 91 Krishana 555	3.3	0	0.8	0.0	35.0	11.1	2.4	1.0
2	Kirdhan	US 51, RCH 776	5.0	0	0.5	2.2	36.7	11.0	4.2	2.2
3	Chaplamori	RCH 773, 776	6.7	0	0.7	4.0	40.0	10.0	6.2	5.0
4	Badopal	US 51, RCH 773,	3.3	0	0.2	5.0	41.7	8.4	4.0	6.0
5	Pili Mandori	RCH 776, BIO 6688	8.3	0	1.0	0.0	36.7	12.0	3.0	2.3
6	Mehuwala	RCH 650, 773	3.3	0	0.8	0.0	36.7	7.0	5.0	5.0

7	Dhangar	RCH 773, 776	5.0	0	0.5	3.0	40.0	8.0	7.5	1.6
8	Bhodiakhera	RCH 773, Local Var	11.6	0	1.0	1.5	43.3	10.8	5.2	2.2
9	Khratikhera	US 91, RCH 776,	8.3	0	0.3	1.2	41.7	10.0	2.0	5.0
10	Dariyapur	BIO 6588, RCH 773	11.6	0	0.2	2.6	45.0	15.5	6.2	2.5
		Average	**6.7**	**0**	**0.6**	**2.0**	**39.7**	**10.4**	**4.6**	**3.3**
III	**Sirsa**									
1	Kheri	Balraj, RCH 773	3.3	0	2.0	1.0	11.7	0.2	2.0	2.0
2	Gigorani	US-91, RCH-776	5.0	0	1.5	3.0	18.3	1.0	3.0	3.0
3	Randhawa	BIO 6317, US 51	6.7	0	1.0	2.0	15.0	0.4	3.0	2.0
4	Thuain	RCH 776, 773	3.3	0	0.0	4.0	13.3	0.2	6.0	4.0
5	Chaharwala	RCH-773, RCH 650	8.3	0	2.5	2.5	11.7	0.1	2.5	2.5
6	Dhani Sherawali	RCH 773, Balraj	3.3	0	0.0	0.0	16.7	0.2	1.0	0.0
		Average	**5.0**	**0**	**1.2**	**2.1**	**14.4**	**0.4**	**2.9**	**2.3**
IV	**Jind**									
1	Kasoon	RCH 773, 776	11.6	0	1.0	1.0	40.0	11.1	2.4	5.0
2	Kheri Saffa	RCH 773, 650	8.3	0	0.5	1.5	43.3	11.0	4.2	1.6
3	Litani	RCH-650, BIO-6588	11.6	0	1.0	1.2	41.7	10.0	6.2	2.2
4	Danoda	RCH-773, 776	8.3	0	1.0	2.6	35.0	8.4	4.0	5.0
5	Kapro	RCH 650, 776	16.6	0	0.3	1.8	55.0	12.0	3.0	2.5
6	Gyanpura	US-51, RCH-773	14.9	0	0.2	1.0	45.0	7.0	5.0	2.3
7	Khapada	RCH 776, 602	6.7	0	0.1	0.9	38.3	8.0	7.5	5.0
8	Raj Khera	RCH 650, BIO 6588	5.0	0	0.8	1.4	36.7	11.1	2.4	1.6
		Average	**10.4**	**0**	**0.6**	**1.4**	**41.9**	**9.8**	**4.3**	**3.2**
V	**Bhiwani**									
1	Ratera	RCH 773, 776	0	0	0.2	1.4	5.0	0.0	0.2	0.4
2	Bawani khera	US 51, BIO 6317	0	0	0.5	1.0	6.7	0.0	1.0	0.1
3	Rhonat	RCH 776, 773	0	0	1.0	0.0	3.3	0.0	0.4	0.0
4	Sipper	RCH 602, 776	0	0	0.1	1.0	8.3	0.0	0.2	0.0
5	Siwani,	RCH 650, RCH 653	0	0	0.3	0.0	3.3	0.1	0.1	0.0
6	Mitthi	RCH 773, BIO 6588	0	0	0.2	2.0	5.0	0.1	0.2	1.0
7	Singhani	RCH 650, 776	0	0	0.1	1.2	5.0	0.0	0.2	3.2

8	Kishkindha	RCH 773650	0	0	0.8	1.2	6.7	0.0	1.0	5.2
9	Chandawas	RCH 602, Bio 6317	0	0	0.2	1.2	3.3	0.0	0.4	5.2
10	Siwani	RCH 773, BIO 6588	0	0	1.0	0.0	8.3	0.0	0.2	0.0
11	Surpura	US 51, BIO 6317	0	0	0.5	0.0	3.3	0.0	0.1	0.2
12	Jadid	RCH 773, 776	0	0	0.4	1.0	5.0	0.0	0.2	0.0
13	Paju	RCH 773, BIO 6588	0	0	1.0	0.0	5.0	0.1	0.2	0.5
14	Kasni	US 51, BIO 6317	0	0	0.3	0.0	6.7	0.1	1.0	0.2
15	Mandhan	RCH 773, Balraj	0	0	0.2	0.0	3.3	0.0	0.4	0.4
		Average	**0**	**0**	**0.5**	**0.7**	**5.2**	**0.0**	**0.4**	**1.1**
VI	**Mahendergarh**									
1	Sarai	RCH 773, 776	0	0	0.1	0.0	3.3	0.1	0.4	0.0
2	Surani	RCH 773, Balraj	0	0	0.3	0.0	6.3	0.0	0.2	0.2
3	Gujjarwas	RCH 650, 776	0	0	0.2	1.0	3.3	0.0	0.1	0.0
4	Bhojawas	RCH 773, BIO 6588	0	0	0.1	0.0	5.0	0.0	0.2	0.0
5	Ateli	US 51, BIO 6317	0	0	0.8	0.0	5.0	0.0	0.2	0.2
6	Tigra	RCH 773, 776	0	0	0.2	0.0	6.7	0.0	0.0	0.0
7	Bachhod	Ankur 3028, US 51	0	0	0.1	0.0	3.3	0.0	0.4	0.0
8	Chandpura	RCH 776, US 51	0	0	0.3	0.0	3.3	0.1	0.4	0.2
9	Begpur	RCH 773, RCH 650	0	0	0.2	1.0	3.3	0.0	0.2	0.0
10	Bhilwara	US 51, BIO 6317	0	0	0.1	0.0	3.3	0.0	0.1	0.1
11	Bajar	RCH 773, 776	0	0	0.8	0.0	5.0	0.0	0.2	0.2
		Average	**0**	**0**	**0.3**	**0.2**	**4.4**	**0.0**	**0.2**	**0.1**
	Overall average		**4.6**	**0.0**	**0.6**	**1.3**	**24.2**	**5.4**	**3.1**	**2.1**

CLCuD= Cotton leaf curl disease, SM=Sooty mold, MLS=Myrothecium leaf spot, RR= Root rot.

Table 4b: Observations on the occurrence of cotton diseases at research farm, CCS HAU, Hisar (Haryana)

Month	Hybrids (BG II)	Incidence (%)				Mean Percent Disease Intensity (PDI %)			
		CLCuD	SM	MLS	RR	CLCuD	SM	MLS	RR

June	RCH 773, 776, US 51	0.0	0.0	0.0	2.5	0.0	0.0	0.0	1.0
July	RCH 773, 776, US 51	22.5	0.0	2.0	10.5	11.7	0.0	1.0	3.0
August	RCH 773, 776, US 51	35.3	10.5	7.5	15.0	28.3	3.0	3.0	5.5
September	RCH 773, 776, US 51	71.5	20.3	15.5	12.5	55.0	10.0	5.0	4.0
October	RCH 773, 776, US 51	65.3	15.5	18.5.	6.5	51.7	11.7	4.7	4.5
	Average	**38.9**	**9.3**	**6.3**	**9.4**	**29.3**	**4.9**	**2.7**	**3.6**

CENTRAL ZONE

Table 5a: Observations on the occurrence of cotton diseases at farmer's fields in Nanded, Jalna, Parbhani, Hingoli and Aurangabad (Maharashtra)

S. No.	District/ Place	Variety/ hybrid	Stage of sampling											
			Percent Disease Intensity (PDI)											
			Early season/Seedling (20-30 DAS)			Mid-season/ Flowering (60-80 DAS)					Late / Boll development (120-150 DAS)			
			ALS	BLB	Root Rot	ALS	BLB	GM	Para-wilt	TSV	ALS	BLB	GM	Boll rot
A	**Nanded**													
	Londhe Sangvi Tq. Loha	Ajeet 328, KDS 726			0.5									
	Yeavati, Tq. Loha	Ajeet 155, Ajeet 328			0.1									
	Halda, Tq. kandhar	RCH 799			0.2									
	Shirad hone, Tq. kandhar	RCH 799			0.5/0.1									
	Barul, Tq. Kandhar	Ajeet 238			1.0									
	Adi, Tq,Loha	Ajeet 155					0.5		1.5					
	Tuppa Tq, Nanded	Paras bramha							2.5					
	Sarsam, Tq. Nanded	Rasi							15.0					
	Himayat nagar, Tq. Himayatnagar	Jadoo							10.0					
	Loha Tq. Loha	Ajeet-5				1.0		15.5	5.0					1.3
	Umri Tq. Hadgaon	Moksha				0.5		15.5	7.2					0.5
	Kandhar, Tq. Kandhar	Rasi											35.5	10.3
	Loha Tq, Loha	Moksha, Rasi											40.5	7.5
		Average	**-**	**-**	**0.5**	**0.8**	**0.5**	**15.5**	**6.9**	**-**	**-**	**-**	**38.0**	**4.9**
B	**Jalna**													
	Partur, Tq. Partur	Asha	-	-	-	-	1.5	-		0.3	-	-		5.0
C	**Parbhani**													

	Palam Tq Palam, Dist Parbhani	Moksha, Jaadoo, Jai Ho	-	-	-	0.5	5.0		7.0					
	Gangakhed Tq. Gangakhed, Dist Parbhani	Jadoo	-	-	-								41.3	7.5
D	**Aurangabad**													
	Phulambari Tq. Aurangabad	Dhandev	-	-	-		0.5	5.0	4.0	0.3				
	Chouka Tq. Aurangabad	Dhandev					0.5	0.5						
	Bandgaon, Tq. Kgyktabad	Dhandev						5.0						
	Gangapur, Tq, Gangapur	Ajeet -5								0.3				
		Average	**-**	**-**	**-**	**-**	**0.5**	**3.5**	**4.0**	**0.3**	**-**	**-**	**-**	**-**
E	**Hingoli**													
	Kalamnuri, Tq. Kalamnuri	Ajeet 155			0.5									
	Gondegon , Tq, Aundha Nagnath	Supercot						4.0						
	Sawonga, Tq. Hingoli	Ctt-29, Rasi 639						5.5						0.5
	Chelka, Tq. Hingoli	Neo, Rasi						5.5						0.5
		Average	**-**	**-**	**0.5**	**-**	**-**	**5.0**	**-**	**-**	**-**	**-**	**-**	**0.5**
	Overall average		**-**	**-**	**0.5**	**0.6**	**1.9**	**8.0**	**6.0**	**0.3**	**-**	**-**	**39.6**	**4.5**

ALS= Alternaria leaf spot; BLB= Bacterial blight; GM= Grey mildew

Table 5b: Observations on the occurrence of cotton diseases at research farm (CRS, Nanded)

Month	Hybrids (BG II)	Incidence (%)			Mean Percent Disease Intensity (PDI)		
		Boll Rot	TSV	ALS	BLB	GM	Boll Rot
June	RCH 659, RCH II, Jadoo BG II, NHH 44 BG II, NH 615, LRA 5166,						
July					0.5		
Aug.				1.5	5.0	Traces	
Sept.				2.5	5.8	5.5	
Oct.				4.8	-	27.8	
Nov.		-	-	-	-	-	7.0
Dec.		7.0	-	-	-	45.1	-
	Average	**7.0**		**2.93**	**3.77**	**26.1**	**7.0**

Table 6a: Observations on the occurrence of the cotton diseases at farmer's fields in Akola and Buldhana (Maharashtra)

Sr. No.	District/ Place	Variety/ Hybrid	Stage of sampling								
			Percent Disease Intensity (PDI)								
			Seedling (20-30 DAS)			Flowering (60-80 DAS)			Boll development (120-150 DAS)		
			BLB	GM	MLS	BLB	GM	MLS	BLB	GM	MLS
A	**Akola district**										
1	Kasali	First class BG II	-	-	-	-	-	-	6.1	-	-
		Ajeet 155 Bt	-	-	-	-	-	-	9.3	-	-
		Neo Bt BG II	-	-	-	-	-	-	13.9	9.3	7.8
2	Chachondi	Ajeet 155 Bt	-	-	-	-	-	-	14.3	11.3	13.9
		JadooBt	-	-	-	-	-	-	7.8	-	-
3	Danwada	Ajeet 155 Bt	-	-	-	-	-	-	11.3	12.2	-
		JadooBt	-	-	-	-	-	-	13.9	-	-

		First class BG II	-	-	-	-	-	-	7.8	18.5	6.1
4	Mathodi	First class BG II	-	-	-	-	-	-	12.2	-	-
		Ajeet 155 Bt	-	-	-	-	-	-	12.9	-	-
5	Ghusar	Ajeet 155 Bt	-	-	-	-	-	-	11.3	-	-
		Neo Bt BG II	-	-	-	-	-	-	9.3	-	-
		Average	**-**	**-**	**-**	**-**	**-**	**-**	**10.8**	**12.8**	**9.3**
		Range	**-**	**-**	**-**	**-**	**-**	**-**	**6.1-14.3**	**9.3-18.5**	**6.1-13.9**
B	**Buldhana district**										
6	Jawala	First class BG II	-	-	-	-	-	-	7.8	-	-
		Neo Bt BG II							13.9		
7	Mhagoan	Ajeet 155 Bt	-	-	-	-	-	-	13.9	14.6	-
		First class BG II	-	-	-	-	-	-	7.8	13.9	-
8	Tintra	Ajeet 155 Bt	-	-	-	-	-	-	12.2	-	-
		First class BG II	-	-	-	-	-	-	12.2	-	-
9	Jastgaon	Ajeet 155 Bt	-	-	-	-	-	-	13.9	-	13.9
		Bhakti Bt	-	-	-	-	-	-	15.8	8.8	-
		Average	**-**	**-**	**-**	**-**	**-**	**-**	**12.2**	**12.4**	**13.9**
		Range	**-**	**-**	**-**	**-**	**-**	**-**	**7.8-15.8**	**8.8-14.6**	**13.9**
		Overall average	**-**	**-**	**-**	**-**	**-**	**-**	**11.5**	**12.6**	**11.6**
		Overall Range	**-**	**-**	**-**	**-**	**-**	**-**	**6.1-15.8**	**8.8-18.5**	**6.1-13.9**

Table 6b: Observations on the occurrence of cotton diseases at research farm (CRS, Akola)

Hybrid/variety	Seedling (20-30 DAS)			Flowering (60-80 DAS)			Boll development (120-150 DAS)		
	BLB	GM	MLS	BLB	GM	MLS	BLB	GM	MLS
Ajeet -5 Bt	-	-	-	-	-	-	7.8	6.1	-
Rajat Bt	-	-	-	-	-	-	12.2	-	-
MallikaBt	-	-	-	-	-	-	13.9	2.8	-
Neo Bt BG II	-	-	-	-	-	-	9.3	-	-
PDKV JKAL-116	-	-	-	-	-	-	7.8	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**10.2**	**4.4**	**-**
Range	**-**	**-**	**-**	**-**	**-**	**-**	**7.8-13.9**	**2.8-6.1**	**-**

BLB- Bacterial leaf blight, GM- Grey Mildew, MLS-*Myrothecium* leaf spot

Table 7a: Observations on the occurrence of diseases in farmer's field in Surat, Bharuch and Narmada (Gujarat)

District/ Village/ GPS Location	Variety/ Hybrid	Stage of sampling (Percent Disease Intensity (PDI)								
		Seedling stage (20-30 DAS)			Flowering stage (60-80 DAS)			Boll development stage (120-150 DAS)		
		BLB	ALS	CoLS	BLB	ALS	CoLS	BLB	ALS	CoLS
Dist: Surat										
(Tal: Mangrol)										
1. Nandola 21.43'25" °N 73.23'68" °E	BG II	0.0	0.0	0.0	0.0-10.0	0.0	0.0	0.0-23.0	0.0	0.0
2. Mosali 21.44'23" °N 73.14'73" °E	BG II	0.0	0.0	0.0	0.0-7.0	0.0	0.0	0.0-19.5	0.0	0.0
3. Gadkach 21.44'06" °N 73.17'70" °E	BG II	0.0	0.0	0.0	0.0-5.0	0.0	0.0	0.0-10.5	0.0	0.0
	Average	**0.0**	**0.0**	**0.0**	**0.0-7.3**	**0.0**	**0.0**	**0.0-17.7**	**0.0**	**0.0**
Dist:Bharuch										
(Tal:Netrag)										
4. Koyali 21.34'47" °N 73.23'03" °E	BG II	0.0	0.0	0.0	0.0-2.0	0.0	0.0	0.0-8.0	0.0	0.0
5. Galiba 21.38'34" °N 73.27" 1°E	BG II	0.0	0.0	0.0	0.0-0.0	0.0	0.0	0.0-5.5	0.0	0.0
6. Fichvada 21.40'22" °N 73.28'50" °E	BG II	0.0	0.0	0.0	0.0-7.0	0.0	0.0	0.0-15.5	0.0	0.0

7. Kharetha 21.42’34” °N 73.28’27” °E	BG II	0.0	0.0	0.0	0.0-8.0	0.0	0.0	0.0-18.5	0.0	0.0
(Tal:Valia)										
8. Tuna 21.54’33” °N 73.23’03” °E	BG II	0.0	0.0	0.0	0.0-5.5	0.0	0.0	0.0-12.0	0.0	0.0
9.Umargam 21.54’33” °N 73.23’03” °E	BG II	0.0	0.0	0.0	0.0-6.0	0.0	0.0	0.0-13.5	0.0	0.0
	Average	**0.0**	**0.0**	**0.0**	**0.0-4.8**	**0.0**	**0.0**	**0.0-12.2**	**0.0**	**0.0**
Dist: Narmada										
(Tal:Dediyapada)										
10. Ghantoli 21.40’15” °N 75.50’50” °E	BG II	0.0	0.0	0.0	0.0-12.0	0.0	0.0	0.0-22.5	0.0	0.0
11. Pangam 21.41’3” °N 73.29’56” °E	BG II	0.0	0.0	0.0	0.0-7.5	0.0	0.0	0.0-18.0	0.0	0.0
12. Amletha 21.50’10” °N 73.24’12” °E	BG II	0.0	0.0	0.0	0.0-3.0	0.0	0.0	0.0-9.5	0.0	0.0
13. Timbi 21.49’34” °N 73.22’21” °E	BG II	0.0	0.0	0.0	0.0-5.0	0.0	0.0	0.0-14.0	0.0	0.0
	Average	**0.0**	**0.0**	**0.0**	**0.0-6.9**	**0.0**	**0.0**	**0.0-16.0**	**0.0**	**0.0**
Overall Average		**0.0**	**0.0**	**0.0**	**0.0-6.3**	**0.0**	**0.0**	**0.0-15.3**	**0.0**	**0.0**

Table 7b: Observations on the occurrence of cotton diseases at research farm (CRS, Surat)

Variety/ Hybrid	Stage of sampling (Percent Disease Intensity (PDI)								
	Seedling stage (20-30 DAS)			Flowering stage (60-80 DAS)			Boll development stage (120-150 DAS)		
	BLB	ALS	Cory	BLB	ALS	Cory	BLB	ALS	Cory
G. Cot.Hy.6 BGII	0.0	0.0	0.0	0.0-2.0	0.0	0.0	0.0-7.5	0.0	0.0
G. Cot.Hy.8 BGII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G. Cot.Hy.10 BGII	0.0-4.0	0.0	0.0	0.0-22.5	0.0	0.0	0.0-38.0	0.0	0.0
G. Cot.Hy.12BGII	0.0-6.0	0.0	0.0	0.0-25.0	0.0	0.0	0.0-45.5	0.0	0.0
GTHH 49 BGII	0.0	0.0	0.0	0.0-5.0	0.0	0.0	0.0-12.5	0.0	0.0
G. Cot. Hy. 102	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G. Cot. 20	0.0-5.0	0.0	0.0	0.0-23.0	0.0	0.0	0.0-41.0	0.0	0.0
GN Cot. 32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G. Cot. 40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GADC 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

GADC 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G. Cot. 42	0.0-2.0	0.0	0.0	0.0-8.5	0.0	0.0	0.0-18.5	0.0	0.0
G. Cot. 34	0.0	0.0	0.0	0.0-6.5	0.0	0.0	0.0-17.0	0.0	0.0
G. Cot. 38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GSBHH 205	0.0-3.0	0.0	0.0	0.0-10.0	0.0	0.0	0.0-22.0	0.0	0.0
G. Cot.Hy.14	0.0-3.5	0.0	0.0	0.0-11.0	0.0	0.0	0.0-22.5	0.0	0.0
G. N. Cot. Hy.12	0.0-3.0	0.0	0.0	0.0-10.0	0.0	0.0	0.0-21.0	0.0	0.0
G. Cot. Hy.10	0.0-2.0	0.0	0.0	0.0-9.0	0.0	0.0	0.0-21.0	0.0	0.0
G. Cot. Hy.8	0.0	0.0	0.0	0.0-3.5	0.0	0.0	0.0-9.0	0.0	0.0
G. Cot. Hy.6	0.0-4.0	0.0	0.0	0.0-13.0	0.0	0.0	0.0-28.0	0.0	0.0
G. Cot. Hy.18	0.0-10.0	0.0	0.0	0.0-22.5	0.0	0.0	0.0-51.5	0.0	0.0
G. Cot. 18	0.0-8.5	0.0	0.0	0.0-20.0	0.0	0.0	**0.0-50.0**	0.0	0.0
GSHH 15032	0.0-6.0	0.0	0.0	0.0-18.5	0.0	0.0	0.0-46..5	0.0	0.0
GSHH 15035	0.0-3.5	0.0	0.0	0.0-13.0	0.0	0.0	0.0-26.5	0.0	0.0
GSHH 24/17	0.0-4.5	0.0	0.0	0.0-14.5	0.0	0.0	0.0-31.0	0.0	0.0
GSBHH 206	0.0	0.0	0.0	0.0-2.5	0.0	0.0	0.0-9.0	0.0	0.0
GN Cot. 22	0.0-9.0	0.0	0.0	0.0-21.0	0.0	0.0	0.0-45.5	0.0	0.0
G. Cot. 36	0.0-6.0	0.0	0.0	0.0-15.0	0.0	0.0	0.0-38.5	0.0	0.0
DH 7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DH 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
V 797	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GN Cot. 27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G. Cot. 21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G. Cot. 19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G. Cot. 15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G. Cot. 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GN Cot. 26	0.0-4.5	0.0	0.0	0.0-14.0	0.0	0.0	0.0-29.0	0.0	0.0
LRA 5166	0.0-13.5	0.0	0.0	0.0-40.5	0.0	0.0	0.0-62.5	0.0	0.0
Average	**0.0-2.6**	**0.0**	**0.0**	**0.0-8.7**	**0.0**	**0.0**	**0.0-17.0**	**0.0**	**0.0**

Table 8a: Observations on the occurrence of diseases in farmer's field in Junagarh (Gujarat)

Sr. No.	District/ Place	Place No.	Variety/ Hybrid	Stage of sampling								
				Percent Disease Intensity (PDI)								
				Early season/Seedling (20-30 DAS)			Mid-season/Flowering (60-80 DAS)			Late/ Boll development (120-150 DAS)		
				BLB	GM	Phoma	BLB	GM	CoLS	CoLS	GM	ALS
I.	**Junagadh**											
1	Vadal	1	G. Cot. Hy.-24 BG-II	0.0	0.0	2.6	1.5	0.0	3.5	15.8	24.5	8.5
		2	ATM	0.0	0.0	3.2	0.5	0.0	2.0	25.5	29.3	6.5
		3	G. Cot. Hy.-24 BG-II	0.0	0.0	4.5	1.5	0.0	3.8	13.5	22.0	5.0
		4	G. Cot. Hy.-24 BG-II	0.0	0.0	5.0	1.0	0.0	2.1	10.2	22.5	9.0
		5	Navab	0.0	0.0	6.3	0.5	0.0	1.5	12.3	16.5	12.5
2	Galath	1	G. Cot. Hy.-24 BG-II	0.0	0.0	4.0	0.0	0.0	4.3	8.9	25.5	4.5
		2	Lado	0.0	0.0	8.9	0.5	0.0	1.0	**29.5**	**35.5**	31.5
		3	RCH-Neo	0.0	0.0	5.5	2.5	0.0	1.5	16.5	22.5	20.5
		4	G. Cot. Hy.-24 BG-II	0.0	0.0	4.4	0.5	0.0	2.4	11.5	24.5	6.5
		5	ATM	0.0	0.0	8.1	3.5	0.0	2.5	22.2	31.6	16.5
3	Sherdi	1	ATM	0.0	0.0	10.2	2.8	0.0	1.7	22.0	32.5	17.5
		2	Buyer 7576	0.0	0.0	12.2	2.4	0.0	6.5	22.5	15.6	12.1
4	Sultanabad	1	ATM	0.0	0.0	10.5	5.7	0.0	3.5	28.5	25.5	18.8
		2	RCH-659	0.0	0.0	11.2	2.4	0.0	3.2	12.5	16.9	10.5
		3	Money maker	0.0	0.0	14.5	4.1	0.0	3.0	14.5	22.5	8.5
5	Bhindora	1	Navab	0.0	0.0	3.5	0.5	0.0	5.0	6.8	18.3	6.5
		2	G. Cot. Hy.-24 BG-II	0.0	0.0	2.5	0.0	0.0	2.2	**5.5**	17.5	3.5
		3	G. Cot. Hy.-24 BG-II	0.0	0.0	2.0	0.5	0.0	1.0	6.5	19.1	4.0
6	Nandiya	1	Modiji	0.0	0.0	13.4	3.6	0.0	5.5	18.5	26.9	12.5
		2	Superb			14.0	2.3		4.5	17.5	11.3	11.5
7	Choki	1	ATM	0.0	0.0	12.5	1.4	0.0	3.2	15.4	31.5	26.5
		2	ATM	0.0	0.0	13.5	2.5	0.0	5.6	16.2	30.5	**34.8**
		3	G. Cot. Hy.-24 BG-II	0.0	0.0	8.2	0.0	0.0	2.5	16.5	27.5	6.8
		4	G. Cot. Hy.-24 BG-II	0.0	0.0	7.1	0.5	0.0	3.5	13.5	27.0	11.5
		5	G. Cot. Hy.-24 BG-II	0.0	0.0	6.2	0.5	0.0	2.6	11.9	30.5	4.5
			Average	**0.0**	**0.0**	**7.8**	**1.6**	**0.0**	**3.1**	**15.8**	**24.3**	**12.4**

II.	**Rajkot**											
8	Toraniya	1	G. Cot. Hy.-24 BG-II	0.0	0.0	3.6	0.4	0.0	1.5	17.5	31.5	5.0
		2	ATM	0.0	0.0	3.8	1.0	0.0	1.0	25.6	33.0	11.6
		3	Navab	0.0	0.0	9.1	2.5	0.0	0.5	18.9	20.0	11.5
		4	Jadu	0.0	0.0	11.0	3.2	0.0	1.0	13.5	22.5	10.8
		5	Ajeet-5	0.0	0.0	13.5	5.5	0.0	2.5	19.5	25.5	5.9
9	Patidal	1	Goldy-333	0.0	0.0	12.0	**7.7**	0.0	2.0	11.5	19.5	7.1
		2	Ajeet-5	0.0	0.0	**16.9**	5.0	0.0	3.5	22.2	15.6	11.5
		3	G. Cot. Hy.-24 BG-II	0.0	0.0	10.5	2.3	0.0	2.0	12.5	18.5	5.0
		4	Ajeet-5	0.0	0.0	12.3	0.5	0.0	3.5	14.5	16.6	12.3
		5	ATM	0.0	0.0	8.6	1.0	0.0	2.5	22.5	13.5	14.5
			Average	**0.0**	**0.0**	**10.1**	**2.9**	**0.0**	**2.0**	**17.8**	**21.6**	**9.5**
III.	**Jamanagar**											
10	Kharedi	1	Varsha	0.0	0.0	6.8	6.8	0.0	1.5	13.5	10.5	8.5
		2	G. Cot. Hy.-24 BG-II	0.0	0.0	7.5	2.2	0.0	1.0	11.0	24.5	3.5
		3	Ajeet-155	0.0	0.0	5.5	0.5	0.0	3.5	6.5	9.0	14.5
		4	Ajeet-5	0.0	0.0	11.5	1.8	0.0	2.5	13.4	19.5	12.5
		5	G. Cot. Hy.-24 BG-II	0.0	0.0	4.3	1.3	0.0	1.2	14.5	11.5	8.5
			Average	**0.0**	**0.0**	**7.1**	**2.5**	**0.0**	**1.9**	**11.8**	**15.0**	**9.5**
IV.	**Morbi**											
11	Tithava	1	G. Cot. Hy.-24 BG-II	0.0	0.0	4.4	0.5	0.0	0.0	11.0	23.5	3.5
		2	Ajeet-1155	0.0	0.0	6.7	0.5	0.0	0.0	13.5	20.5	10.5
		3	Ankur-Jay	0.0	0.0	7.5	1.5	0.0	0.5	11.5	14.5	12.5
		4	G. Cot. Hy.-24 BG-II	0.0	0.0	2.2	0.5	0.0	1.0	14.0	16.8	5.5
		5	ATM	0.0	0.0	8.6	2.3	0.0	1.0	15.5	25.5	20.5
			Average	**0.0**	**0.0**	**5.9**	**1.1**	**0.0**	**0.5**	**13.1**	**20.2**	**10.5**
	Overall Average			**0.0**	**0.0**	**7.7**	**2.0**	**0.0**	**1.9**	**14.6**	**20.3**	**10.5**

BLB- Bacterial leaf blight, GM- Grey Mildew, CoLs-*Corynespora* leaf spot, ALS- Alternaria Leaf spot, Phoma blight

Table 8b: Observations on the occurrence of cotton diseases at the research farm (CRS, Junagarh)

Month	Hybrids (BG II)	Incidence (%)			Mean Percent Disease Intensity (PDI)								
		Wilt	Root rot	Boll Rot	ALS	HLS	CLS	ATN	CoLS	MLS	BLB	GM	Phoma
July	RCH-2 (BG-II)	0	0	0	0	0	0	0	0	0	0	0	0
	G. Cot. Hy. 8 (BG-II)	0	0	0	0	0	0	0	0	0	0	0	0
Aug.	RCH-2 (BG-II)	0	0	0	0	0	0	0	0	0	35.5	0	12.5
	G. Cot. Hy. 8 (BG-II)	0	0	0	0	0	0	0	0	0	15.8	0	22.0
Sept.	RCH-2 (BG-II)	0	0	2.5	0	0	0	0	5.5	0	45.0	2.5	0
	G. Cot. Hy. 8 (BG-II)	0	0	3.0	0	0	0	0	8.7	0	17.0	10.5	0
Oct.	RCH-2 (BG-II)	0	0	3.5	0	0	5.0	0	15.5	0	14.7	3.5	0
	G. Cot. Hy. 8 (BG-II)	0	0	6.5	0	0	3.5	0	19.8	0	7.0	12.0	0
Nov.	RCH-2 (BG-II)	0	0	0	28.5	0	5.0	0	2.1	0	35.4	13.5	0
	G. Cot. Hy. 8 (BG-II)	0	0	0	18.4	0	3.5	0	5.0	0	15.5	24.4	0
Dec.	RCH-2 (BG-II)	0	0	0	10.3	0	0	0	0	0	0	0	0
	G. Cot. Hy. 8 (BG-II)	0	0	0	15.5	0	0	0	0	0	0	0	0
	Average	**0**	**0**	**1.3**	**6.1**	**0**	**1.4**	**0**	**4.7**	**0**	**15.5**	**5.5**	**2.9**

ALS: Alternaria leaf spot, HLS: Helminthosporium leaf spot, CLS: Cercospora leaf spot, ATN: Anthracnose, CoLS: Corynespora Leaf spot, MLS: Myrothecium leaf spot, BB: Bacterial blight, GM: Grey mildew, Phoma: Phoma wet blight

Table 9a: Observations on the occurrence of the diseases in farmer's field in Khandwa (Madhya Pradesh)

District	Block	Village	BLB (PDI)	ALS (PDI)	GM (PDI)
Khandwa	Khandwa	Jawra	5.2	10.5	22.5
		kalmukhi	5.0	2.5	17.5
		Amalpura	2.5	5.0	15.0
		Bhamgarh	7.5	5.1	12.5
		Atar	2.5	10.0	5.0
		Talwadiya	7.5	6.4	7.5
		Bamjhar	2.5	8.8	2.3
	Pandhana	Pawai Kala	7.5	3.4	15.0
		Kodar	3.6	6.9	2.5
		Bihar	2.5	0.0	2.5
		Gandhwa	2.5	6.3	12.5
		Temi khurda	2.5	7.5	7.5
		Sirpur	8.5	3.3	15.0
	Chhegaon Makhan	Sengar	2.5	7.5	10.0
		Dulhar	7.5	5.3	10.0
		Chichgohan	0.0	6.7	12.5
		bherukheda	0.0	2.5	12.5
		Ahmadpur	0.0	0.0	22.5
		Khegaon	0.0	0.0	20.0
		Surgeon Joshi	0.0	0.0	17.5
	Punasa	Punasa	0.0	8.7	10.0
		Mundi	0.0	8.7	
		Beed	0.0	10.0	15.0
		Peepal kota	0.0	10.2	17.5
		Jawar	0.0	5.0	15.0
		Chirakhan	0.0	3.3	22.5

		Bangarda	0.0	2.5	2.5
		Pipal Gota	0.0	7.5	15.0
	Khalwa	dankna	0.0	8.6	2.5
		Raipur	0.0	10.0	0.0
		Nagotar	0.0	10.0	0.0
		Khalwa	0.0	2.5	0.0
		Khar	0.0	2.5	0.0
		Bakhar	0.0	2.5	0.0
		Average	**2.1**	**5.6**	**10.4**

Table 9b: Observations on the occurrence of cotton diseases at research farm RVSKVV at Khandwa station

Month	Disease incidence				
	Wilt	MLS	GM	BLB	ALB
July	0.0	0.0	0.0	00	00
August	0.0	0.0	00	2.4	Traces
September	1.33	0.0	Traces	1.2	6.35
October	6.66	0.0	5.4	3.6	14.88
November	13.33	0.0	14.6	00	23.69
December	-	0.0	2.5	00	16.13

ALB: Alternaria leaf spot; **MLS:** Myrothecium leaf spot; **BLB**: Bacterial leaf blight; **GM:** Grey mildew

SOUTH ZONE

Table 10a: Observations on the occurrence of diseases at Farmer's fields in Dharwad (Karnataka)

Sr.No.	District/Village	Variety/Hybrid	Stage of sampling												
			Percent Disease Intensity (PDI)												
			Early season/Seedling				Mid-season/Flowering				Late season/Boll development				
			(20-30DAS)				(60-80DAS)				(20-30DAS)				
			ALS	BLB	GM	Boll rot	ALS	BLB	GM	Boll rot	ALS	BLB	GM	Rust	Boll rot
A	**District: Belagavi**														
1	Anigol	First class	0	0	0	0	9.0	2.0	1.2	0	17.0	4.0	9.6	11.8	14.6
		Yuva	0	0	0	0	7.8	1.8	3.0	0	16.5	2.9	7.5	10.7	17.0
		RCH-659	0	0	0	0	6.5	1.0	2.3	0	21.2	3.8	6.8	8.9	16.6
		Jadu	0	0	0	0	10.6	2.5	1.8	0	17.7	2.8	5.6	12.0	18.0
		Puli	0	0	0	0	8.0	1.1	2.3	0	21.0	4.5	7.0	10.5	16.6
2	Vakkunda	Malini	0	0	0	0	7.8	1.6	3.7	0	15.0	3.6	6.8	7.7	14.5
		Chiranjeevi	0	0	0	0	6.6	2.6	5.0	0	18.8	4.0	9.0	8.3	17.8
		MRC7351	0	0	0	0	13.7	3.0	2.8	0	16.6	3.8	9.8	6.8	15.5
		Jwala	0	0	0	0	10.5	2.8	1.0	0	23.5	2.8	8.8	9.3	17.8
		Money maker	0	0	0	0	7.8	1.0	1.8	0	20.6	2.7	7.6	9.8	15.7
3	Murgod	Lotus	0	0	0	0	8.0	2.3	3.5	0	18.8	3.5	6.5	7.5	18.0
		Super cot	0	0	0	0	10.0	1.1	2.5	0	16.7	4.0	10.0	10.0	15.7
		Rasi magic	0	0	0	0	11.6	2.8	5.0	0	21.6	2.5	9.8	8.8	17.7
		Bhaskar	0	0	0	0	9.9	0.9	2.6	0	19.5	2.0	8.6	8.0	16.7
		Soumya	0	0	0	0	12.5	1.9	1.3	0	16.8	3.8	7.0	11.4	18.0
4	Asundi	First class	0	0	0	0	6.8	3.0	3.8	0	23.0	3.9	10.2	9.0	16.5
		Ajeet155	0	0	0	0	10.8	0.8	4.0	0	20.8	3.0	6.8	7.8	16.8
		RCH-659	0	0	0	0	8.5	1.8	2.8	0	25.7	2.7	7.7	8.3	17.5
		Soumya	0	0	0	0	8.0	2.5	2.6	0	26.5	4.0	9.6	7.8	15.9
		Puli	0	0	0	0	7.8	1.9	3.6	0	27.0	3.5	8.0	10.3	14.5

5	Parakanatti	Malini	0	0	0	0	13.3	2.1	2.3	0	19.8	2.9	6.5	9.8	13.5
		Chiranjeevi	0	0	0	0	7.7	2.3	4.4	0	24.8	3.3	7.8	7.8	15.0
		MRC7351	0	0	0	0	12.1	3.1	2.8	0	21.9	3.9	10.0	8.0	16.2
		Jwala	0	0	0	0	9.1	1.5	4.8	0	20.6	4.1	9.8	11.3	17.8
		Money maker	0	0	0	0	11.1	2.4	3.1	0	19.8	3.9	8.9	9.8	17.0
		Average	**0**	**0**	**0**	**0**	**9.4**	**2.0**	**2.9**	**0**	**20.4**	**3.4**	**8.2**	**9.2**	**16.4**
B	**District: Dharwad**														
6	Maradagi	First class, RCH-659	0	0	0	0	15.7	3.5	5.7	0	24.7	5.0	12.0	21.5	15.8
		Vaibhav	0	0	0	0	12.6	1.3	6.6	0	19.6	7.2	10.7	19.5	13.5
		Jwala	0	0	0	0	10.8	2.0	4.5	0	16.6	6.7	11.3	17.0	12.3
		Vega	0	0	0	0	14.6	3.4	7.0	0	21.3	7.1	9.8	18.8	15.5
		MRC7351	0	0	0	0	9.8	1.8	4.5	0	17.6	5.8	10.0	21.4	16.0
7	Byahatti	First class	0	0	0	0	13.3	2.3	5.8	0	18.8	7.2	8.8	18.9	14.7
		Mahadev	0	0	0	0	8.8	3.8	3.6	0	21.3	6.0	7.8	20.8	13.8
		RCH-659	0	0	0	0	13.5	2.6	4.0	0	19.8	5.8	11.7	16.7	12.9
		Soumya	0	0	0	0	14.0	2.8	6.7	0	23.5	6.7	8.8	17.0	15.8
		Ajeet 155	0	0	0	0	7.8	4.0	5.7	0	17.7	-	7.8	18.8	16.0
8	Yamanur	Ajeet 199	0	0	0	0	9.3	4.6	3.0	0	25.0	7.5	11.8	**22.0**	13.3
		MRC7383	0	0	0	0	10.5	3.5	4.6	0	19.0	6.6	12.3	19.6	15.3
		Jwala	0	0	0	0	6.8	4.0	2.8	0	22.4	5.6	12.0	20.8	12.2
		Vega	0	0	0	0	13.5	2.8	5.6	0	20.6	7.2	8.9	17.8	14.5
		MRC7351	0	0	0	0	12.6	2.3	2.6	0	18.6	7.0	9.6	18.0	16.0
9	Sharewad	First class	0	0	0	0	9.8	3.2	1.7	0	23.4	6.3	7.7	16.7	14.5
		Super cot,	0	0	0	0	11.7	3.0	3.6	0	20.8	5.9	11.0	19.3	15.8
		Jwala	0	0	0	0	12.0	4.6	4.3	0	21.7	7.5	9.3	17.8	13.3
		MRC7351	0	0	0	0	13.7	2.3	1.8	0	17.8	5.8	8.8	21.4	15.5
		RCH-659	0	0	0	0	14.9	3.7	4.5	0	18.9	6.6	11.5	19.3	12.9
10	Jodahalli	Bhaskar	0	0	0	0	15.0	4.5	3.3	0	21.2	5.5	10.7	**22.0**	16.0
		First class	0	0	0	0	7.9	1.8	6.3	0	24.6	7.3	8.6	18.5	14.5
		RCH-659	0	0	0	0	9.9	2.6	4.6	0	20.6	5.9	9.2	21.4	13.4
		Soumya	0	0	0	0	11.3	3.4	2.4	0	19.9	6.7	10.8	19.6	15.0

		Ajeet 155	0	0	0	0	13.5	4.5	5.0	0	22.8	7.3	12.2	17.8	14.5
		Average	**0**	**0**	**0**	**0**	**11.7**	**3.1**	**4.4**	**0**	**20.7**	**6.5**	**10.1**	**19.3**	**14.5**
C	**District: Gadag**														
11	Laxmeshwar	Rasi 659	0	0	0	0	10.8	0	3.4	0	18.8	3.0	7.8	8.8	10.8
		First class	0	0	0	0	5.7	0	2.7	0	16.7	2.0	6.5	6.7	9.8
		Super cot	0	0	0	0	7.8	0	1.9	0	20.0	1.2	5.0	7.7	12.0
		Rasi magic	0	0	0	0	4.5	0	3.1	0	19.3	2.3	6.5	9.3	8.9
		MRC7383	0	0	0	0	5.0	0	2.7	0	15.0	3.0	7.0	10.0	9.5
12	Govinal	Everest	0	0	0	0	9.3	0	4.5	0	16.8	1.8	5.6	8.3	10.8
		Ajeet 155	0	0	0	0	4.7	0	1.8	0	18.3	2.2	6.8	6.8	8.8
		RCH-659	0	0	0	0	9.7	0	2.0	0	13.8	2.1	5.8	9.5	11.6
		Bhaskar	0	0	0	0	6.7	0	3.6	0	19.2	1.8	7.6	5.8	7.8
		Rasi 659	0	0	0	0	10.0	0	4.0	0	15.8	2.0	8.0	6.7	9.3
13	Jalligeri	MRC7351	0	0	0	0	7.7	0	4.5	0	20.0	1.2	5.8	8.9	11.2
		First class	0	0	0	0	8.8	0	2.7	0	18.9	1.5	6.0	9.0	10.8
		Super cot	0	0	0	0	5.7	0	3.4	0	16.7	2.2	7.7	7.8	7.8
		Jadu	0	0	0	0	9.3	0	4.0	0	12.8	1.0	5.9	6.7	8.9
		Ajeet199	0	0	0	0	6.8	0	1.9	0	15.6	2.4	7.8	7.0	7.0
14	Hulakoti	Everest	0	0	0	0	11.8	0	2.6	0	18.3	2.7	8.0	9.5	11.9
		Ajeet 155	0	0	0	0	8.8	0	2.9	0	19.0	1.8	6.6	5.0	6.8
		RCH-659	0	0	0	0	9.3	0	3.5	0	13.5	1.5	5.6	6.8	8.0
		Bhaskar	0	0	0	0	11.0	0	4.5	0	17.8	2.0	7.2	7.8	10.9
		MRC7351	0	0	0	0	7.3	0	2.8	0	16.7	2.8	5.5	8.8	9.9
15	Ramogi	Rasi 659	0	0	0	0	9.9	0	3.5	0	19.3	1.0	7.6	6.1	7.0
		First class	0	0	0	0	10.6	0	4.5	0	15.5	1.8	6.7	10.0	6.6
		Super fiber,	0	0	0	0	8.9	0	3.4	0	13.8	2.3	5.8	9.8	12.0
		Jiaho	0	0	0	0	7.7	0	3.0	0	16.7	2.9	7.0	6.8	10.6
		Jadu	0	0	0	0	9.0	0	3.3	0	17.8	3.0	6.8	7.2	6.6
		Average	**0**	**0**	**0**	**0**	**8.3**	**0**	**3.2**	**0**	**17.0**	**2.0**	**6.6**	**7.8**	**9.5**
D	**District: Haveri**														
16	Savanur	MRC7351	0	0	0	0	13.0	0	8.8	0	27.8	5.0	12.6	15.6	10.8

		MRC 7383	0	0	0	0	16.7	0	5.8	0	32.0	3.5	13.0	14.5	12.3
		Jaadu	0	0	0	0	19.5	0	6.8	0	30.5	4.5	15.0	13.8	14.0
		First class	0	0	0	0	14.5	0	7.8	0	24.5	4.0	11.8	16.6	13.3
		Rasi-659	0	0	0	0	17.8	0	9.3	0	26.6	2.8	12.9	17.7	13.8
17	Sidenur	First class	0	0	0	0	16.7	0	4.5	0	23.3	3.8	14.6	14.5	11.3
		Priya seeds	0	0	0	0	18.9	0	9.0	0	27.8	4.0	13.0	18.0	10.8
		MRC7351	0	0	0	0	20.8	0	5.9	0	27.6	2.8	12.9	16.8	12.5
		Dhanya	0	0	0	0	13.6	0	3.4	0	31.3	3.8	13.9	17.0	9.9
		Puli	0	0	0	0	17.8	0	4.9	0	28.9	4.4	12.3	15.8	11.2
18	Byadagi	Mahadev	0	0	0	0	16.9	0	7.8	0	32.0	5.0	14.4	13.8	8.9
		MRC7351	0	0	0	0	14.5	0	6.9	0	29.0	4.5	13.7	13.0	10.5
		MRC 7383	0	0	0	0	17.0	0	8.3	0	26.7	3.9	11.8	14.5	12.3
		Jaadu	0	0	0	0	18.9	0	7.8	0	31.2	2.7	15.0	16.8	13.0
		First class	0	0	0	0	16.9	0	9.8	0	30.8	3.0	13.8	17.3	7.8
19	Mattur	Ajeet 155	0	0	0	0	19.5	0	4.6	0	22.6	1.9	12.3	16.6	10.0
		MRC 7383	0	0	0	0	14.0	0	5.8	0	29.9	2.3	13.5	15.9	8.9
		Jaadu	0	0	0	0	18.9	0	8.3	0	28.9	3.3	14.6	14.5	13.0
		First class	0	0	0	0	16.8	0	6.7	0	25.6	4.8	13.0	13.8	12.5
		Ajeet 199	0	0	0	0	18.0	0	9.0	0	26.7	4.0	12.8	11.8	10.0
20	Haradalli	First class	0	0	0	0	20.0	0	7.8	0	29.8	2.3	11.0	12.0	11.8
		Priya seeds	0	0	0	0	14.8	0	6.6	0	31.1	3.0	13.5	13.9	7.8
		Yuva	0	0	0	0	16.8	0	8.6	0	24.6	3.9	12.2	15.7	10.0
		MRC 7383	0	0	0	0	17.6	0	7.8	0	30.8	4.5	13.3	14.0	13.8
		Puli	0	0	0	0	19.0	0	9.3	0	27.8	1.9	14.0	16.8	14.0
		Average	**0**	**0**	**0**	**0**	**17.1**	**0**	**7.2**	**0**	**28.3**	**3.6**	**13.2**	**15.2**	**11.3**
E	**District: Uttar Kannada**														
21	Malagi	First class	0	0	0	0	5.8	0.9	3.0	0	13.8	5.1	6.0	4.5	12.6
		MRC 7383	0	0	0	0	3.8	1.1	4.5	0	18.8	4.5	8.9	6.8	10.7
		Jaadu	0	0	0	0	7.8	2.5	2.7	0	17.8	3.5	7.8	5.7	13.8
		Everest	0	0	0	0	6.7	2.0	1.9	0	15.5	5.6	9.3	6.0	14.0
		Mahadev	0	0	0	0	9.9	1.2	3.5	0	20.8	4.8	7.8	5.8	12.3

22	Mundagod	First class	0	0	0	0	8.3	0.8	4.5	0	14.6	5.0	6.6	4.5	14.7
		Yuva	0	0	0	0	5.8	1.0	5.0	0	16.0	2.8	8.8	3.6	15.0
		Priya seeds	0	0	0	0	7.8	2.4	3.8	0	12.9	4.5	6.6	6.7	11.8
		Puli	0	0	0	0	4.8	1.8	4.6	0	14.8	6.0	8.2	7.0	10.5
		Chiranjeevi	0	0	0	0	6.6	0.9	2.9	0	17.8	5.5	10.0	5.6	13.3
23	Hunagund	Dhanya	0	0	0	0	3.5	3.5	1.7	0	22.0	4.6	8.4	4.5	12.8
		MRC 7383	0	0	0	0	6.0	2.0	3.0	0	11.8	5.5	7.7	3.8	9.8
		Jaadu	0	0	0	0	9.3	1.0	4.5	0	16.8	6.0	6.0	2.9	10.8
		Chiranjeevi	0	0	0	0	8.0	2.3	5.0	0	13.9	5.9	9.3	4.9	13.8
		Mahadev	0	0	0	0	7.8	2.3	3.8	0	14.9	4.4	7.8	5.3	12.8
24	Koppa	First class	0	0	0	0	6.6	1.7	4.0	0	20.8	3.5	8.7	6.7	10.0
		MRC 7383	0	0	0	0	5.8	1.10.	2.9	0	19.8	5.9	6.8	7.0	11.8
		Yuva	0	0	0	0	6.7	2.0	4.7	0	16.7	4.8	7.8	5.8	8.8
		Priya seeds	0	0	0	0	4.8	2.1	3.9	0	17.8	5.7	5.9	4.3	10.8
		Puli	0	0	0	0	3.8	0.8	2.6	0	21.3	4.0	9.0	6.5	11.0
25	Varoor	Chiranjeevi	0	0	0	0	2.9	2.3	1.9	0	15.8	5.5	7.8	2.8	8.8
		MRC 7383	0	0	0	0	4.0	3.2	2.0	0	13.5	5.9	6.7	5.0	7.9
		Jaadu	0	0	0	0	6.7	1.7	3.5	0	18.3	4.7	7.0	4.5	8.8
		Everest	0	0	0	0	4.0	1.0	5.0	0	19.0	3.8	8.2	6.0	7.8
		Mahadev	0	0	0	0	5.0	1.1	4.5	0	21.3	4.8	9.6	5.9	11.0
		Average	**0**	**0**	**0**	**0**	**6.1**	**1.7**	**3.6**	**0**	**17.0**	**4.9**	**7.9**	**5.3**	**11.4**
		Overall Average	**0**	**0**	**0**	**0**	**18.2**	**1.4**	**4.3**	**0**	**20.7**	**4.1**	**9.2**	**11.4**	**12.6**

ALS=Alternaria leaf spot, BLB= Bacterial leaf blight, CoLS= Corynespora leaf spot, GM= Grey mildew

Table 10b: Observations on the occurrence of diseases at the research farm (UAS Dharwad, Under Protected conditions)

Month	Hybrids (BG II)	Incidence (%)			Mean Percent Disease Intensity (PDI)								
		Wilt	Root rot	Boll Rot	ALS	HLS	CLS	ATN	CoLS	MLS	BLB	GM	Rust
Aug-22	Neelam,Ajeet-199,Super cot,RCH-Magic,MRC-7351 Gold,MRC-7017,Money maker(KCH-100),RASI-659,Dr.Brent (MRC-7347),Jai Ankur, Jadoo,ATM(KCH311),MRC-7373(Dhandev),First class,DPC-7065(9135),Malini(NCS-9015), Jwala and Raja(NCS-954).	0.0	3.0	0.0	9.6	0.0	0.0	0.0	0.0	0.0	4.5	6.5	0.0
Sept-22	Neelam,Ajeet-199,Super cot,RCH-Magic,MRC-7351 Gold,MRC-7017,Money maker(KCH-100),RASI-659,Dr.Brent (MRC-7347),Jai Ankur, Jadoo,ATM(KCH311),MRC-7373(Dhandev),First class,DPC-7065(9135),Malini(NCS-9015), Jwala and Raja(NCS-954).	0.0	2.5	4.2	12.7	0.0	0.0	0.0	0.0	0.0	5.4	7.1	0.0
Oct-22	Neelam,Ajeet-199,Super cot,RCH-Magic,MRC-7351 Gold,MRC-7017,Money maker(KCH-100),RASI-659,Dr.Brent (MRC-7347),Jai Ankur, Jadoo,ATM(KCH311),MRC-7373(Dhandev),First class,DPC-7065(9135),Malini(NCS-9015), Jwala and Raja(NCS-954).	0.0	4.0	5.5	14.5	0.0	0.0	0.0	0.0	0.0	16.3	9.5	12.6
Nov-22	Neelam,Ajeet-199,Super cot,RCH-Magic,MRC-7351 Gold,MRC-7017,Money maker(KCH-100),RASI-659,Dr.Brent (MRC-7347),Jai Ankur, Jadoo,ATM(KCH311),MRC-7373(Dhandev),First class,DPC-7065(9135),Malini(NCS-9015), Jwala and Raja(NCS-954).	0.0	8.5	8.8	18.8	0.0	0.0	0.0	0.0	0.0	17.5	6.5	18.5
	Average	**0.0**	**4.5**	**4.6**	**13.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**10.9**	**7.4**	**7.8**

ALS=Alternaria leaf spot, BLB= Bacterial leaf blight, HLS=Helminthosporium leaf spot, CLS=Cercospora leaf spot, ATN= Anthracnose, CoLS= Corynespora leaf spot, GM= Grey mildew, MLS=Myrothecium leaf spot.

Table 11a: Observations on the occurrence of diseases in Guntur, Krishna and Kurnool districts (Andhra Pradesh) (in farmers' fields)

Sr. No.	District/ Place	Variety/ Hybrid	Stage of Sampling																
			Early season/Seedling (20-30 DAS)			Mid-season/Flowering (50-100 DAS)						Late-season/ Boll development (100-150 DAS)							
			BLB	ALS	CoLS	BLB	ALS	MLS	CoLS	GM	Rust	BLB	ALS	CoLS	Root rot	wilt	Boll rot	GM	Rust
A.	**District: Guntur/Palnadu**																		
1	Tadikonda crossroads	Akira	0	0	0														
2	Ponnekallu	US 4708	0	0	0														
		Akira	0	0	0														
3	Ravela	Platinum	0	0	0														
		Akira	0	0	0														
4	Pamulapadu	Akira	0	0	0														
		Siri	0	0	0														
		Sareen	0	0	0														
5	Bandarupalli	Akira	0	0	0														
6	Garikapadu	Siri	0	0	0														
7	Mandepudi	Jaadoo	0	0	0														
8	Damarapalli	Akira	0	0	0														
9	Phanidaram	Jaadoo	0	0	0														
10	Bazathpuram	Tulasi 45	0	0	0														
		Super Chetak	0	0	0														
		Siri	0	0	0														
		US 7067	0	0	0														
11	Jonnalagadda	Akira	0	0	0														
		US 4708	0	0	0														
		Syerra	0	0	0														
		Om Sai	0	0	0														
12	Perecherla	Stalin	0	Traces	Traces														
13	Medikinduru	Asha	0	0	0														
14	Bhiminenivaripalem	Jayabheri	0	0	0														
15	Korrapadu	ATM	0	0	0														
16	Kantepudi	Asha	0	0	0														
17	Nandigama crossroad	Sadananda	0	0	0														
18	Sattenapalli	Akira	0	0	0														
19	Madala	Tulasi 245	0	0	0														

20	Venna Devi	Akira	0	0	0														
		US 4708	0	0	0														
21	Reddigudem	Akira	0	0	0														
		Tulasi 7	0	0	0														
		Platinum	0	0	0														
22	Rajupalem	Akira	0	0	0														
23	Gangireddipalem	US 4708	0	0	0														
24	Siddapuram	Akira	0	0	0														
25	Kamepalli	Adya	0	0	0														
26	Anjanipuram	Jaadoo	0	0	0														
27	Veerapuram	Pradeep	0	0	0														
28	Sambasivapeta	Akira	0	0	0														
29	Santhinagar	Jaadoo	0	0	0														
30	Dachepalli	Akira	0	0	0														
31	Muthyalampadu Road	Syerra	0	0	0														
32	Nadikudi	Platinum	0	0	0														
33	KottaAmbapuram	Akira	0	0	0														
34	Ambapuram	Jaadoo	0	0	0														
35	Gurazala	Geetha	0	0	0														
36	Rentacintala	Tulasi 7	0	0	0														
37	Kambhampadu	Tulasi 216	0	0	0														
38	Rayavaram	RCH 659	0	0	0														
39	Polepalli	Akira	0	0	0														
40	Obulesunipalli	Geetha	0	0	0														
41	Adigoppula	Mudra	0	0	0														
42	Naramalapadu	Gold Cot	0	0	0														
43	Oppicherla	Acharya	0	0	0														
44	Karempudi	RCH 659	0	0	0														
45	PetaSannigandla	Geetha	0	0	0														
46	Zulakallu	Akira	0	0	0														
47	Guttikonda	Akira	0	0	0														
48	Nakarikallu	Akira	0	0	0														
49	Narasingapadu	RCH 659	0	0	0														
50	Challgundla	Jaadoo	0	0	0														
51	Nakarikalli cross road	Akira	0	0	0														
52	Dechvaram	RCH 659	0	0	0														
53	Rupenagundla	Jaadoo	0	0	0														

54	Ravipadu	Big boss	0	0	0														
55	Satuluru	MoneyMaker	0	0	0														
56	Ponugupadu	Asha	0	0	0														
57	Merikapudi	Siri	0	0	0														
58	Nudurupadu	Akira	0	0	0														
29	Vemavaram	Jaadoo	0	0	0														
60	Phirangipuram	Tulasi 45	0	0	0														
61	Repudi	Akira	0	0	0														
62	Perecherla	Akira	0	0	0														
63	Gundlapalem	Akira	0	0	0														
64	Pamulapadu	Sarkar					Traces		0	0	0								
		Siri					Traces		0	0	0								
		Akira					Traces		0	0	0								
65	Tatikonda	Adya					Traces		0	0	0								
66	Nidumukkala	Siri					Traces		0	0	0								
67	Visadala	Akira					0		0	0	0								
68	Medikonduru	Akira		0	0					0	0								
69	Bhiminenivaripalem	Platinum		0	0					0	0								
70	Korrapadu	Stalin		0	0					0	0								
71	Nandigamacrossroads	Akira		Traces	0					0	0								
72	Sattenapalli	Pradeep		0	0					0	0								
		Jaadoo		0	0					0	0								
73	Dhulipalla	Stalin		0	0					0	0								
74	Ganapavaram	Akira		<1%	0					0	0								
		US 7069		<1%	0					0	0								
75	Balijepalli	Akira		0	0					0	0								
76	Rajupalem	Pradeep		0	0					0	0								
77	Mokkapadu	Stalin		0	0					0	0								
78	Pakalapadu	US 4708		0	0					0	0								
79	Yerrabalem	Akira					0		0	0	0								
80	Krosuru	Sadananda					0		0	0	0								
81	Velpuru	Akira					0		0	0	0								
		Platinum					0		0	0	0								
82	Grandhasiri	Akira					0		0	0	0								
83	Chigurupadu	Jayabheri					0		0	0	0								
84	Rudravaram	Siri					0		0	0	0								
85	Bayyavaram	Akira					0		0	0	0								
86	Thuragavaripalem	RCH 659					0		0	0	0								

87	Munugodu	Sadananda		0	0					0	0								
88	Endroi	Akira					0		0	0	0								
89	Nidumukkala	Siri					Traces		0	0	0								
90	Tadikonda	Akira					0		0	0	0								
91	Mukkai	Siri								0	0								
92	Ravela	RCH 659					0		0	0	0								
		Akira					0		0	0	0								
		US 4708					0		0	0	0								
93	Vijanapuram	Adya					0		0	0	0								
		US 4708					0		0	0	0								
		Ujjawala					0		0	0	0								
94	Ponnekallu	Akira					0		0	0	0								
95	Jonnalagadda	LHDP 5					0		0	0	0								
		Akira					Traces		0	0	0								
96	Solasa	Jaadoo					2		Traces	0	0								
		ATM					Traces		0	0	0								
97	Lingapuram	Syrra					0		0	0	0								
		Police					0		0	0	0								
		Revanth					0		0	0	0								
98	Chirumamilla	US 4078					0		0	0	0								
		Adya					Traces		0	0	0								
		Sixer					0		0	0	0								
		Siri					0		0	0	0								
99	Phirangipuram	Akira					0		0	0	0								
100	Jonnalagadda	Akira					0		Tr.- 5	0	0								
101	Ponnekallu	RCH 661					0		0	0	0								
		Akira					0		0	0	0								
		US 4078					0		0	0	0								
102	Lam	US 4078					0		traces	0	0								
103	Ponnekallu	Siri					0		0	0	0								
		Ujjwal					0		0	0	0								
		Sarkar					0		0	0	0								
104	Ravela	Mass					0		traces	0	0								
		Siri					0		traces	0	0								
105	Garikapadu	Ajeet111					0		0	0	0								
106	Damarapalli	Akira					0		0	0	0								

107	Jonnalagadda	Akira					0		Tr.-7.0	0	0								
		US4708					0		Tr.-5.0	0	0								
108	Tatireddypalem	Akira					0		1	0	0								
109	Tadikonda	Akira					0		2	0	0								
110	Pamulapadu	Akira					0		10	0	0								
		Siri					0		0	0	0								
		Sarkar					0		0	0	0								
111	Ponnekallu	Akash					0		11	0	0								
		Siri					0		3.8	0	0								
		Ujjwal					0		Traces	0	0								
		Sarkar					0		2.5	0	0								
		RCH 661					0		Traces	0	0								
		Ajeet 111					0		0	0	0								
112	Ravela	Platinum					0		Traces	0	0								
		Akira					0		2.5	0	0								
		Mass					0		0	0	0								
		Siri					0		12.5	0	0								
		RCH 659					0		5	0	0								
		US 4708					0		12.5	0	0								
113	Nidumukkala	Siri					0		7.5	0	0								
114	Mothadaka	Akira					0		3.8	0	0								
115	Borupalem	US 4078					0		4.5	0	0								
116	Parimi	Akira					0		0	0	0								
117	Pedaparimi	Siri					0		0	0	0								
118	Thulluru	Siri					0		2	0	0								
119	Ananthavaram	Akira					0		0	0	0								
120	Abbarajupalem	US 7067					0		0	0	0								
121	Dondapadu	Siri					0		3.5	0	0								
122	Narasimhapuram	Akira					0		0	0	0								
123	Vaikuntapuram	Akira					0		0	0	0								
124	Mandepudi	Adya					0		1	0	0								
125	Pedamadduru	Adya					0		0	0	0								
126	Lingapuram	Siri					0		2.5	0	0								
127	Unguturu	Akira					0		0	0	0								
128	Munugodu	Akira					0		Traces	0	0								
129	Narakullapadu	Akira					0		0	0	0								

130	Dharanikota	Jaadoo					0		5	0	0								
131	Harischandrapuram	US 7067					0		0	0	0								
132	Amaravati	US 4078					0		Traces	0	0								
133	75Thalluru	Akira					0		4	0	0								
134	Hussainapuram	Akira					0		0	0	0								
135	Khambampadu	Siri					0		5	0	0								
		Ajeet 111					0		0	0	0								
136	Parasa	Akira					0		Traces	0	0								
137	Damarapalli	Akira					0		0	0	0								
138	Garikapadu	Ajeet 111					0		Traces	0	0								
139	Lemalle	Money Maker					0		3.8	0	0								
140	14th Mile	Akira					0		7.5	0	0								
141	Endroi	Akira					0		8.5	0	0								
142	Atchempet	Akira										6.8	0	22.5	0	0	0	7.8	0
143	Tallacheruvu	Sixer										0	0	14.2	0	0	2	17.0	0
		Sixer										6.7	0	15.8	0	0	5	8.3	0
		US 7067										3.8	0	10.6	0	0	3.3	0.0	0
145	Krosur	Sixer										8	0	10.3	0	0	1-2	6.5	Traces
		Sixer										0	0	16.3	0	0	1	12.5	5.6
		US 7067										2	0	16.3	0	0	1	5.0	5
146	Bayyavaram	Platinum										2	0	10.5	0	0	0	10.0	0
147	Velpur	Sixer										6.3	0	20.4	0	0	1-2	8.6	3.1
148	Vipparla	Sixer										2	0	16.6	0	0	1-2	7.1	4.6
		Sixer										12.5	0	11.2	0	0	1	8.2	4.3
149	Errabalem	Akira										6.7	0	16.5	0	0	1	2.1	2
150	Sattenapalli	Jaadoo										12.9	0	24.5	0	0	0	2.5	0
151	Kantepudi	Asha										0	0	5.3	0	0	0	0.0	0
152	Medikonduru	Akira										9.6	0	16.0	0	0	0	3.3	0
153	KottaAmbapuram	Akira										0	2.8	7.8	0	0	0	3.5	0
		Platinum										0	0	14.5	0	0	Traces	21.5	14.8
154	Gangavaram	Akira										0	0	12.2	0	0	1-2%	5.8	2.5
		Geetha										0	0	17.1	0	0	0	13.9	5.8
155	Gogulapadu	Akira										8.5	0	25.0	0	0	1-3%	9.3	1.8
156	Ambapuram	Akira										5.5	0	23.5	0	0	0-1	11.0	Traces
157	Satuluru	Moneymaker										0	0	1.8	0	0	0	0	6.3
158	Guttikonda	Akira										0	0	2.0	0	0	<1%	0	16.0
159	Zulakallu	Akira										0	0	20.0	0	0	0	0	0.0

160	Karempudi	RCH 659										Traces	0	0	0	0	1.5	0	20.0
161	Oppicherla	Nava mallika										0	0	0	0	0	2	0	19.5
162	Obulesunipalli	Geetha										Traces	0	13.5	0	0	2	0	6.8
163	Durgi	Akira										0	0	Traces	0	0	5.7	0	9.8
164	Rayavaram	RCH 659										0	0	3	0	0	4.5	0	27
165	Kambhampadu	Tulasi 216										Traces	0	29.3	0	0	0	0	5.6
166	Paluvoi	Tulasi 7										0	0	Traces	0	0	3	0.0	19.3
167	Rentachintala	Adbhuth										0	0	13.3	0	0	1	0.0	9.5
168	Dachepalli	Adhya										0	0	15.3	0	0	0	Traces	0.0
169	Veerapuram	Pradeep										0	0	7.3	0	0	0	2.5	0.0
170	Vemuluripadu	Akira										0	0	6.3	0	0	0	4.8	26.0
		Ujjwal										0	0	4.3	0	0	0	Traces	10.5
171	Phirangipuram	Akira										0	0	7.8	0	0	0	Traces	14.3
172	Jonnalagadda	Akira										0	0	14.3	0	0	0	11.3	41.0
		US 4078										0	0	11.5	0	0	0	10.5	12.5
		Siri										0	0	19.3	0	0	0	9.0	14.5
		Adhya										0	0	11.8	0	0	0	8.8	34.0
173	Amaravathi	NCH 279										0	0	18.5	0	0	0	0.0	11.5
		Akira										0	0	14.3	0	0	0	3.8	12.5
174	Tadikondacross roads	Akira										0	0	15.5	0	0	0	1.5	16.8
175	Ponnekallu	Ajeet 111										0	0	10.5	Traces	0	0	1.0	9.0
176	Ravela	RCH 797										0	0	16.3	0	0	0	0.0	11.5
177	Pamulapadu	Sarkar										0	0	9.0	0	0	0	5.3	3.8
		Siri										0	0	10.3	0	0	0	6.8	9.0
178	Bezathpuram	Akira										0	0	18.3	0	0	0	0.0	8.8
		US 4078										0	0	4.8	0	0	0	1.8	5.5
179	Tatireddypalem	RCH 797										0	0	6.3	0	0	0	Traces	2.5
		Adhya										0	0	4.8	0	0	0	2.8	4.8
		Akira										0	0	7.8	0	0	0	0.0	11.5
180	Jonnalagadda	LHDP 5										0	0	28.0	0	0	0	1.8	6.3
		Akira										0	0	10.0	0	0	0	0.0	0.0
181	Venegandla	Crystal 369										Traces	0	18.3	0	0	0	1.8	2.8
182	Tadikonda	Akira										0	0	22.5	0	0	0	Traces	17.8
		Siri										0	0	19.8	0	0	0	0.0	15.3
183	Koppuravuru	US 4078										0	0	5.0	0	0	0	4.0	2.0
184	Kantheru	Akira										0	0	6.4	0	0	0	1.6	1.7
185	Endroi	Akira										0	0	5.0	0	0	0	1.5	7.7
186	Venegalla	Akira										0	0	7.9	0	0	0	1.1	6.3

187	Borupalem	US 4078										0	0	9.3	0	0	0	9.1	14.0
188	Nidumukkala	Siri										0	0	5.1	0	0	0	3.0	24.0
189	Pulladigunta	Platinum										0	0	9.3-15.4	0	0	0	3.3	24.1
190	Kurnuthala	US 4078										0	0	5.1-9	0	0	0	2.3	22.5
		Average	**0.0**	**0.0**	**0.0**	**-**	**0.0**	**-**	**1.4**	**0.0**	**0.0**	**1.5**	**0.0**	**12.6**	**0.0**	**0.0**	**0.6**	**4.3**	**9.3**
		Range	**0.0**	**0.0-Traces**	**0.0-Traces**	**0.0**	**0.0-Traces**	**0.0**	**0 - 12.5**	**0.0**	**0.0**	**0-12.9**	**0-2.5**	**0-29.5**	**0.0-traces**	**0.0-3.0**	**0.0-5.7**	**0.0-21.5**	**0.0-41.0**
B.	**District: NTR / Krishna**																		
1	Mulpadu	Sixer		0	0	0	0	0	0	0	0								
		Akira		0	0	0	0	0	0	0	0								
2	Kethanakonda	Akira		0	0	0	0	0	0	0	0								
3	Paritala	Sadananda		0	0	0	0	0	0	0	0								
		Jangi		0	0	0	Traces	0	0	0	0								
		Siri		0	0	0	0	0	0	0	0								
4	Parakalapadu	US 4708		0	0	0	Traces	0	0	0	0								
5	Aithavaram	Akira		0	0	0	Traces	0	0	0	0								
6	Nawabpet	Siri		0	0	0	Traces	0	0	0	0								
		US 4078		0	0	0	0	0	0	0	0								
7	Chillakallu	RCH 661		0	0	0	0	0	0	0	0								
8	Bhimavaram	Akira		0	0	0	0	0	0	0	0								
		Sadananda		0	0	0	0	0	0	0	0								
		US 4708		0	0	0	0	0	0	0	0								
		US 7067		0	0	0	0	0	0	0	0								
9	Makkapeta	Siri		0	0	0	0	0	0	0	0								
10	Penuganchiprolu	Akira		0	0	0	Traces	0	0	0	0								
		US 4078		0	0	0	0	0	0	0	0								
11	Thalluru	Akira		0	0	0	0	0	0	0	0								
12	Penugolanu	Siri		0	0	0	0	0	0	0	0								
13	Challgondlavaripalem	Asheerwad		0	0	0	0	0	0	0	0								
14	Chintalakurva	Akira		0	0	0	0	0	0	0	0								
15	Gopalapuram	US 4078		0	0	0	0	0	0	0	0								
16	Chandragudem	Akira		0	0	0	0	0	0	0	0								
17	Mylavaram	Akira		0	0	0	0	0	0	0	0								
18	G.Konduru	Akira		0	0	0	0	0	0	0	0								
		Average		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**								
		Range		**0**	**0**	**0**	**0- <1**	**0**	**0**	**0**	**0**								
C.	**Kurnool / Nandyal**																		

1	Gogulapadu	Profit Plus				0	0	0	0	0	0								
2	Parla	US 4078, Adya				0	0	0	0	0	0								
3	Penchikalapadu	Shakthi				0	0	0	0	0	0								
4	Chanugondla	Jhangi				0	0	0	0	0	0								
5	Guduru	Sadananda				0	0	0	0	0	0								
6	Pelakurthi	US 7067				0	0	0	0	0	0								
7	Gudipadu	US 4078,				0	0	0	0	0	0								
8	Orvakallu	US 7067				0	0	0	0	0	0								
9	Hussainapuram	US 4078,				0	0	0	0	0	0								
10	Gani	US 7067				0	0	0	0	0	0								
11	Manchalakatt	Navneeth				0	0	0	0	0	0								
12	Talamudipi	Tadakha				0	0	0	0	0	0								
13	Polur	Adhya				0	0	0	0	0	0								
14	G.Singavaram,	US 7067					0		25.0	0	0								
		Vindhya											0	5.0	0	0		0	0
		Killer					0		12.0	2.5	0			0	0	0			
		Moneymaker											0	3.0	0	0	0	0	0
		Toofan											0	11.5	0	0	0	0	Traces
15	Parla, Kalluru	Money maker											0	8.5	0	0	0	0	0
		US 7067											0	8.8	0	0	0	2.3	2.5
		Aditya 455											0	0	0	0	0	0	0
		Akira											0	10.0	0	0	0	0	0
		Tadakha											0	8.0	0	0	0	0	0
		Jaadoo											0	0	0	0	0	0	0
		Basava											0	2.3	0	0	0	0	0
		Chandni											0	5.0	0	0	0	0	0
16	Muguthi,	Moksha											0	10.5	0	0	0	0	0
		Revanth											0	10.0	0	0	0	0	0
		Asha											0	0	0	0	0	0	0
		US 7067											0	6.5	0	0	0	0	3.5
17	Mitta Sompuram	Akira											0	15.8	0	0	0	0	0
18	T. Somulaguduru	Super 971											0	4.5	0	0	0	Traces	0
19	Chilakaldona,	KDCH 1031					0		3.0	0	0								
		Panchamukhi					0		9.0	0	0								
20	Kalvakuntla, Pedkaduguru	Akira											0	9.0	3.0	0	0	0	0

21	Singarajanahalli	Tadakha											0	14.3	0	0	0	0	0
		Akira											0	21.8	0	0	0	0	Traces
22	Musanupalli	Rovan											0	Traces	0	0	0	0	0
		Adhya											0	0	0	0	0	0	0
23	Kotakandukuru	Akira											0	11	0	0	0	3.3	0
		Tadakha											0	16.3	0	0	0	5.0	0
24	Julakallu	Akira											0	1	0	0	0	1.5	Traces
25	Midthala	Akira					0		0	1.5	0				0	0	3		
26	K.Sivaramapur	Akira					0		11.3	0	0				0	0	0		
		Tadakha					0		1.0	1.5	0				0	0	0		
27	Neravada	Bharat					0		Traces	0	0				0	0	0		
		Wonder Cotton					0		Traces	0	0				0	0	1-2		
28	Veepanagandla	NCS 864					0		8.0	0	16.0				0	0	0		
		Vindhya					0		0	0	13.0				0	0	0		
		Mahyco7160											0	2.3	0	0	0	1.3	0
29	Cherukucherla	Mahyco7160											0	Traces	0	0	0	0	0
		Akira											0	Traces	0	0	0	0	0
		Average				**0.0**	**0.0**	**0.0**	**3.1**	**0.2**	**1.2**	**-**	**0.0**	**7.1**	**0.1**	**0.0**	**0.1**	**0.5**	**0.2**
		Range	**-**	**-**	**-**	**0.0**	**0.0**	**0.0**	**0.0-25.0**	**0.0-2.5**	**0.0-16.0**	**-**	**0.0**	**0.0-21.75**	**0.0-3.0**	**0.0**	**0.0-3.0**	**0.0-5.0**	**0.0-2.5**
	Overall Average		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.5**	**0.1**	**0.4**	**1.5**	**0.0**	**9.8**	**0.0**	**0.0**	**0.3**	**2.4**	**4.8**
	Overall Range		**0.0**	**0.0-Traces**	**0.0-Traces**	**0.0**	**0.0-<1.0**	**0.0**	**0.0-25.0**	**0.0-2.5**	**0.0-16.0**	**0.0-12.9**	**0.0-2.5**	**0.0-29.5**	**0.0-3.0**	**0.0-3.0**	**0.0-5.7**	**0.0-21.5**	**0.0-41.0**

ALS=Alternaria leaf spot, BLB= Bacterial leaf blight, HLS=Helminthosporium leaf spot, CLS=Cercospora leaf spot, ATN= Anthracnose, CoLS= Corynespora leaf spot, GM= Grey mildew, MLS=Myrothecium leaf spot, RR= Root rot

Table 11b: Incidence of TSV on Cotton in farmers' fields in Guntur-Andhra Pradesh

Month	District	Location (Village)	Hybrid (BG II)	Age/ Stage of the crop (days)	Incidence (%)
July 2022	**Guntur**	Tadikonda X roads	Akira	10	0
		Ponnekllu	US 4708	10	0
			Akira	10	0
		Ravela	Platinum	10	0
			Akira	7-10	0
		Pamulapadu	Akira	12	0
			Siri	7	0
			Sareen	10	0
		Bandarupalli	Akira	7	0
		Garikapadu	Siri	7	0
		Mandepudi	Jaadoo	10	0
		Damarapalli	Akira	7	0
		Phanidaram	Jaadoo	7	0
		Bazathpuram	Tulasi 45	10	0
			Super Chetak	10	0
			Siri	10	0
			US 7067	10	0
		Jonnalagadda	Akira	3	0
			US 4708	3	0
			Syerra	3	0
			Om Sai	3	0
		Perecherla	Stalin	7-10	0
		Medikinduru	Asha	10-15	0
		Bhiminenivaripalem	Jayabheri	15	0
		Korrapadu	ATM	7-10	0
		Kantepudi	Asha	7-10	0
		Nandigama X road	Sadananda	7-15	0
		Sattenapalli	Akira	7-10	0

		Madala	Tulasi 245	15-20	0
		Venna Devi	Akira	15-20	0
			US 4708	15-20	0
		Reddigudem	Akira	15-20	1-2%
			Tulasi 7	15-20	2-3%
			Platinum	7-15	Traces
		Rajupalem	Akira	10-15	Traces
		Gangireddipalem	US 4708	7-10	Traces
		Siddapuram	Akira	7-10	0
		Kamepalli	Adya	10-15	0
		Anjanipuram	Jaadoo	20-30	0
		Veerapuram	Pradeep	10-15	0
		Sambasivapeta	Akira	10-15	Traces
		Santhinagar	Jaadoo	7-10	Traces
		Dachepalli	Akira	12-18	Traces
		Muthyalampadu	Syerra	15-20	0
		Nadikudi	Platinum	7-15	0
		KottaAmbapuram	Akira	10-15	0
		Ambapuram	Jaadoo	7-10	0
		Gurazala	Geetha	10-15	0
		Rentacintala	Tulasi 7	30	0
		Kambhampadu	Tulasi 216	20-30	0
		Rayavaram	RCH 659	40	0
		Polepalli	Akira	30-40	2-4
		Obulesunipalli	Geetha	30-50	0
		Adigoppula	Mudra	20-35	0
		Naramalapadu	Gold Cot	20-30	0
		Oppicherla	Acharya	30	0
		Karempudi	RCH 659	30	0
		PetaSannigandla	Geetha	30-40	0
		Zulakallu	Akira	10-20	0

		Guttikonda	Akira	10-20	0
		Nakarikallu	Akira	30-40	0
		Narasingapadu	RCH 659	30-40	0
		Challgundla	Jaadoo	30-40	0
		Nakarikalli X road	Akira	30-40	0
		Dechvaram	RCH 659	20	0
		Rupenagundla	Jaadoo	10-20	0
		Ravipadu	Big boss	20	0
		Satuluru	Money Maker	20	0
		Ponugupadu	Asha	10-20	0
		Merikapudi	Siri	7-15	0
		Nudurupadu	Akira	10-20	0
		Vemavaram	Jaadoo	7-20	0
		Phirangipuram	Tulasi 45	10-15	0
		Repudi	Akira	10-15	0
		Perecherla	Akira	7-10	0
		Gundlapalem	Akira	7-10	0
Aug.'22		Pamulapadu	Sarkar	44	Traces to < 1.0%
			Siri	44	Traces
			Akira	44	Traces
		Tatikonda	Adya	44	5%
		Nidumukkala	Siri	40	3-5%
		Visadala	Akira	45	1-3
		Medikonduru	Akira	20-25	Traces
		Bhiminenivaripalem	Platinum	25-35	Traces
		Korrapadu	Stalin	35-40	Traces
		Nandigama crossroads	Akira	45	Traces to 1%
		Sattenapalli	Pradeep	25-30	Traces to <1%
			Jaadoo	50	Traces to <1%
		Dhulipalla	Stalin	25-30	0
		Ganapavaram	Akira	50	Traces to 3%

			US 7069	60	1-3%
		Balijepalli	Akira	45	Traces to 5%
		Rajupalem	Pradeep	25-35	Traces
		Mokkapadu	Stalin	25-50	Traces
		Pakalapadu	US 4708	25-50	Traces
		Yerrabalem	Akira	50-60	Traces
		Krosuru	Sadananda	45-55	Traces
		Velpuru	Akira	40-45	Traces
			Platinum	40-45	Traces
		Grandhasiri	Akira	50-55	Traces
		Chigurupadu	Jayabheri	30-40	0
		Rudravaram	Siri	50-60	Traces
		Bayyavaram	Akira	40-45	0
		Thuragavaripalem	RCH 659	40-45	Traces
		Munugodu	Sadananda	30-40	Traces
		Endroi	Akira	50	Traces
		Nidumukkala	Siri	40	3-5%
		Tadikonda	Akira	45-50	Traces
		Mukkai	Siri	55	Traces
		Ravela	RCH 659	55	0
			Akira	55	0
			US 4708	55	0
		Vijanapuram	Adya	55	0
			US 4708	55	0
			Ujjawala	55	0
		Ponnekallu	Akira	40	0
		Jonnalagadda	LHDP 5	55	Traces
			Akira	55	Traces
Sept.'22		Solasa	Jaadoo	55	Traces
			ATM	55	1%
		Lingapuram	Syrra	55	1%

			Police	55	Traces
			Revanth	50	Traces
		Chirumamilla	US 4078	50	Traces
			Adya	50	Traces
			Sixer	50	0
			Siri	50	0
		Phirangipuram	Akira	50	0
	Krishna	Mulpadu	Sixer	55	1
			Akira	55	3
		Kethanakonda	Akira	55	1
		Paritala	Sadananda	60	5
			Jangi	90	1
			Siri	50-60	Traces
		Parakalapadu	US 4708	60	traces
		Aithavaram	Akira	60	3%
		Nawabpet	Siri	60	traces
			US 4078	60	0
		Chillakallu	RCH 661	65	traces
		Bhimavaram	Akira	65	traces
			Sadananda	65	0
			US 4708	70	0
			US 7067	70	0
		Makkapeta	Siri	60	0
		Penuganchiprolu	Akira	70	traces
			US 4078	45	0
		Thalluru	Akira	45	0
		Penugolanu	Siri	45-50	0
		Challgondlavaripalem	Asheerwad	50-60	Traces to <1%
		Chintalakurva	Akira	45-50	traces
		Gopalapuram	US 4078	50	traces
		Chandragudem	Akira	45	0

		Mylavaram	Akira	50	traces
		G.Konduru	Akira	65	traces
	Guntur	Jonnalagadda	Akira	80	traces
		Ponnekallu	RCH 661	75	traces
			Akira	90	traces
			US 4078	90	traces
		Lam	US 4078	70	Traces-1%
		Ponnekallu	Siri	90	Traces-1%
			Ujjwal	90	Traces-1%
			Sarkar	90	Traces-1%
		Ravela	Mass	85	0
			Siri	85	traces
		Garikapadu	Ajee t111	90	Traces-2%
		Damarapalli	Akira	90	<1%
	Kurnool	Gogulapadu	ProfitPlus	90-100	3-5
		Parla	US 4078	80 -90	<5.0
			Aadhya		<5.0
		Penchikalapadu	Shakthi	70 – 80	10 – 20
		Chanugondla	Jhangi	80 – 90	5 – 10
		Guduru	Sadananda	80-90	0
		Pelakurthi	US 7067	80 – 90	5.0
		Gudipadu	US 4078,	90 – 100	15.0
		Orvakallu	US 7067	90 – 100	Traces – 2.0
		Hussainapuram	US 4078,	90 – 100	Traces – 1.0
		Gani	US 7067	80 – 90	Traces – 2.0
		Manchalakatta	Navneeth	90 – 100	2 – 30.0
		Talamudipi	Tadakha	90 – 100	5 – 10.0
		Polur	Adhya	90 – 100	< 5.0
Oct.'22		Jonnalagadda	Akira	80– 100	0
			US4708		0
		Tatireddypalem	Akira	70 -90	0

		Tadikonda	Akira	70 – 90	0
		Pamulapadu	Akira	80-100	0
			Siri	90 – 100	0
			Sarkar	90-100	0
		Ponnekallu	Akash	90 – 100	3.0
			Siri	90-100	Traces
			Ujjwal	80-100	Traces
			Sarkar	90-100	Traces
			RCH 661	80 – 100	Traces
			Ajeet 111	90-100	Traces
		Ravela	Platinum	90-100	Traces
			Akira	80-90	Traces
			Mass	90-100	Traces
			Siri	80-100	1.0
			RCH 659	90-100	0
			US 4708	80 – 100	0
		Nidumukkala	Siri	90-100	Traces
		Mothadaka	Akira	80-100	Traces
		Borupalem	US 4078	90-100	Traces
		Parimi	Akira	80 – 100	0
		Pedaparimi	Siri	80 – 90	0
		Thulluru	Siri	70-90	0
		Ananthavaram	Akira	90 – 100	0
		Abbarajupalem	US 7067	80-100	0
		Dondapadu	Siri	80-90	traces
		Narasimhapuram	Akira	80 – 90	1.0
		Vaikuntapuram	Akira	90 – 100	0
		Mandepudi	Adya	90 – 100	0
		Pedamadduru	Adya	80-100	traces
		Lingapuram	Siri	80-90	1.0
		Unguturu	Akira	80-100	traces

		Munugodu	Akira	70-90	traces
		Narakullapadu	Akira	80-100	traces
		Dharanikota	Jaadoo	80-90	1.0
		Harischandrapuram	US 7067	80-100	Traces
		Amaravati	US 4078	80-100	2.0
		75Thalluru	Akira	70-100	1.0
		Hussainapuram	Akira	80-100	1.0
		Khambampadu	Siri	80-90	Traces
			Ajeet 111	90-100	Traces
		Parasa	Akira	80-100	Traces
		Damarapalli	Akira	80-90	Traces-1.0
		Garikapadu	Ajeet 111	90-100	Traces
		Lemalle	Money Maker	80-90	Traces
		14th Mile	Akira	90-100	1.0
		Endroi	Akira	90-100	Traces
	Kurnool	G. Singavaram	US 7067	105-115	1-5
			Vindhya	110-120	2
			Killer	90-100	10.0
			Money maker	110-120	0
			Toofan	110-120	5-10
		Parla	Money maker	110-120	1.0
			US 7067	110-120	0
			Aditya 455	110	Traces
			Akira	100	0
			Tadakha	100	10
			Jaadoo	110	0
			Basava	110	Traces
			Chandni	110	10
		Muguthi	Moksha	100-105	Traces
			Revanth	100-105	7
			Asha	110-115	2

			US 7067	110-115	5
		Mitta Sompuram	Akira	110-115	10
		T. Somulaguduru	Super 971	110-115	10
		Chilakaldona	KDCH 1031	90	2
			Panchamukhi	100	2
		Kalvakuntla, Pedkaduguru	Akira	120	7
		Singarajanahalli	Tadakha	120	0
			Akira	120	2
		Musanupalli	Rovan	120	10
			Adhya	120	0
		Kotakandukuru	Akira	120-125	10
			Tadakha	110	0
		Julakallu	Akira	110-120	7.0
		Midthala	Akira	95-100	10.0
		K.Sivaramapur	Akira	90-95	0
			Tadakha	95-100	Traces
		Neravada	Bharat	90-100	10.0
		Nerawada	Wonder Cotton	100	10
		Veepanagandla	NCS 864	100	1.0
			Vindhya	100	Traces
			Mahyco 7160	100-110	0
		Cherukucherla	Mahyco 7160	120	0
			Akira	120	0
Nov.'22	**Guntur**	Atchempet	Akira	130-140	0
		Tallacheruvu	Sixer	130-135	0
			Sixer	120-125	0
			US 7067	120-125	2.5
		Krosur	Sixer	125-130	Traces
			Sixer	130-140	Traces
			US 7067	130-140	0
		Bayyavaram	Platinum	130-140	0

		Velpur	Sixer	130-140	Traces
		Vipparla	Sixer	125-130	Traces
			Sixer	120-125	2.0
		Errabalem	Akira	120-125	0
		Sattenapalli	Jaadoo	120-125	0
		Kantepudi	Asha	125-130	2.0
		Medikonduru	Akira	125-130	Traces
		KottaAmbapuram	Akira	115-120	2-10%
			Platinum	115-120	Traces
		Gangavaram	Akira	115-120	Traces
			Geetha	115-120	0
		Gogulapadu	Akira	115-120	0
		Ambapuram	Akira	115-120	0
		Satuluru	Money maker	135-140	Traces
		Guttikonda	Akira	130-140	0
		Zulakallu	Akira	130-140	0
		Karempudi	RCH 659	130-140	0
		Oppicherla	Nava mallika	130-140	0
		Obulesunipalli	Geetha	130-140	0
		Durgi	Akira	130-140	0
		Rayavaram	RCH 659	130-140	0
		Kambhampadu	Tulasi 216	130-140	Traces
		Paluvoi	Tulasi 7	140-150	0
		Rentachintala	Adbhuth	140-150	Traces
		Dachepalli	Adhya	140-150	0
		Veerapuram	Pradeep	140-150	0
Dec.'22		Vemuluripadu	Akira	140-150	0
			Ujjwal	140-150	0
		Phirangipuram	Akira	140-150	0
		Jonnalagadda	Akira	140-150	0
			US 4078	140-150	0

			Siri	140-150	0
			Adhya	140-150	0
		Amaravathi	NCH 279	140-150	Traces
			Akira	140-150	0
		Tadikonda X roads	Akira	140-150	0
		Ponnekallu	Ajeet 111	140-150	0
		Ravela	RCH 797	140-150	0
		Pamulapadu	Sarkar	140-150	0
			Siri	140-150	0
		Bezathpuram	Akira	140-150	0
			US 4078	140-150	0
		Tatireddypalem	RCH 797	140-150	0
			Adhya	140-150	0
			Akira	140-150	0
		Jonnalagadda	LHDP 5	140-150	0
			Akira	140-150	0
		Venegandla	Crystal 369	140-150	0
		Tadikonda	Akira	140-150	0
			Siri	140-150	0
		Koppuravuru	US 4078	150-160	0
		Kantheru	Akira	150-160	0
		Endroi	Akira	150-160	0
		Venegalla	Akira	150-160	0
		Borupalem	US 4078	150-160	0
		Nidumukkala	Siri	150-160	0
		Pulladigunta	Platinum	150-160	0
		Kurnuthala	US 4078	150-160	0

Table 11c: Incidence of TSV (in Range) on Cotton in farmers' fields in Lam Guntur-Andhra Pradesh

Month	Hybrids (BG-II)	Incidence of TSV (%)
July - 2022	Akira, US 4708, Platinum, Siri, Sareen, Jaadoo, Tulasi 45, Super Chetak, US 7067, US 4708, Syerra, Om Sai, Stalin, Asha, Jayabheri, ATM, Asha, Sadananda, Tulasi 245, Tulasi 7, Aadhya, Pradeep, Geetha, Tulasi 216, RCH 659, Mudra, Gold Cot, Acharya, Big Boss, Money maker, Asha	0.0 to 4.0%
Aug. - 2022	Sarkar, Siri, Akira, Aadhya, Platinum, Stalin, Pradeep, Jaadoo, US 7069, Pradeep, US 4708, Sadananda, Jayabheri, RCH 659, Ujjawala, LHDP 5	0.0 to 5.0%
Sept. - 2022	Jaadoo, Sixer, ATM, Syerra, Police,Akira, Sadananda, Revanth, US 4078, Aadhya, Siri, Jhangi, RCH 661, US 7067, Asheerwad, Ujjwal, Sarkar, Mass, Ajeet111, ProfitPlus, Shakthi, Navneeth, Tadakha	0.0 to 30.0%
Oct. - 2022	Akira, US 4078, Siri, Sarkar, Akash, Ujjwal, RCH 661, Ajeet 111, Platinum, Mass, RCH 659, US 7067, Aadhya, Jaadoo, Money Maker, Vindhya, Killer, Toofan, Aditya 455, Tadakha, Basava, Chandni Moksha, Revanth, Asha, Super 971, KDCH 1031, Panchamukhi, Rovan, Bharat, Wonder Cotton, NCS 864, Mahyco 7160	0.0 to 10.0%
Nov. - 2022	Akira, Sixer, US 7067, Platinum, Jaadoo,Asha, Geetha, Money maker, RCH 659, Nava Mallika, RCH 659, Tulasi 216, Tulasi 7, Adbhuth, Aadhya, Pradeep	0.0 to 10.0%
Dec. - 2022	Akira, Ujjwal, US 4078, Siri, Aadhya, NCH 279, Ajeet 111, RCH 797, Sarkar, US 4078, LHDP 5, Crystal 369, Platinum	0.0 to Traces

Table 11d: Observations on the occurrence of diseases in at research farm (Lam Guntur-Andhra Pradesh)

Month	Hybids(BG-II)	Incidence (%)			Mean Percent Disease Index (PDI)								
		Wilt	Root rot	Boll rot	ALS	HLS	CLS	ATN	CoLS	MLS	BB	GM	Rust
Aug. 2022	Varieties and hybrids of cotton trials	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sept. 2022		0.0	0.0	0.0	3.8-5.3	0.0	0.0	0.0	Traces	0.0	0.0	0.0	0.0
Oct. 2022		0.0	0.0	0.0-1.0	0.0-4.2	0.0	0.0	0.0	5.8-9.3	0.0	0.0-8.3	0.0-10.5	0.0-3.5
Nov. 2022		0.0	0.0	1.0-2.0	0.0	0.0	0.0	0.0	9.7-10.3	0.0	0.0-14.0	0.0-4.6	6.0-41.0
Dec. 2022		0.0	0.0	1.0-3.0	0.0	0.0	0.0	0.0	13.0-32.5	0.0	Traces	Tr.-20.5	24.5- 33.5
Average					**4.4**	**0.0**	**0.0**	**0.0**	**13.4**	**0.0**	**11.2**	**11.9**	**18.7**

Table 12a: Observations on the occurrence diseases in farmer's fields in Coimbatore, Dindigul, Virudhnagar, Tutukurin, Tirunelveli, Trippur, Salem, Perambalur (Tamil Nadu)

S.No.	District/Villages	Variety/Hybrid	Stage of sampling									
			Per cent Disease Index (PDI) / Per cent Disease Incidence									
			Early season/ Seedling stage	Mid-season/ Flowering stage				Late season / Boll development stage				
			(20- 30DAS)	(60- 80 DAS)				(120- 150 days)				
			Collar rot	ALB	BB	GM	RR	ALB	BB	GM	RR	BR
	Coimbatore											
1	Keeranatham	RCH 659, Ankur	5.0	5.0	7.8	19.5	4.3	5.5	8.3	20.5	4.3	4.0
2	Kallipalayam	RCHIIBGII, RCH 659, Ankur	5.5	4.8	4.7	12.5	3.5	5.0	5.2	13.5	4.0	4.5
3	Chenthampalayam	RCHIIBGII, Kaveri, RCH 659	3.7	5.3	5.5	7.3	3.7	5.7	6.3	7.5	3.9	4.3
4	Kovilpalayam	RCHIIBGII, Jackpot, RCH 659, Jackpot	5.3	7.7	7.7	5.7	6.5	8.3	8.0	6.0	6.8	3.5
5	Vadapudur	RCHIIBGII, RCH 659,	4.5	8.5	6.5	5.0	4.2	9.3	7.4	5.5	4.7	4.7
6	Thottipalayam	RCHIIBGII, RCH 659	4.0	8.0	6.0	7.0	5.0	8.5	6.3	7.5	6.4	5.5
		Average	**4.7**	**6.6**	**6.4**	**9.5**	**4.5**	**7.1**	**6.9**	**10.1**	**5.0**	**4.4**
	Dindigul											
1	Kamatchipuram	RCHIIBGII, RCH 659, Ankur	3.3	12.3	2.3	3.5	5.0	12.7	3.5	4.7	5.3	4.7
2	Kuyanayakkanpatti	RCHIIBGII, Kaveri, RCH 659, Ankur	5.5	13.0	5.5	6.5	7.7	13.7	6.5	7.0	8.0	5.0
3	Govindhapuram	RCHIIBGII, Kaveri, RCH 659, Ankur	5.3	11.0	6.7	18.0	11.0	11.5	7.0	18.5	12.3	4.0
4	S,Paraipatti	RCHIIBGII, RCH 659, Ankur	3.7	10.5	4.3	7.0	7.0	11.3	5.5	7.7	8.5	3.5
5	Malaiyandipuram	RCHIIBGII, Kaveri, RCH 659, Ankur, Bagubali	3.2	12.5	1.3	5.5	5.5	13.6	2.3	6.2	6.0	5.7
6	Vellamarathupatti	RCHIIBGII, Kaveri, RCH 659, Bagubali	4.5	17.3	10.0	12.3	7.5	18.5	12.0	12.5	8.0	4.4

		Average	**4.3**	**12.8**	**5.0**	**8.8**	**7.3**	**13.6**	**6.1**	**9.4**	**8.0**	**4.6**
	Virudhunagar											
1	Kariyapatti	RCHIIBGII, RCH 659	4.3	6.5	0.0	0.0	4.3	7.3	0.0	0.0	5.0	3.5
2	Subbaiyapuram	RCHIIBGII, RCH 659	6.7	7.3	0.0	0.0	15.0	8.0	0.0	0.0	15.5	4.0
3	Saminathapuram	RCHIIBGII, RCH 659	3.8	6.7	0.0	0.0	8.5	7.7	0.0	0.0	9.0	4.3
4	Vadakarai	RCHIIBGII, RCH 659	4.7	7.8	0.0	0.0	7.0	8.5	0.0	0.0	8.0	5.3
		Average	**4.9**	**7.1**	**0.0**	**0.0**	**8.7**	**7.9**	**0.0**	**0.0**	**9.4**	**4.3**
	Tutukurin											
1	Villicheri	RCHIIBGII, RCH 659, Kaveri,	3.5	7.3	0.0	1.0	5.0	9.2	0.0	2.0	5.5	2.5
2	Nalattumuthoor	RCHIIBGII, RCH 659, Kaveri,	4.3	7.7	0.0	3.7	3.7	8.0	0.0	4.0	4.2	3.0
3	Nalattupudur	RCHIIBGII, RCH 659, Kaveri,	4.5	6.0	0.0	4.5	3.3	6.8	0.0	3.7	3.5	4.2
		Average	**4.1**	**7.0**	**0.0**	**3.1**	**4.0**	**8.0**	**0.0**	**3.2**	**4.4**	**3.2**
	Tirunelveli											
1	Sankarankovil	RCHIIBGII, RCH 659, Kaveri,	5.0	7.0	1.5	0.0	12.3	7.9	2.0	0.0	12.7	3.5
2	Rastha	RCHIIBGII, RCH 659, Kaveri,	5.7	10.5	15.3	0.0	10.5	11.0	16.0	0.0	11.5	2.7
3	Manoor	RCHIIBGII, RCH 659, Kaveri,	4.3	7.5	2.5	0.0	7.5	8.0	4.5	0.0	8.4	3.3
4	Perumalpatti	RCHIIBGII, RCH 659, Kaveri,	4.8	8.3	2.0	0.0	9.3	9.3	3.0	0.0	9.7	3.0
		Average	**5.0**	**8.3**	**5.3**	**0.0**	**9.9**	**9.1**	**6.4**	**0.0**	**10.6**	**3.1**
	Trippur											
1	Vellaigoundan valasu	RCHIIBGII, Kaveri, RCH 659, Ankur	5.5	11.5	5.7	4.7	5.5	12.5	6.3	5.3	6.2	3.5
2	Avinashi	RCHIIBGII, RCH 659, Ankur	3.3	9.3	4.4	4.3	5.0	10.0	4.7	5.0	5.3	3.7
3	Samiyanpalayam	RCHIIBGII, RCH 659, Ankur	4.2	6.5	1.5	3.5	4.3	7.0	6.8	2.7	4.5	4.5
		Average	**4.3**	**9.1**	**3.9**	**4.2**	**4.9**	**9.8**	**5.9**	**4.3**	**5.3**	**3.9**
	Salem											
1	Thamukkapalaym	RCH 659, Jackpot, Bagubali	5.0	13.5	14.7	12.5	6.0	14.3	15.1	12.8	6.5	2.5
2	Ramanathapuram	RCH 659, Ankur, Jackpot	3.9	12.7	15.8	15.5	7.3	13.0	16.3	16.0	8.0	3.0
3	Vazhapadi	RCH 659, Ankur	4.5	13.5	17.3	16.7	7.0	14.7	17.7	18.3	7.7	4.1
		Average	**4.5**	**13.2**	**15.9**	**14.9**	**6.8**	**14.0**	**16.4**	**15.7**	**7.4**	**3.2**
	Perambalur											
1	Krishnapuram	RCHIIBGII, Kaveri, NEO, RCH 659, Ankur	5.7	11.3	10.5	10.3	6.0	11.5	11.0	14.2	6.7	3.7
2	Nergunam	RCHIIBGII, Kaveri, RCH 659, Bagubali	5.5	9.7	12.0	13.5	6.5	10.3	12.5	14.7	7.0	3.5
3	Veppamthattai	RCHIIBGII, NEO, RCH 659	6.0	10.5	15.0	17.3	8.0	11.5	15.7	18.0	8.3	4.0
4	Varagampadi	RCHIIBGII, Kaveri, RCH 659, Ankur, Bagubali	5.3	12.3	13.4	13.7	7.3	13.0	14.0	15.0	7.5	4.2
5	Alathur	RCHIIBGII, Kaveri, RCH 659, Ankur, Bagubali	4.5	8.7	7.3	12.5	5.1	9.0	8.3	13.0	5.5	3.8
		Average	**5.4**	**10.5**	**11.6**	**13.5**	**6.6**	**11.1**	**12.3**	**15.0**	**7.0**	**3.8**
		Overall Average	**4.6**	**9.3**	**6.0**	**6.7**	**6.6**	**10.1**	**6.8**	**7.2**	**7.1**	**3.8**

ALS=Alternaria leaf spot, BLB= Bacterial leaf blight, GM= Grey mildew, MLS=Myrothecium leaf spot, RR= Root rot, BR=Boll rot

Table 12b: Observations on the occurrence and distribution of major diseases of cotton diseases at Research farm TNAU Coimbatore

Year & Month	Hybrids / Varieties	Incidence (%)			Mean Percent Disease Intensity (PDI)					
		CR	Root rot	Boll Rot	ALS	CLS	MLS	BB	GM	Rust
Aug.-2022	DCH32, RCHIIBGII, RCH 659 and varieties Co15 and Co17, MCU5, JaddooK12, K11	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sept.-2022		5.2	0.0	0.0	4.3	0.0	4.0	4.3	0.0	0.0
Oct.-2022		6.1	0.0	0.0	9.5	6.3	5.3	8.5	7.0	0.0
Nov.-2022		0.0	5.5	0.0	20.5	8.3	6.5	11.3	15.5	0.0
Dec.-2022		0.0	10.0	5-10	18.5	7.5	7.0	15.7	25.7	0.0
Jan.-2023		0.0	15.0	5-10	15.3	5.0	7.3	13.7	25.7	0.0
	Average	**2.4**	**5.1**	**5-10**	**11.4**	**4.5**	**5.0**	**8.9**	**12.3**	**0.0**

Path 1(b) Disease progress in relation to weather factors

NORTH ZONE

Table 13a: Disease progress in relation to weather factors at ARS, PAU Faridkot (Punjab)

SMW	Temperature (°C)			Relative humidity (%)			Wind speed	Sunshine	Rainfall	Rainy days	F 846			HS 6			RS 981			RST 9		
											CLCuD %		WF Adult	CLCuD %		WF Adult	CLCuD %		WF Adult	CLCuD %		WF Adult
	max	min	mean	max	min	mean	(Km/h)	(hour)	(mm)	(no.)	Incidence	PDI	Per 3 leaf	Incidence	PDI	Per 3 leaf	Incidence	PDI	Per 3 leaf	Incidence	PDI	Per 3 leaf
23	44.0	27.0	35.5	36	16	26	3.6	8.5	0.0	0	0.2	0.7	0.3	0.9	1.0	0.4	0.4	0.4	0.2	0.7	1.0	0.6
24	40.0	28.0	34.0	45	24	34	7.7	7.8	0.0	1	2.0	1.4	0.7	2.4	1.7	0.9	1.5	0.7	1.1	2.2	1.4	0.8
25	32.1	23.2	27.7	76	57	67	8.3	4.3	84.8	2	7.2	3.2	4.2	8.7	4.6	4.6	7.6	2.8	4.9	8.3	3.6	3.9
26	37.5	27.8	32.6	69	40	55	4.6	8.5	0.0	1	15.4	10.3	6.3	17.6	11.3	5.8	16.3	10.7	7.1	17.0	11.0	6.1
27	35.7	29.1	32.4	83	64	74	7.7	2.6	8.0	1	30.9	25.3	37.0	32.6	26.3	38.6	30.4	24.7	40.3	32.2	26.0	39.2
28	34.3	27.6	31.0	79	65	72	6.2	2.3	0.0	1	45.7	39.3	98.0	48.7	40.7	99.0	47.0	39.7	96.8	47.4	40.0	103.6
29	33.4	26.1	29.7	85	70	77	7.3	4.4	126.0	4	54.8	42.7	32.6	58.5	46.3	34.2	53.9	43.3	31.7	56.5	45.0	33.3

30	33.7	26.8	30.2	86	66	76	7.7	4.5	57.2	2	71.3	48.0	31.9	76.1	49.2	31.4	72.4	47.6	31.9	73.5	48.8	32.9
31	32.5	25.7	29.1	90	73	82	4.2	3.2	74.3	3	81.5	50.8	8.0	84.6	52.8	8.5	81.5	49.6	7.4	81.5	51.6	9.8
32	34.4	27.3	30.9	88	73	80	3.5	5.2	77.0	2	97.4	52.2	4.1	98.3	54.8	4.1	97.2	52.6	5.0	97.2	54.0	4.7
33	34.1	26.8	30.5	79	61	70	5.7	6.1	3.8	1	99.1	56.1	6.6	99.6	58.6	7.0	98.9	55.6	6.1	99.4	57.6	7.7
34	35.0	26.9	31.0	81	56	68	5.6	9.5	0.0	0	100	58.1	10.0	100	59.8	8.6	100	57.7	10.7	100	58.9	9.2
35	35.2	26.6	30.9	82	56	69	5.0	7.3	0.0	0	100	60.5	8.2	100	61.8	7.2	100	59.7	8.4	100	61.4	7.2
36	35.1	25.5	30.3	78	53	66	3.5	8.2	0.0	0	100	61.3	9.4	100	62.3	9.7	100	61.0	8.6	100	62.0	10.7
37	34.7	25.4	30.1	84	58	71	3.2	5.3	0.2	0	100	61.4	12.9	100	63.0	16.0	100	61.4	13.9	100	62.4	14.9
38	33.8	25.2	29.5	83	58	70	2.9	6.4	0.0	0	100	62.3	6.6	100	62.9	7.5	100	62.0	6.2	100	62.6	7.0
39	30.8	22.9	26.8	89	66	78	4.2	4.2	40.2	2	100	62.6	5.1	100	63.2	5.0	100	62.3	5.8	100	62.9	6.1
40	33.8	21.7	27.8	85	46	66	1.9	9.5	0.0	0	100	62.9	2.2	100	63.5	2.8	100	62.6	2.1	100	63.2	2.5

Table 13b: Correlation coefficient between weather parameters and CLCuD of cotton (Cv F 846)

Sr.No	Weather parameters	Correlation coefficient	
		CLCuD (DI)	CLCuD PDI
1.	Maximum temperature (°C)	-0.582	-0.620
2.	Minimum temperature (°C)	-0.356	-0.349
3.	Mean temperature (°C)	-0.564	-0.587
4.	Maximum relative humidity (%)	0.710	0.753
5.	Minimum relative humidity (%)	0.561	0.609
6.	Mean relative humidity (%)	0.645	0.691
7.	Rainfall (mm)	0.077	-0.011
8.	Rainy days (#)	-0.066	-0.048
9.	Sunshine (hour)	-0.164	-0.120

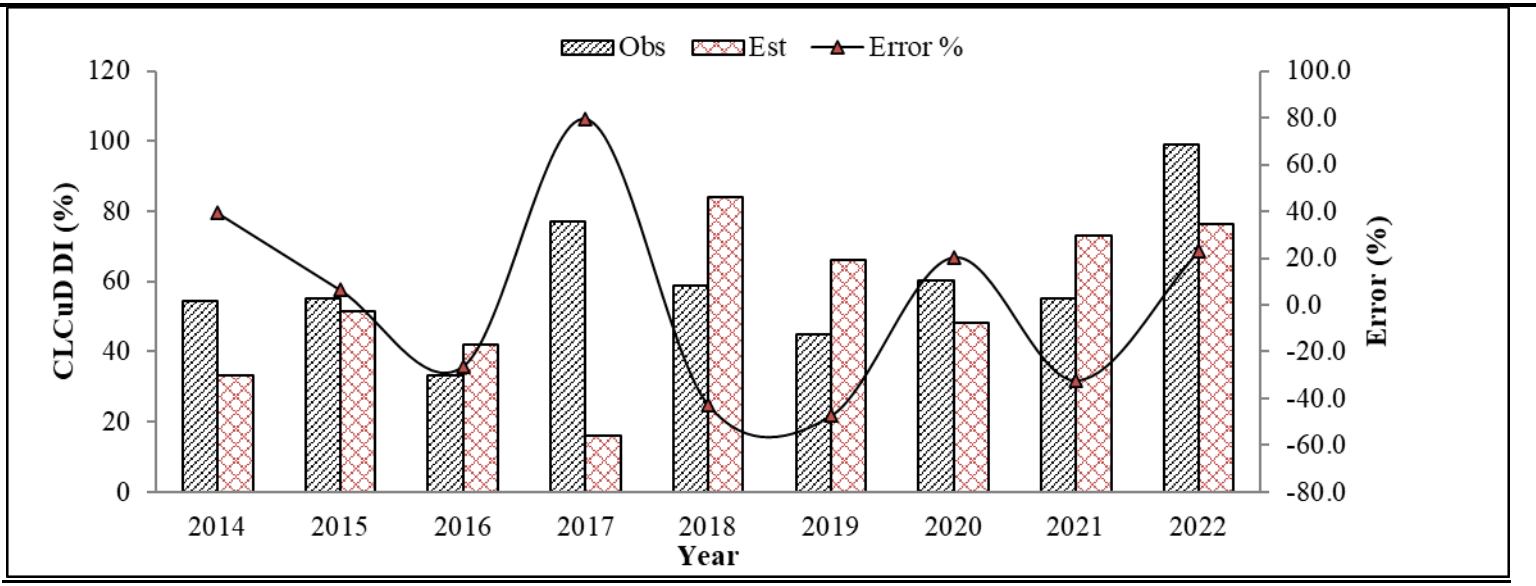

Fig. 1: Observed and estimated CLCuD incidence for 2014-2022 by Monga et al. (2018)

Table 14a: Disease progress in relation to weather factors at ARS SKRAU, Sriganganagar (Rajasthan) (HS-6)

SMW	Date of Observation	Disease incidence (%)	PDI (%)	Whitefly/3 leaves	Meteorological data				
					Rain fall (mm)	Temperature (°C)		RH (%)	
						Max	Min	Morning	Evening
23	08.06.22	1.9	1.0	7.6	0.0	44.8	25.4	50.7	44.7
24	15.06.22	6.7	3.7	24.2	0.0	44.8	28.3	46.7	29.4
25	22.06.22	26.9	27.7	17.1	29.6	36.1	22.3	58.0	50.0
26	30.06.22	48.5	33.7	88.2	24.4	41.0	24.5	55.1	50.3
27	07.07.22	87.6	42.6	96.2	4.8	37.6	25.6	76.9	61.4
28	15.07.22	98.3	48.3	172.4	236.6	38.0	26.8	71.6	61.4
29	21.07.22	100	49.4	88.7	15.3	35.8	25.6	73.0	69.7

Table 14b: Correlation values between weather parameters and CLCuD of cotton ARS Sriganganagar [Correlation coefficient (r)]

S.No	Weather parameters	Correlation coefficient		
		Disease incidence (%)	PDI (%)	Whitefly/3 leaves
1.	Rainfall (mm)	0.492^{NS}	0.472^{NS}	0.775^{*}
2.	Maximum temperature (°C)	-0.752^{NS}	-0.866^{*}	-0.472^{NS}
3.	Minimum temperature (°C)	0.064^{NS}	-0.179^{NS}	0.254^{NS}
4.	Morning relative humidity (%)	0.943^{**}	0.894^{**}	0.729^{NS}
5.	Evening relative humidity (%)	0.901^{**}	0.899^{**}	0.664^{NS}
6.	Whitefly	0.868^{*}	0.817^{*}	

Table 15a: Disease progress in relation to weather factors at HAU, Hisar (Haryana) (Cultivar HS-6)

SMW	Period	Rainy days	Rainfall (mm)	Temp. (^{0}C)		RH (%)		Sunshine	Wind speed	WF/ 3 leaves	CLCuD (%)		
				Max.	Min.	Morn	Even	hours/day	Km/h		Incidence	Change	PDI
18	30.4.22 – 06.5.22	0	0.0	41.5	24.3	59.0	25.0	8.3	6.6	0.0	0.0	0.0	0.0
19	07.5.22 – 13.5.22	0	0.0	41.7	26.3	59.0	22.0	8.6	6.4	0.0	0.0	0.0	0.0
20	14.5.22 = 20.5.22	0	0.0	44.0	26.0	56.0	27.0	7.8	5.1	0.0	0.0	0.0	0.0
21	21.5.22 – 27.5.22	2	25.6	36.9	22.4	66.0	39.0	7.6	8.6	1.8	0.0	0.0	0.0
22	28.5.22 – 03.6.22	1	6.0	41.2	25.4	62.0	31.0	6.7	6.2	3.3	4.3	0.0	3.3
23	04.6.21 - 10.6.21	0	0.0	43.7	26.4	46.0	30.0	9.3	5.3	5.6	7.5	3.3	8.3
24	11.6.21 - 17.6.21	0	0.0	43.2	27.9	55.0	41.0	9.0	10.0	4.0	9.4	1.9	6.7
25	18.6.21 - 24.6.21	2	10.9	33.1	22.9	84.0	50.0	4.9	6.5	7.6	18.5	9.1	11.7
26	25.6.21 - 01.7.21	0	0.0	39.8	28.6	68.0	43.0	7.4	8.9	8.3	25.3	6.8	13.3
27	02.7.21 - 08.7.21	0	2.4	36.5	28.5	82.0	56.0	4.8	7.1	9.6	28.5	3.2	15.0
28	09.7.21 - 15.7.21	3	45.6	35.6	27.0	84.0	66.0	5.7	6.4	14.8	32.3	3.8	23.3
29	16.7.21 - 22.7.21	3	101.0	35.2	26.6	90.0	73.0	4.7	6.4	22.3	58.5	26.5	30.0
30	23.7.21 - 29.7.21	1	17.6	33.0	27.0	90.0	77.0	5.1	7.2	18.8	67.3	8.8	36.7
31	30.7.21 - 05.8.21	4	132.1	32.3	26.4	95.0	83.0	3.7	3.3	25.3	70.5	3.2	40.0
32	06.8.21 - 12.8.21	0	2.4	33.7	27.6	86.0	65.0	6.0	5.6	24.2	75.3	4.8	41.7

33	13.8.21 - 19.8.21	2	55.0	33.5	26.1	88.0	64.0	6.9	8.2	30.0	76.8	1.0	55.0
34	20.8.21 - 26.8.21	0	0.0	34.3	26.1	90.0	64.0	8.2	6.1	21.8	78.3	1.5	56.6
35	27.8.21 - 02.9.21	0	0.0	35.2	25.5	87.0	55.0	8.5	5.4	23.1	79.3	1.0	58.3
36	03.9.21 - 09.9.21	0	2.4	33.7	27.6	86.0	65.0	6.0	5.6	25.2	80.5	1.3	61.6
37	10.9.21 -16.9.21	2	55.0	33.5	26.1	88.0	64.0	6.9	8.2	28.4	82.3	1.8	63.6
38	17.9.21 - 23.9.21	0	0.0	34.3	26.1	90.0	64.0	8.2	6.1	15.2	83.8	1.5	64.7
39	24.9.21 - 30.9.21	0	0.0	35.5	25.6	86.0	53.0	8.5	5.0	14.3	84.2	0.5	65.1
40	01.10.21 - 07.10.21	0	0.0	36.7	25.3	84.0	48.0	8.7	4.6	10.8	85.0	0.8	65.6
41	08.10.21 - 14.10.21	0	1.2	35.3	27.9	85.0	59.0	6.5	7.7	3.5	85.2	0.2	66.0
42	15.10.21 - 21.10.21	2	44.3	34.6	24.7	89.0	65.0	5.5	5.1	18.0	86.4	1.2	66.6

Table 15b: Correlation values between weather parameters and CLCuD of cotton HAU Hisar [Correlation coefficient (r)]

S.No	Weather parameters	Correlation coefficient		
		Disease incidence (%)	PDI (%)	Whitefly/3 leaves
1	Rainfall (mm)	0.231NS	0.132NS	0.512**
2	Maximum temperature (°C)	-0.781**	-0.708**	-0.777**
3	Minimum temperature (°C)	0.193NS	0.129NS	0.195NS
4	Morning relative humidity (%)	0.856**	0.784**	0.785**
5	Evening relative humidity (%)	0.781**	0.674**	0.831**
6	Sunshine (Hr)	-0.209NS	-0.076NS	-0.396*
7	Wind Speed(Km/h)	-0.290NS	-0.275NS	-0.202NS
8	Whitefly/3 leaves	0.779**	0.699**	

Table 16a: Disease progress in relation to weather factors at CICR-RS, Sirsa (Haryana) (Cultivar HS-6)

SMW	Temp. (^{0}C)			Degree Days	GDD	RH (%)		Rainfall (mm)	Rainy days	CLCuD			WF/3 leaves
	Max	Min	Mean			Max	Min			Incidence (%)	Grade	PDI (%)	
16	40.2	25.9	33.0	17.5	17.5	45.9	32.1	1.4	1	0.0	0.0	0.0	0.0
17	42.0	26.2	34.1	18.6	36.1	37.4	28.0	0.0	0	0.0	0.0	0.0	0.0
18	41.9	26.6	34.2	18.7	54.9	50.9	38.1	2.0	1	0.0	0.0	0.0	0.0
19	43.6	28.3	35.9	20.4	75.3	61.9	31.9	0.0	0	0.0	0.0	0.0	0.0
20	45.1	27.9	36.5	21.0	96.3	55.1	28.7	0.0	0	0.0	0.0	0.0	0.5
21	38.2	25.6	31.9	16.4	112.7	62.9	50.0	14.2	2	2.8	0.0	0.5	1.5
22	42.9	28.4	35.7	20.2	20.2	56.9	34.0	0.0	0	5.3	0.1	1.0	2.8
23	44.3	28.3	36.3	20.8	41.0	43.3	28.7	0.0	0	16.1	0.2	3.6	5.1
24	44.3	28.3	36.3	20.8	61.8	54.6	36.9	0.0	0	24.3	0.4	5.9	11.4
25	33.4	24.5	29.0	13.5	75.2	84.4	56.1	52.4	2	33.0	0.5	7.7	9.1
26	40.1	27.0	33.6	18.1	93.3	57.3	43.0	5.8	1	41.3	0.6	10.7	17.6
27	37.6	28.1	32.9	17.4	110.6	71.9	55.3	1.2	1	58.8	1.0	16.7	27.4
28	35.2	26.4	30.8	15.3	126.0	77.1	71.0	77.5	1	75.1	1.3	22.4	30.8
29	33.3	26.3	29.8	14.3	140.3	83.0	77.3	78.8	3	100	1.9	31.3	37.5
30	32.9	26.3	29.6	14.1	154.4	90.3	76.7	94.2	2	100	2.4	39.9	16.7
31	32.0	26.2	29.1	13.6	168.0	89.0	80.7	67.4	3	100	2.9	48.9	71.2
32	35.5	26.7	31.1	15.6	183.6	86.7	67.6	0.0	0	100	3.4	56.1	2.7
33	33.9	25.8	29.8	14.3	197.9	86.6	68.4	0.0	0	100	3.7	61.8	4.0
34	34.9	26.4	30.6	15.1	213.0	89.1	62.3	0.0	0	100	4.0	67.4	6.4
35	36.1	25.8	31.0	15.5	228.5	85.7	58.3	6.8	1	100	4.5	75.0	8.2
36	35.9	26.0	30.9	15.4	243.9	86.1	55.0	0.0	0	100	5.2	87.0	11.4
37	35.0	25.7	30.4	14.9	258.8	84.0	62.0	0.0	0	100	5.5	91.5	8.6

Table 16b: Correlation values between weather parameters and CLCuD of cotton CICR RS, Sirsa [Correlation coefficient (r)]

Weather parameters	Correlation coefficient						
	DI	Grade	PDI	Whitefly	Whitefly & DI	Whitefly & CLCuD Grade	Whitefly & CLCuD PDI
Maximum temperature (°C)	-0.839**	-0.672**	-0.673**	-0.530*	0.484*	0.198NS	0.201NS
Minimum temperature (°C)	**-0.395NS**	-0.426*	-0.427*	**-0.087NS**			
Mean temperature	-0.786**	-0.654**	-0.655**	-0.459*			
Degree Days	-0.786**	-0.654**	-0.655**	-0.459*			
GDD	0.944**	0.916**	0.916**	**0.371NS**			
Maximum relative humidity (%)	0.896**	0.789**	0.789**	0.428*			
Minimum relative humidity (%)	0.887**	0.654**	0.655**	0.637**			
Rainfall (mm)	0.384NS	0.037NS	0.038NS	0.658**			
Rainy days	0.212NS	-0.079NS	-0.077NS	0.678**			

CENTRAL ZONE

Table 17a: Disease progress in relation to weather factors at CRS NAU, Nanded (Maharashtra)

SMW	Period	Rainfall (mm)	Rainy Days	Temperature ^{0}C		Relative Humidity (%)		RCH 2 BG II PDI (%)			LRA-5166 PDI (%)			PA-255 PDI (%)
				Max	Min	Morn	Even	BLB	ALS	GM	BLB	ALS	GM	GM
28	09 – 15 Jul	433.4	5.0	28.7	17.6	86.6	82.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	16 – 22 Jul	74.0	3.0	29.7	18.8	82.7	70.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	23 – 29 Jul	80.2	6.0	29.6	18.1	81.1	74.9	0.5	0.0	0.0	0.0	0.0	0.0	0.0
31	30 – 05 Aug	182.8	3.0	31.7	18.8	80.4	67.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0
32	06 – 12 Aug	34.0	3.0	32.9	19.4	78.4	64.7	1.0	0.5	0.0	0.5	0.5	0.0	0.0
33	13 – 19 Aug	7.2	2.0	33.1	20.1	74.7	61.9	1.0	1.0	0.0	1.0	0.5	0.0	0.0
34	20 – 26 Aug	7.6	1.0	33.3	20.9	68.3	61.0	2.0	1.5	0.0	2.0	1.0	0.0	0.0
35	27 – 02 Sep	2.4	0.0	34.4	20.4	73.6	55.9	4.0	2.0	0.0	4.0	1.0	0.5	0.5

36	03 – 09 Sep	75.4	2.0	31.0	18.4	82.0	73.1	4.5	2.0	3.5	4.0	1.5	1.5	1.0
37	10 – 16 Sep	67.6	3.0	31.6	19.1	77.6	71.4	5.0	2.5	4.0	5.5	1.5	2.0	2.5
38	17 – 23 Sep	43.4	2.0	31.9	20.3	74.4	66.4	5.5	3.5	5.0	5.5	2.0	3.0	3.5
39	24 – 30 Sep	50.6	3.0	32.0	19.6	76.3	66.7	6.0	4.5	5.5	6.0	3.0	5.0	4.0
40	01 – 07 Oct	69.2	2.0	33.3	19.6	72.7	58.0	7.0	4.5	5.5	6.5	3.5	5.5	4.5
41	08 – 14 Oct	34.8	4.0	31.6	19.3	80.3	70.0	**9.0**	5.0	7.5	6.5	4.0	7.5	6.5
42	15 – 21 Oct	8.4	1.0	32.0	19.6	73.7	65.3	6.0	6.0	15.0	8.5	4.5	10.5	11.5
43	22 – 28 Oct	0.0	0.0	32.4	19.7	71.4	60.6	5.0	**9.0**	15.5	5.5	5.0	13.5	14.0
44	29 – 04 Nov	0.0	0.0	32.7	17.7	77.0	61.3	4.5	7.0	22.0	6.0	5.8	15.0	15.5
45	05 – 11 Nov	0.0	0.0	-	-	-	-	4.0	5.5	27.0	4.5	5.5	18.0	19.0
46	12 – 18 Nov	0.0	0.0	-	-	-	-	3.5	4.0	34.0	3.0	4.0	20.0	20.0
47	19 –25 Nov	0.0	0.0	-	-	-	-	3.0	3.5	45.3	2.5	4.0	35.0	43.0
48	26 - 02 Dec	0.0	0.0	-	-	-	-	2.0	3.0	55.3	2.0	3.5	40.0	33.0
49	03 - 09 Dec	0.0	0.0	-	-	-	-	0.0	2.0	58.0	1.0	3.0	**50.0**	44.0
50	10 - 16 Dec	0.0	0.0	-	-	-	-	0.0	1.5	**65.0**	1.0	2.0	46.0	42.0
51	17 - 23 Dec	0.0	0.0	-	-	-	-	0.0	1.0	58.6	0.0	0.0	40.0	35.0
52	24 - 31 Dec	0.0	0.0	-	-	-	-	0.0	0.0	44.0	0.0	0.0	35.0	30.0

*From 45th SMW, whether factors was not noted due to the farm disturbance (due to the national highway)

Table 17b: Correlation values between weather parameters and diseases of cotton Nanded [Correlation coefficient (r)]

Weather Parameters	Correlation coefficient (r)						
	RCH 2 BG II			LRA 5166			PA 255
	BLB	ALS	GM	BLB	ALS	GM	GM
Rainfall (mm)	-0.426^{NS}	-0.458^{NS}	-0.355^{NS}	-0.459^{NS}	-0.441^{NS}	-0.363^{NS}	-0.363^{NS}
Temp. Maximum (^{0}C)	0.367^{NS}	0.360^{NS}	0.194^{NS}	0.392^{NS}	0.341^{NS}	0.224^{NS}	0.216^{NS}
Temp. Minimum (^{0}C)	0.268^{NS}	0.135^{NS}	-0.167^{NS}	0.246^{NS}	0.031^{NS}	-0.104^{NS}	-0.102^{NS}
Morning RH (%)	-0.372^{NS}	-0.494*	-0.286^{NS}	-0.465^{NS}	-0.417^{NS}	-0.323^{NS}	-0.333^{NS}
Evening RH (%)	-0.305^{NS}	-0.436^{NS}	-0.286^{NS}	-0.365^{NS}	-0.403^{NS}	-0.330^{NS}	-0.325^{NS}

Table 18a: Disease progress in relation to weather factors at PDKV, Akola (Maharashtra)

SMW	Period	Rainy days	Rainfall (mm)	Temperature		R. Humidity		Sunshine hours	Wind speed (km/H)	LRA-5166			Bhakti Bt.		
				^{0}C		%				(PDI)			(PDI)		
				Max.	Min.	Morn.	Even	BSH		BLB	MLS	GM	BLB	MLS	GM
34	20-26 Aug	1	37.6	30.4	21.4	87.0	60.0	4.6	6.4						
35	27-2 Sept	2	40.1	30.6	21.8	87.0	54.0	6.9	2.6						
36	3-9 Sept	2	35.0	31.0	21.3	87.0	58.0	5.3	1.1						
37	10-16Sept	5	25.3	32.1	21.5	85.0	72.0	4.0	3.8						
38	17-23 Sept	2	26.5	32.5	20.8	85.0	62.0	4.6	5.8	2.2			2.2		
39	24-30Sept	1	23.7	33.3	20.7	85.0	55.0	7.4	2.0	3.9			3.9		
40	1-7 Oct	2	25.3	33.6	20.5	82.0	53.0	6.6	1.2	3.9			5.0	1.7	
41	8-14 Oct	2	14.5	33.8	21.3	79.0	62.0	4.0	1.0	5.0	3.9	2.2	7.8	2.2	
42	15-21 Oct	2	7.5	33.3	18.7	78.0	57.0	5.6	1.5	5.0	6.1	3.9	13.9	2.8	3.9
43	22-28 Oct	0	5.9	33.0	13.9	74.0	39.0	8.2	1.3	13.9	13.3	5.0	15.6	3.9	6.1
44	29-4 Nov	0	1.9	32.6	12.2	74.0	41.0	8.5	0.6	13.9	13.9	7.8	18.9	5.0	7.8
45	5-11 Nov	0	3.2	32.2	13.5	72.0	37.0	8.4	0.5	18.9	18.9	6.1	17.2	7.8	12.2
46	12-18 Nov	0	7.1	31.4	11.8	74.0	38.0	7.9	0.6	15.6	18.9	5.0	13.9	7.8	13.9
47	19-25 Nov	0	4.5	30.8	8.4	72.0	34.0	8.3	0.7	15.6	7.8	3.9	11.1	5.0	15.6
48	26-2 Dec	0	3.8	30.7	8.9	70.0	35.0	8.3	0.3	13.9	12.2	2.2	7.8	3.9	15.6
49	3-9 Dec	0	2.1	30.2	12.0	70.0	38.0	4.9	0.7				5.0		5.0
50	10-16 Dec	1	2.0	29.7	15.4	71.0	45.0	5.1	1.3						
51	17-23 Dec	0	2.0	29.5	11.6	70.0	40.0	8.7	0.9						
52	24-31 Dec	0	4.5	29.0	12.5	72.0	42.0	8.1	0.9						

Table 18b: Correlation values between weather parameters and bacterial blight of cotton at Akola (Maharashtra) [Correlation coefficient (r)]

Sr. No.	Particulars	Rainfall (mm)	Temperature (^{0}C)		R.H. (%)		Sunshine hours/BSH
			Max.	Mini	Morn.	Even.	
1	**LRA-5166** % Disease intensity	-0.855**	-0.678**	-0.892**	-0.912**	-0.941**	0.810**
2	**Bhakti Bt** % Disease intensity	-0.710**	0.015	-0.465*	-0.535**	-0.495**	0.597**

('r') values : * Significant at 5% 0.456, ** Significant at 1% 0.575

Table 19a: Disease progress in relation to weather factors at NAU, Surat (Gujarat), cultivar- G.Cot.Hy. 12 (Non-Bt)

SMW	Period	Weather parameter, 2021							
		Temperature (^{0}C)		Humidity (%)		Sunshine	Rain fall	Rainy days	BLB
		Max	Min	Morning	Evening	hour	(mm)		PDI (%)
25	18/06/2022	32.5	25.9	96	73	2.8	91.0	6	0.0
26	25/06/2022	32.8	26.6	96	72	1.9	96.0	5	0.0
27	2/7/2022	30.5	25.6	99	83	1.0	275.5	7	0.0
28	9/7/2022	28.9	25.5	100	88	0.0	221.5	7	0.0
29	**16/07/2022**	30.9	26.5	95	77	2.0	30.5	6	2.5
30	23/07/2022	31.9	26.2	95	68	2.3	37.5	5	6.5
31	30/07/2022	33.1	26.9	90	63	3.7	84.0	2	8.0
32	6/8/2022	31.4	26.0	90	60	1.9	100.5	6	10.5
33	13/08/2022	29.8	25.5	88	60	2.4	218.0	7	11.0
34	20/08/2022	31.2	26.9	80	60	3.4	4.5	4	12.5
35	27/08/2022	33.4	25.9	85	65	5.6	23.5	4	20.0
36	3/9/2022	34.4	26.7	84	61	4.8	16.5	3	21.5

37	10/9/2022	31.5	25.3	87	74	2.0	130.5	7	22.5
38	17/09/2022	31.4	25.7	81	76	4.1	8.0	2	24.5
39	24/09/2022	32.5	25.2	81	67	5.2	27.0	3	30.5
40	1/10/2022	33.4	26.3	77	62	6.7	19.5	1	34.5
41	8/10/2022	32.1	24.4	83	75	5.3	60.0	3	38.5
42	**15/10/2022**	34.8	23.7	63	50	6.7	0.0	0	**45.5**
43	22/10/2022	35.2	21.0	64	39	8.9	0.0	0	37.0
44	29/10/2022	35.2	19.3	56	39	8.6	0.0	0	35.0
45	5/11/2022	35.7	20.2	63	49	7.7	0.0	0	28.5
46	12/11/2022	34.0	20.7	55	42	7.3	0.0	0	24.5
47	19/11/2022	32.3	16.3	54	33	8.6	0.0	0	23.0
48	26/11/2022	33.3	18.2	58	45	7.2	0.0	0	15.5
49	3/12/2022	31.7	20.5	64	49	6.7	0.0	0	10.5
50	10/12/2022	33.6	21.5	68	49	5.7	0.0	0	7.5
51	17/12/2022	32.0	20.0	62	42	9.0	0.0	0	4.0

Table 19b: Correlation values between weather parameters and bacterial blight of cotton at MCRS, Surat

Factors	Temperature		Relative Humidity		Sunshine hour	Rain fall	Rainy days
	Max	Min	Morning	Evening			
Correlation matrix	0.61	-0.28	-0.553	-0.394	0.611	-0.481	-0.54

*significant at 5 % (r=0.381) and ** 1% (r=0.487) level of significance at n-2 degree of freedom

Table 20a: Disease progress in relation to weather factors at JAU, Junagarh (Gujarat)

Met. Week	Period	Rainy days	Rainfall in mm	Temperature ^{0}C		R. Humidity %		Sunshine hours	Wind speed	LRA-5166			
				Max.	Min.	Morn.	Even.	(BSH)	(km/hr)	BLB	ALS	CoLS	GM
29	16-07-22 to 22-07-22	4	36.9	30.6	24.4	95	82	0.6	8.9	1.0	0.0	0.0	0.0
30	23-07-22 to 29-07-22	4	27.7	30.5	24.2	94	78	2.1	7.5	11.0	0.0	0.0	0.0
31	30-07-22 to 05-08-22	3	61.2	32.4	24.5	92	74	3.4	6.4	14.5	0.0	0.0	0.0
32	06-08-22 to 12-08-22	7	108.6	31.6	24.4	92	83	1.8	3.9	4.0	0.0	0.0	0.0
33	13-08-22 to 19-08-22	7	203.9	29.6	23.6	94	88	0.7	8.5	3.0	0.0	0.0	0.0
34	20-08-22 to 26-08-22	0	3.3	30.2	23.8	90	73	2.3	7.8	8.0	0.0	3.5	0.0
35	27-08-22 to 02-08-22	1	7.3	32.2	23.3	85	64	5.1	3.9	14.0	0.0	16.5	0.0
36	03-09-22 to 09-09-22	1	14	33.6	24.4	86	59	5.5	4.6	0.0	0.0	18.5	0.0
37	10-09-22 to 16-09-22	5	100.7	32.4	23.5	91	77	3.0	3.9	17.0	0.0	15.5	0.0
38	17-09-22 to 23-09-22	0	0.0	34.4	23.0	84	57	9.0	4.6	22.0	0.0	22.5	0.0
39	29-09-22 to 30-09-22	0	2.4	32.9	22.5	83	58	8.2	4.5	31.0	0.0	20.5	0.0
40	01-10-22 to 07-10-22	0	0.0	33.8	23.4	81	49	8.3	3.9	0.0	0.0	11.5	0.0
41	08-10-22 to 14-10-22	1	51.2	35.0	23.4	85	47	6.9	2.9	11.0	0.0	6.5	0.0
42	15-10-22 to 21-10-22	0	0.0	35.9	20.2	62	25	10.1	2.7	11.0	0.0	4.0	5.5
43	22-10-22 to 28-10-22	0	0.0	35.6	19.7	67	27	9.5	2.6	3.0	0.0	2.0	36
44	29-10-22 to 4-11-22	0	0.0	35.8	17.8	65	26	9.3	2.2	32.5	0.0	1.0	45.5
45	05-11-22 to 11-11-22	0	0.0	35.4	18.2	61	28	9.0	2.7	28.0	3.5	1.0	28.5
46	12-11-22 to 18-11-22	0	0.0	33.9	16.9	72	27	9.1	2.4	**37.0**	8.0	1.0	29.5
47	19-11-22 to 25-11-22	0	0.0	32.3	13.8	67	26	9.5	2.3	13.5	12.5	1.0	27.5
48	26-11-22 to 02-12-22	0	0.0	32.6	14.9	68	31	9.2	2.6	6.5	11.5	0	18.0
49	03-12-22 to 09-12-22	0	0.0	31.4	15.3	68	32	8.2	3.8	4.5	15.5	0	11.0
50	10-12-22 to 16-12-22	0	0.0	31.6	17.7	73	39	5.7	4.3	1.5	27.0	0	6.5
51	17-12-22 to 23-12-22	0	0.0	32.2	17.3	63	26	8.1	4.0	1.0	25.5	0	1.5
52	24-12-22 to 31-12-22	0	0.0	28.7	11.7	70	30	8.3	4.5	0.0	20.0	0	1.0

Table20b: Correlation values between weather parameters and BLB, ALB, Grey mildew diseases of cotton Junagarh [Correlation coefficient (r)]

Sr. No.	Diseases	Rainfall	Temperature ^{0}C		R. Humidity		Sunshine hours/BSH
			Max.	Min.	Morn.	Even.	
1	Bacterial leaf blight	-0.1810	0.4709*	-0.0529	-0.1678	-0.1805	0.3297
2	Alternaria leaf spots	-	-0.6722	-0.070	0.3070	0.4716	0.3463
3	Grey mildew	-0.3570	0.5093	-0.025	-0.3435	-0.4956	-0.7684
4	Corynespora leaf spot	-0.007	0.5267*	0.4027	0.3771	-0.1972	0.0104

Table 21a: Disease progress in relation to weather factors at Khandwa

Met. Week	Period	Rainfall in mm	Temperature ^{0}C		R. Humidity (%)		JK-4		
			Max.	Min.	Morn.	Even.	BLB	ALS	GM
30	23-07-22 to 29-07-22	34.5	30.7	24.3	100	80.0	-	-	-
31	30-07-22 to 05-08-22	7.0	34.0	24.8	100	58.0	-	-	-
32	06-08-22 to 12-08-22	56.5	30.7	24.6	100	86.0	Traces	-	-
33	13-08-22 to 19-08-22	30.5	30.2	23.6	100	79.0	Traces	-	-
34	20-08-22 to 26-08-22	13.0	30.7	23.6	100	71.0	8.2	-	-
35	27-08-22 to 02-08-22	22.5	34.0	23.9	100	59.0	9.3	Traces	-
36	03-09-22 to 09-09-22	22.0	34.7	24.5	100	59.0	9.1	5.3	-
37	10-09-22 to 16-09-22	178.5	31.9	24.2	100	75.0	10.3	4.5	-
38	17-09-22 to 23-09-22	44.5	32.0	23.2	100	65.0	3.9	9.2	-
39	29-09-22 to 30-09-22	7.0	35.0	23.0	100	50.0	3.2	6.9	
40	01-10-22 to 07-10-22	78.5	34.2	23.2	100	53.0	2.7	6.7	
41	08-10-22 to 14-10-22	33.0	32.5	21.8	100	57.0	2.3	13.3	
42	15-10-22 to 21-10-22	0.0	33.8	19.1	100	39.0	2.0	18.2	5.7
43	22-10-22 to 28-10-22	0.0	34.3	15.8	100	21.0	2.0	21.4	11.1
44	29-10-22 to 04-11-22	0.0	34.4	14.4	100	19.0	-	18.7	13.7
45	05-11-22 to 11-11-22	0.0	34.6	15.9	100	22.0	-	19.3	10.8
46	12-11-22 to 18-11-22	0.0	31.7	14.0	100	24.0	-	21.5	15.6
47	19-11-22 to 25-11-22	0.0	29.7	10.4	100	23.0	-	35.2	7.7
48	26-11-22 to 02-12-22	0.0	30.7	10.8	100	24.0	-	16.7	2.3
49	03-12-22 to 09-12-22	0.0	29.6	13.6	100	33.0	-	15.6	0.0

Table 21b: Correlation values between weather parameters and BLB, ALB, Grey mildew diseases of cotton at Khandwa [Correlation coefficient (r)]

Sr. No.	Diseases	Rainfall	Temperature ^{0}C		R. Humidity	
			Max.	Min.	Morn.	Even.
1	Bacterial leaf blight (BLB)	0.229^{NS}	-0.156^{NS}	-0.193^{NS}	0.028^{NS}	-0.011^{NS}
2	Alternaria leaf spots (ALS)	0.429^{NS}	0.167^{NS}	0.117^{NS}	0.131^{NS}	0.091^{NS}
3	Grey mildew (GM)	0.229^{NS}	0.164^{NS}	0.239^{NS}	0.443^{NS}	0.405^{NS}

SOUTH ZONE

Table 22a: Disease progress in relation to weather factors at UAS, Dharwad (Karnataka)

SMW	Period	Rainy days	Rainfall (mm)	Temp. (^{0}C)		RH %		V1 Abhaditha				V2 Jayadhar				V3 Ajeeth 155 Bt				V4 First class Bt			
				Max.	Min.	Mor.	Eve.	AB	BLB	GM	Rust	AB	BLB	GM	Rust	AB	BLB	GM	Rust	AB	BLB	GM	Rust
31	30 Jul – 5 Aug	3.0	12.2	29.7	20.9	85.3	77.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	6 – 12 Aug	6.0	53.8	25.3	20.2	92.1	86.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	13 – 19 Aug	2.0	9.2	26.8	19.9	92.9	86.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	20 – 26 Aug	0.0	3.2	27.7	20.2	90.9	78.3	6.3	0.0	0.0	0.0	4.9	0.0	4.3	0.0	5.8	0.0	0.0	0.0	4.8	0.0	0.0	0.0
35	27 Aug – 2 Sep	5.0	127.2	29.6	20.4	91.1	74.0	8.8	0.0	0.0	0.0	7.7	0.0	5.5	0.0	6.6	0.0	0.0	0.0	5.0	0.0	0.0	0.0
36	3 – 9 Sep	3.0	48.8	29.3	21.0	90.1	77.4	14.0	0.0	0.0	0.0	10.5	0.0	8.5	0.0	8.0	0.0	0.0	0.0	6.8	0.0	0.0	0.0
37	10 – 16 Sep	5.0	48.2	26.6	20.5	95.0	89.1	18.0	0.0	0.0	0.0	12.7	0.0	12.5	0.0	10.0	0.0	0.0	0.0	8.5	0.0	0.0	0.0
38	17 – 23 Sep	0.0	0.0	28.3	19.0	88.1	67.4	20.5	0.0	0.0	0.0	15.3	0.0	14.0	0.0	12.5	0.0	0.0	0.0	10.3	0.0	0.0	0.0
39	24 – 30 Sep	1.0	6.2	30.0	19.3	85.1	66.1	22.8	0.0	0.0	0.0	19.6	0.0	18.8	0.0	14.8	0.0	4.5	0.0	11.6	0.0	2.5	0.0
40	1 – 7 Oct	3.0	69.4	29.0	19.6	91.3	76.0	25.0	0.0	0.0	0.0	23.7	0.0	20.0	0.0	18.8	0.0	6.8	0.0	13.0	0.0	4.3	0.0
41	8 – 14 Oct	2.0	72.2	28.1	20.5	93.4	81.9	29.5	3.3	6.5	0.0	26.3	0.0	21.5	0.0	22.5	0.0	8.0	0.0	20.3	0.0	6.5	0.0

42	15 – 21 Oct	4.0	56.2	29.5	20.3	91.3	75.7	32.8	4.4	8.5	0.0	29.4	0.0	25.3	0.0	24.5	0.0	10.8	0.0	22.5	0.0	7.0	0.0
43	22 – 28 Oct	0.0	0.0	29.1	15.4	74.1	46.9	31.5	7.5	10.8	0.0	30.3	0.0	26.8	0.0	25.3	3.5	12.6	0.0	23.3	3.0	8.5	0.0
44	29 Oct – 4 Nov	0.0	0.0	29.3	16.1	72.6	45.1	29.5	9.7	11.3	8.7	26.9	0.0	25.3	6.7	26.3	6.0	15.0	6.6	24.7	5.8	10.3	7.8
45	5 – 11 Nov	0.0	0.0	30.2	15.6	68.7	40.9	26.3	5.7	13.2	14.3	22.7	0.0	19.5	12.7	28.8	7.8	16.0	10.5	26.8	8.0	14.7	11.5
46	12 – 18 Nov	0.0	0.0	29.7	16.1	69.3	44.9	23.0	4.6	5.3	16.6	19.0	0.0	18.0	15.6	18.0	5.8	4.7	15.3	17.5	9.5	8.9	14.6

AB=Alternaria leaf spot, BLB= Bacterial leaf blight, GM= Grey mildew

Path– 22b: Correlation values between weather parameters and cotton foliar diseases [Correlation coefficient (r)] at UAS, Dharwad

Weather parameters	**r' values**														
	V1 Abhadita				**V2 Jayadhar**			**V3 Ajeet 155 Bt**				**V4 First class Bt**			
	AB	BB	GM	Rust	AB	GM	Rust	AB	BB	GM	Rust	AB	BB	GM	Rust
Max. Temp	0.479	0.378	0.950	0.394	0.485	0.800	0.385	0.530	0.422	0.477	0.242	0.516	0.414	0.504	0.390
Min. Temp	-0.542	-0.812	-0.494	-0.743	-0.554	-0.590	-0.728	-0.673	-0.915	-0.727	-0.527	-0.709	-0.866	-0.814	-0.742
RH Morning (%)	-0.423	-0.762	-0.350	-0.833	-0.440	-0.477	-0.820	-0.583	-0.940	-0.661	-0.607	-0.633	-0.920	-0.791	-0.832
RH Evening (%)	-0.561	-0.786	-0.384	-0.769	-0.577	-0.607	-0.753	-0.696	-0.904	-0.720	-0.546	-0.728	-0.866	-0.812	-0.768

r' Values: * Significant at 5% 0.482, ** Significant at 1% 0.606

Table 23a: Disease progress in relation to weather factors (weekly observations) at RARS, Lam Guntur (Andhra Pradesh)

Met. Week	Period	Rainfall (mm)	Rainy days	Temperature ^{0}C		R. Humidity%		Sunshine hours	Wind speed (km/H)	Evaporation
				Max.	Min.	Morn./I	Even./II	BSH		
35	27Aug-2Sept	44.0	2.0	30.6	24.8	99.1	74.4	6.7	10.5	5.7
36	3-9 Sept	35.6	1.0	29.8	25.3	99.1	88.1	6.6	3.4	4.4
37	10-16	35.2	2.0	29.7	25.3	99.1	87.9	3.4	6.0	3.0
38	17-23	14.8	1.0	29.8	25.2	97.7	78.6	5.7	5.3	3.6
39	24-30Sept	44.6	3.0	30.4	25.1	99.0	67.9	6.2	5.1	3.6
40	Oct.1-7	149.4	4.0	28.9	23.9	98.7	76.9	1.4	5.9	2.1
41	8-14	44.8	4.0	27.6	24.5	99.7	81.0	3.9	3.4	1.6
42	15-21	74.4	3.0	31.5	24.7	94.1	82.9	0.0	2.9	3.3
43	22-28	5.6	1.0	30.4	20.3	98.1	65.3	9.2	4.6	4.4
44	29Oct-4 Nov	63.8	3.0	29.0	21.1	88.1	77.7	2.5	2.8	1.9
45	5-11	1.1	0.0	30.2	20.4	95.0	66.4	8.1	3.3	4.4
46	12-18	0.0	0.0	30.2	18.5	85.7	67.0	6.3	4.2	5.1
47	19-25	1.1	0.0	28.2	17.8	100.0	74.4	7.2	4.8	6.3
48	26- 2Dec	1.6	0.0	30.2	17.7	85.7	66.7	7.2	2.7	5.1
49	3-9	0.0	0.0	30.3	19.0	100.0	71.0	3.5	4.5	3.4
50	10-16	46.2	3.0	27.6	20.4	100.0	84.0	4.4	4.4	1.3
51	17-23	0.0	0.0	28.8	17.0	100.0	76.9	7.0	2.7	3.7
52	24-31Dec	0.0	0.0	29.7	20.3	100.0	67.4	7.4	3.9	4.1
01	1-7 Jan	0.0	0.0	28.9	19.6	100.0	75.4	5.6	3.5	3.4
02	8-14	0.0	0.0	29.5	15.3	99.7	74.4	7.7	2.2	3.9
03	15-21	0.0	0.0	30.1	15.3	99.4	66.4	6.6	3.5	3.7
04	21-28	0.0	0.0	30.3	15.5	100.0	65.9	6.5	4.3	5.0
05	29Jan-4Feb	0.0	0.0	30.6	18.2	99.7	65.6	6.3	4.2	4.4

Table 23b: Disease progress in relation to weather factors (weekly observations) at RARS, Lam Guntur (Andhra Pradesh)

Met. Week	Period	Corynespora leaf spot				Grey mildew				Rust			
		Jaadoo BG II	RCH 2 BG II	L 1060	NDLH 1938	Jaadoo BG II	RCH 2 BG II	L 1060	NDLH 1938	Jaadoo BG II	RCH 2 BG II	L 1060	NDLH 1938
36	3-9 Sept.												
37	10-16	5.3	4.3	5.0	3.8								
38	17-23	16.5	12.3	16.5	12.8								
39	24-30 Sept	6.8	6.0	14.3	11.5								
40	1-7 Oct.	10.0	9.5	12.0	8.8								
41	8-14	10.8	17.3	19.5	15.0								
42	15-21	19.8	21.5	25.0	25.0								
43	22-28	23.5	22.3	29.0	25.0	10.5	0.0	7.5	6.3	2.5	2.5	3.5	3.5
44	29Oct-4Nov	22.3	23.8	27.3	25.5	14.0	0.0	3.5	3.5	7.0	5.0	7.0	5.6
45	5-11	24.5	22.8	27.3	26.5	27.0	Traces	10.8	7.5	14.0	9.5	16.0	14.8
46	12-18	26.3	23.3	34.0	25.3	25.5	Traces	21.8	11.3	23.5	17.8	24.8	24.5
47	19-25	28.8	30.0	39.0	31.5	20.8	2.5	13.8	5.0	26.8	27.0	26.8	23.5
48	26-2Dec	24.0	21.5	28.3	24.3	25.5	5.0	17.5	10.5	30.0	29.5	28.0	25.0
49	3-9	27.5	25.3	28.0	27.8	21.8	3.3	10.5	5.6	30.3	23.5	28.0	29.3
50	10-16	28.3	23.5	29.5	27.8	20.3	2.8	5.3	4.0	28.3	24.5	26.8	25.0
51	17-23	31.5	26.3	33.5	30.5	15.8	5.0	6.0	5.8	37.8	28.5	31.5	33.8
52	24-31Dec	28.0	24.8	32.5	27.3	7.3	5.0	7.3	5.3	36.3	28.3	33.5	33.0
01	1-7 Jan.	25.5	25.0	28.5	26.3	8.5	5.0	6.0	5.5	30.3	30.0	29.5	29.5
02	8-14	24.8	24.5	25.8	24.5	4.5	3.8	0.5	2.3	30.3	29.8	21.5	28.8
03	15-21	9.0	7.8	22.5	9.3	4.3	4.3	2.8	2.0	28.3	27.3	28.8	25.5
04	22-28	6.3	5.5	12.5	7.0	0.8	0.0	0.3	0.3	28.8	27.3	26.8	25.8
05	29Jan-4Feb	5.3	4.3	8.5	5.0								

Table 23c: Correlation values between weather parameters and Corynespora leaf spot of cotton [Correlation coefficient (r)] (Guntur-AP)

Sr. No.	Entry/ PDI	Rainfall	Rainy days	Temperature ^{0}C		R. Humidity		Sunshine hours/ BSH	Wind Speed kmph	Evaporation
				Max.	Mini	Morn.	Even.			
1	L 1060 (39.00)	-0.485	-0.459	-0.413	-0.639	-0.437	-0.574	0.357	-0.785	0.226
2	NDLH 1938 (31.50)	-0.395	-0.354	-0.459	-0.517	-0.420	-0.424	0.25	-0.74	0.097
3	RCH 2 BG II (30.00)	-0.395	-0.362	-0.454	-0.518	-0.431	-0.423	0.255	-0.749	0.131
4	Jaadoo BG II (31.50)	-0.488	-0.455	-0.502	-0.557	-0.367	-0.408	0.346	-0.703	0.16

('r') values: * Significant at 5% 0.433; ** Significant at 1% 0.549

Table 23d: Correlation values between weather parameters and grey mildew of cotton [Correlation coefficient (r)] (Guntur-Andhra Pradesh)

Sr. No.	Entry/ PDI	Rainfall	Rainy days	Temperature ^{0}C		R. Humidity		Sunshine hours/ BSH	Wind Speed kmph	Evaporation
				Max.	Mini	Morn.	Even.			
1	L 1060 (21.75)	-0.188	-0.215	-0.247	0.086	-0.714	-0.152	0.165	0.533	0.582
2	NDLH 1938 (11.75)	-0.472	-0.505	-0.082	-0.368	-0.635	-0.675	0.454	0.644	0.739
3	Jaadoo BG II (25.50)	-0.303	-0.329	-0.110	-0.292	-0.596	-0.485	0.222	0.787	0.537

('r') values: * Significant at 5% 0.553; ** Significant at 1% 0.684

Table 23e: Correlation values between weather parameters and rust of cotton [Correlation coefficient (r)] (Guntur-Andhra Pradesh)

Sr. No.	Entry/ (PDI)	Rainfall	Rainy days	Temp. ^{0}C		R. Humidity		Sunshine	Wind Speed	Evaporation
				Max.	Mini	Morn.	Even.	hours/ BSH	(km/h)	
1	L 1060 (33.50)	-0.856	-0.824	-0.816	-0.873	0.413	-0.085	0.568	0.109	0.242
2	NDLH 1938 (33.75)	-0.842	-0.806	-0.833	-0.863	0.497	-0.027	0.556	0.016	0.169
3	Jaadoo BG II (37.75)	-0.824	-0.786	-0.839	-0.852	0.499	-0.001	0.527	0.042	0.158
4	RCH 2 BG II (30.0)	-0.857	-0.821	-0.765	-0.892	0.488	-0.056	0.548	0.003	0.221

('r') values: * Significant at 5% 0.553; ** Significant at 1% 0.684

Table 24a: Disease progress in relation to weather factors at UAS, Coimbatore (Tamil Nadu)

SMW	Period	Rainy days	Rainfall (mm)	Temperature (^{0}C)		Relative Humidity (%)		Wind speed (km/h)	Sun Shine hours
				Max.	Min.	Morn.	Even		BSH
30	July 23-29	0	0.5	31.1	23.8	76.0	51.0	8.7	4.4
31	July 30-05Aug	4	13.5	31.4	23.0	80.0	62.0	9.5	4.1
32	Aug 6- 12	4	19.5	28.0	23.0	79.0	66.0	13.7	4.0
33	Aug 13-19	5	28.5	29.0	22.7	82.0	66.0	11.9	3.6
34	Aug 20-26	0	0.5	30.8	23.4	84.0	58.0	5.2	5.1
35	27 Aug -2Sep	3	40.3	32.3	23.3	88.0	55.0	4.8	7.2
36	Sep 3-9	3	15.1	27.8	23.0	82.0	69.0	5.3	5.0
37	Sep 10-16	0	1.0	30.7	22.9	81.0	54.0	4.7	8.5
38	Sep 17-23	0	0.6	32.3	23.2	85.0	56.0	5.9	6.1
39	Sep 24-30	4	91.5	30.3	22.8	87.0	63.0	4.9	4.0
40	Oct 1-7	3	25.0	31.1	23.2	84.0	60.0	4.5	5.3
41	Oct 8-14	1	7.0	29.6	22.9	82.0	60.0	6.6	6.1

42	Oct 15-21	0	0.0	31.9	22.2	83.0	49.0	4.9	5.3
43	Oct 22-29	0	1.5	32.0	22.1	84.0	50.0	5.8	8.0
44	Oct 29-Nov 4	2	16.5	31.5	22.4	83.0	50.0	5.9	4.5
45	Nov5-11	1	30.0	30.2	22.4	85.0	57.0	4.2	3.8
46	Nov 12-18	3	26.0	30.7	222.0	85.0	60.0	3.2	6.5
47	Nov 19-25	0	0.0	30.5	19.7	86.0	49.7	2.9	4.1
48	Nov 26- 2 Dec	1	3.0	29.0	22.0	84.0	57.0	4.1	4.7
49	Dec 3-9	1	8.5	29.1	21.1	85.0	59.0	4.3	5.3
50	Dec 10-16	3	77.5	27.6	20.7	86.0	58.0	3.8	5.0
51	Dec 17-23	0	0.0	29.3	19.6	84.0	59.0	5.4	4.8
52	Dec 24-31	0	0.0	29.5	21.1	84.0	52.0	5.7	4.7

Table 24b: Disease progress in relation to weather factors at UAS, Coimbatore (Tamil Nadu)

SMW	Foliar diseases															Soil borne disease				
	ALB					Tobacco Streak virus					Grey mildew					Collar rot / root rot				
	RCH659	CO 17	Jadoo	K12	K11	RCH659	CO 17	Jadoo	K12	K11	RCH659	CO 17	Jadoo	K12	K11	RCH659	CO17	Jadoo	K12	K 11
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.0	1.0	2.5	1.0	0.5
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.5	1.5	3.3	1.5	1.4
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.3	2.0	4.7	1.9	2.0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.7	3.0	6.0	2.3	2.3
39	3.0	2.5	2.7	2.0	1.5	1.0	1.0	1.5	0	0	0	0	0	0	0	3.2	4.0	6.7	3.0	2.7
40	3.5	4.0	3.5	2.7	2.7	1.7	1.7	2.3	0	0	0	0	0	0	0	3.7	6.5	7.0	3.5	3.0
41	4.3	4.7	4.8	3.2	3.5	3.0	3.0	3.5	0	0	0	0	0	0	0	1.7	1.0	1.3	0	0
42	5.7	6.0	6.2	4.1	5.0	4.0	4.0	4.3	0	0	1.3	2.0	2.0	1.5	1.3	1.0	2.0	1.0	0	0
43	6.5	7.3	7.5	5.3	5.5	5.5	5.3	5.7	0	0	2.7	3.5	3.7	2.5	2.3	0	0	0	0	0
44	8.0	9.7	8.3	6.5	7.0	6.7	6.7	6.0	0	0	5.5	4.5	4.3	3.0	3.5	0	0	0	0	0
45	8.7	10.3	9.5	7.0	8.1	7.5	7.5	6.3	0	0	7.7	6.7	5.3	4.3	4.7	2.5	0	3.0	0	0

46	10.0	11.3	11.4	7.3	9.3	8.0	9.5	7.0	0	0	8.3	7.3	6.3	5.3	6.7	4.0	2.7	6.5	2.0	0
47	11.5	14.1	12.8	8.5	10.5	15.0	15.5	7.5	0	0	10.7	10.5	9.5	6.7	9.3	4.5	3.5	7.7	3.5	2.5
48	12.5	17.5	13.7	9.1	11.0	12.0	17.0	7.8	0	0	15.5	14.5	11.5	8.3	11.3	5.3	4.3	8.5	4.3	3.3
49	14.7	20.5	16.5	10.5	12.5	10.0	15.0	5.5	0	0	17.3	15.3	12.7	10.5	13.7	5.7	4.8	12.5	5.1	4.7
50	13.3	17.3	12.5	11.5	7.3	9.7	12.0	4.3	0	0	15.5	10.5	5.5	4.0	7.5	6.0	5.2	10.3	5.7	5.0
51	9.1	15.5	9.3	9.1	5.5	8.8	9.0	2.1	0	0	14.3	9.3	4.2	3.3	4.3	7.3	6.0	9.7	5.3	5.2
52	5.7	10.1	8.7	7.5	4.0	7.5	7.5	1.0	0	0	10.3	8.0	3.0	2.1	3.1	5.7	6.0	8.3	4.0	5.5

Table 24c: Correlation between weather variables and disease incidence in Cotton at UAS, Coimbatore (Tamil Nadu)

Environmental variables	Correlation Coefficient			
	***Alternaria* blight**	**Tobacco streak virus**	**Grey mildew**	**Collar rot / root rot**
Maximum Temperature	- 0.6189	- 0.5180	- 0.4290	- 0.4290
Minimum Temperature	- 0.0350	- 0.0591	- 0.0077	- 0.0077
RH (Morning)	0.2645	0.2688	0.4680	0.4680
RH (Evening)	- 0.0528	- 0.1271	- 0.4134	- 0.4134
Wind speed	- 0.0526	- 0.5880	- 0.5745	- 0.5745
Sunshine hours	0.1468	- 0.1878	0.1872	- 0.1872
Rainfall	- 0.1380	- 0.0484	- 0.0478	- 0.0478

Path 1c: Studies on the variability in Alternaria causing leaf spot in cotton

Table 25: Morphological studies of *Alternaria* cultures: Dharwad

Days	Morphological character			
	Morphological character	Growth	Sporulation	Virulence
3	White in colour	Rapid	Sporulation has not initiated	Highly
5	White with light olive green in colour	Rapid	Sporulating conidia	Highly
7	Greyish centre, whitish border	Rapid	Sporulating conidia	Highly
9	White in centre, Olive green in colour	Rapid	Sporulating conidia	Highly

Path 1 (d) Survey and basic studies of TSV

Table-26: Progress of TSV incidence (%) at RARS, Lam, Guntur during *kharif* 2022

SMW	Month & Date	Incidence of Tobacco Streak Virus Disease (%)			
		RCH 2 BG II	Jaadoo BG II	L 1060	NDLH 1938
33	13-20 Aug	0.8	0.5	0.3	0.6
34	20-26 Aug	5.8	2.5	2.9	0.8
35	27Aug-2Sept	10.3	8.3	4.8	2.1
36	3-9 Sept	9.4	4.4	0.9	1.1
37	10-16	6.6	4.0	0.8	1.0
38	17-23	6.1	4.4	1.4	1.3
39	24-30	5.5	4.4	3.6	1.3
40	Oct.1-7	6.6	4.3	2.5	1.0
41	8-14	6.9	4.4	2.8	1.1
42	15-21	10.0	6.0	4.9	11.6
43	22-28	12.6	7.9	6.8	9.0

44	29Oct- 4 Nov	9.0	4.9	5.0	5.6
45	5-11	8.6	3.8	1.9	2.9
46	12-18	6.6	3.3	0.8	2.9
47	19-25	7.8	3.5	0.6	2.3
48	26Nov- 2Dec	7.3	2.6	1.3	2.0
49	3-9	5.4	2.9	0.9	1.5
50	10-16	4.4	2.3	1.3	1.3
51	17-23	2.6	1.4	0.3	0.1
52	24-31	2.3	0.9	0.5	0.0
1	1-7 Jan	3.4	1.8	0.1	0.3
2	8-14	3.9	4.0	1.0	0.5

Table 27: Occurrence of TSV from major cotton growing areas of Coimbatore district in Tamil Nadu

Period	District & Village	Hybrids/ varieties	Stage of the crop	TSV incidence %
	Coimbatore			
October 2022	Keeranatham	RCHIIBGII, RCH 659	Vegetative stage	2.5
	Chenthampalayam	RCHIIBGII, RCH 659	Vegetative stage	3.7
	Kovilpalayam	RCHIIBGII, RCH 659	Vegetative stage	2.0
	Vadapudur	RCHIIBGII, RCH 659	Vegetative stage	5.7
	Thottipalayam	RCHIIBGII, RCH 659	Vegetative stage	3.0
	TNAU Farm	RCH 659,DCH32, Jadoo, CO15, CO17	Vegetative stage	5.3
		Average		**3.7**
	Dindugal			
	Kamatchipuram	RCH 659	Vegetative stage	3.5
	Kuyanayakkanpatti	RCH 659	Vegetative stage	7.0
	Govindhapuram	RCH 659	Vegetative stage	2.3
	Malaiyandipuram	RCH 659	Vegetative stage	1.7
	Vellamarathupatti	RCH 659	Vegetative stage	1.0

November 2022	**Coimbatore**			**3.1**
	Keeranatham	RCHIIBGII, RCH 659	Square formation	5.5
	Chenthampalayam	RCHIIBGII, RCH 659	Square formation	4.7
	Kovilpalayam	RCHIIBGII, RCH 659	Square formation	5.0
	Vadapudur	RCHIIBGII, RCH 659	Square formation	7.0
	Thottipalayam	RCHIIBGII, RCH 659	Square formation	3.0
	TNAU Farm	RCH 659,DCH32, Jadoo, CO15, CO17	Square formation	15.0
		Average		**6.7**
	Dindugal			
	Kamatchipuram	RCH 659	Square formation	5.0
	Kuyanayakkanpatti	RCH 659	Square formation	17.5
	Govindhapuram	RCH 659	Square formation	7.0
	Malaiyandipuram	RCH 659	Square formation	3.0
	Vellamarathupatti	RCH 659	Square formation	3.5
		Average		**7.2**
December 2022	**Coimbatore**			
	Keeranatham	RCHIIBGII, RCH 659	Boll formation	6.0
	Chenthampalayam	RCHIIBGII, RCH 659	Boll formation	5.0
	Kovilpalayam	RCHIIBGII, RCH 659	Boll formation	5.5
	Vadapudur	RCHIIBGII, RCH 659	Boll formation	7.5
	Thottipalayam	RCHIIBGII, RCH 659	Boll formation	3.5
	TNAU Farm	RCH 659,DCH32, Jadoo, CO15, CO17	Boll formation	15.5
				7.17
	Dindugal			
	Kamatchipuram	RCH 659	Boll formation	5.3
	Kuyanayakkanpatti	RCH 659	Boll formation	18.7
	Govindhapuram	RCH 659	Boll formation	7.5
	Malaiyandipuram	RCH 659	Boll formation	4.0
	Vellamarathupatti	RCH 659	Boll formation	5.0
		Average		**8.1**

January 2023	**Coimbatore**			
	Keeranatham	RCHIIBGII, RCH 659	Boll maturity	3.5
	Chenthampalayam	RCHIIBGII, RCH 659	Boll maturity	3.0
	Kovilpalayam	RCHIIBGII, RCH 659	Boll maturity	4.2
	Vadapudur	RCHIIBGII, RCH 659	Boll maturity	4.0
	Thottipalayam	RCHIIBGII, RCH 659	Boll maturity	1.0
	TNAU Farm	RCH 659,DCH32, Jadoo, CO15, CO17	Boll maturity	10.5
				4.37
	Dindugal			
	Kamatchipuram	RCH 659	Boll maturity	4.0
	Kuyanayakkanpatti	RCH 659	Boll maturity	12.7
	Govindhapuram	RCH 659	Boll maturity	5.5
	Malaiyandipuram	RCH 659	Boll maturity	2.0
	Vellamarathupatti	RCH 659	Boll maturity	3.3
		Average		**5.5**

Path 1 (e) Studies on variability of Corynespora leaf spot

Table 28: Presence of *Corynespora* species in cotton leaf spot samples collected from different locations of North and Central Zone during 2021: ICAR-CICR RS Sirsa

S.No	GPS Location	Area	Colony Character	Number of pseudoseptate in per conidia, and beak	Microscopic confirmation
1.	29.546096N, 75.037421E	Sirsa, Haryana	Light gray turning to dark gray, colony dense and velvet, Entire, raised, Dark brown center and outer side tan Brown	8-12, transverse pseudoseptate, slightly curved with truncate base, rounded tip	Positive
2.	29.545564N, 75.035017E	Sirsa, Haryana	Gray, colony dense and Velvet, Filiform, Raised, Reddish brown	3-7, transverse pseudoseptate, cylindrical with truncate base, rounded tip,	Positive
3.	29.524942N, 74.807920E	Rania, Sirsa, Haryana	Whitish gray, Dense and Velvet Filiform, Raised, Light Reddish brown	6-10, transverse pseudoseptate, lorate, slightly curved with truncate base, tip-both sides rounded	Positive
4.	29.542820N, 75.037324E	Sirsa, Haryana	Dim gray, Dense & velvety growth, Lobate, Unbonate, Tan brown	6-13, transverse pseudoseptate lanceolate, slightly curved at tip with truncate base, tip rounded, long beak	Positive
5.	29.137732N, 75.172415E	Bhadra, Hanumangarh, Rajasthan	Gray, Dense and Velvet, Filiform, Raised, Center Light gray and outer side dark brown	8-14, transverse pseudoseptate, lanceolate slightly curved with truncate base, rounded tip, long beak	Positive
6.	29.933646N, 73.896577E	SriGanganagar, Rajasthan	Whitish gray, Dense & velvety growth, Lobate and Convex, Light brownish gray with light zonation	5-10, transverse pseudoseptate, narrowly ovate, with truncate base, tip rounded, short beak	Positive
7.	30.673546N, 74.744642E	Faridkot, Punjab	Gray, Dense & velvet growth, Undulate (wavy), Convex, Center dark	5-11, transverse pseudoseptate, ovate, slightly curved with truncate base, tip	Positive

			with outer side light gray with light to dark gray, zonation	rounded, long beak	
8.	30.189579N, 74.949719E	Bhatinda, Punjab	Gray, Dense & velvety growth, Undulate (wavy), Convex to flat, Light gray with zonation	6-11, transverse pseudoseptate, subulate with truncate base, tip rounded, pseudobeak	Positive
9.	29.363724N, 75.231026E	Fatehabad, Haryana	Light gray, Dense & velvety growth, Undulate (wavy), Raised, Center tan brown and outer side light pinkish	5-11, transverse pseudoseptate, lanceolate, slightly curved with truncate base, tip rounded, pseudobeak	Positive
10.	29.855954N, 75.414584E	Hisar, Haryana	Dark gray, Dense & velvety growth, Filiform, Convex, Dark brown to gray	5-9, transverse pseudoseptate, cylindrical, slightly curved with truncate base, beak tapered	Positive
11.	29.196487N, 75.677929E	Hisar, Haryana	Gray, Dense and Velvet, Undulate (wavy), Convex, Gary with zonation	5-11, transverse pseudoseptate, slightly curved with truncate base, tip tapered and rounded	Positive
12.	29.573528N, 73.556675E	Sangria, Rajasthan	Light gray to tan brown, Dense and Velvet, Undulate (wavy), Convex, Gray with zonation	5-13, transverse pseudoseptate, narrowly ovate, with truncate base, beak slightly long, tip rounded	Positive
13.	21.169642N, 72.797612E	Surat, Gujarat	Gray, Dense and Velvet, Undulate (wavy), Convex, Center dark brown & outer tan brown	7-13, transverse pseudoseptate, lanceolate slightly curved with truncate base, rounded tip, tapered beak	Positive
14.	21.493511N, 70.436142E	Junagarh, Gujarat	Whitish gray, Dense and Velvet, Undulate (wavy), Convex, Center dark brown and outer light gray with less zonation	6-11, transverse pseudoseptate, narrowly ovate, slightly curved at base with truncate base, tapered beak	Positive

Table 29: Morphological studies of *Corynespora* cultures (Junagarh)

Days	Morphological character	Growth	Sporulation	Virulence
1	Septet brownish mycelium	Profuse aerial mycelium	No	-
2	Septate brownish mycelium	Olivaceous, profuse aerial mycelium	No	-
3	Septate brownish mycelium, conidia with three or four transverse pseudoseptate	Dark brown, profuse aerial mycelium	Moderate	-
4	Septate brownish black mycelium,	Brown to black pigmentation	Good	virulent

Table 30: Presence of *Corynespora* species in cotton leaf spot samples during *kharif* 2022 in Andhra Pradesh

S. No.	Date	Place (district)	Hybrid / variety	Presence of Corynespora spores
1	10.10.22	Pamulapadu Guntur)	Akira	Positive
2	26.10.22	Mitta Sompuram (Kurnool)	Akira	Positive
3	27.10.22	Kotakandukuru(Kurnool)	Tadakha	Positive
4	14.11.22	Gogulapadu (Palnadu)	Akira	Positive
5	23.11.22	RARS, Lam, Guntur	L 1060	Positive
6	25.11.22	Dachepalli (Palnadu)	Aadhya	Positive
7	06.12.22	Nidumukkala	Siri	Positive
8	06.12.22	Pulaadigunta (Guntur)	Platinum	Positive

Path 2: Screening of AICRP entries for disease reaction and confirmation

NATIONAL TRIAL: North Zone

Path 2(a) Screening of breeding lines for disease reaction

Table 31: Br. 22 a/b Initial Evaluation Trial -*G. arboreum*

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)													
		Bacterial Blight (BB)				Fungal foliar leaf spot (FFS)				Root rot		Pooled			
		Faridkot		Bathinda		Faridkot		Bathinda		Sirsa		BLB		FFS	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
201	HD 545	0.0	DF	3.3	R	0.0	DF	23.0	R	50.0	S	1.7	R	11.5	R
202	FDK 341	0.0	DF	2.8	R	0.0	DF	23.3	R	100.0	S	1.4	R	11.7	R
203	RG 895	0.0	DF	3.5	R	0.0	DF	24.5	R	30.0	S	1.8	R	12.3	R
204	CISAA 33-9	0.0	DF	4.3	R	0.0	DF	23.8	R	50.0	S	2.2	R	11.9	R
205	LC	0.0	DF	3.3	R	0.0	DF	25.5	R	100.0	S	1.7	R	12.8	R
206*	PBD 155	0.0	DF	3.0	R	0.0	DF	27.5	MR	-	-	1.5	R	13.8	R
207	HD 563	0.0	DF	2.0	R	0.0	DF	22.5	R	85.0	S	1.0	R	11.3	R
208	FDK 331	0.0	DF	2.5	R	0.0	DF	22.0	R	83.3	S	1.3	R	11.0	R
209	ZC (FDK 124)	0.0	DF	2.5	R	0.0	DF	25.8	R	50.0	S	1.3	R	12.9	R
210	RG 892	0.0	DF	2.3	R	0.0	DF	21.3	R	50.0	S	1.2	R	10.7	R
211*	FDK 345	0.0	DF	3.0	R	0.0	DF	25.5	R	-	-	1.5	R	12.8	R
212*	PBD 154	0.0	DF	3.3	R	0.0	DF	26.8	MR	-	-	1.7	R	13.4	R
213	CISAA 6-165	0.0	DF	3.5	R	0.0	DF	23.8	R	50.0	S	1.8	R	11.9	R
	LD 949 (LC)			6.3	R			30.3	MR			6.3	R	30.3	MR
	CISA-310									100.0	S				
	CISA-614									60.8	S				

Overall poor germination, *No germination at RS-Sirsa

Table 32: Br. 25 a/b Preliminary Hybrid Trial - Desi Hybrid

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)					
		Bathinda				Sirsa	
		FFS		Bacterial Leaf Blight		Root rot	
		PDI	DR	PDI	DR	PDI	DR
221	CISAA 21-2	34.3	MR	4.3	R	90.0	S
222	KR 161	24.3	R	4.5	R	68.5	S
223	ZC (KR 64-NZ)	24.5	R	4.0	R	40.0	S
224*	AAH 47	9.8	R	5.3	R	-	-
225	KR 160	17.8	R	2.3	R	70.8	S
226	CISAA 21-1	22.5	R	3.0	R	100.0	S
227	LC	51.5	MS	3.5	R	50.0	S
228	KR 162	23.8	R	3.8	R	78.6	S
229	AAH 46	11.8	R	1.3	R	50.0	S
	LD 949(LC)	30.0	MR	5.5	R		
	CICR-2					80.0	S

Overall poor germination, *No germination at RS-Sirsa

NATIONAL TRIALS: Central Zone

Table 33: Br. 22 b IET-*G.arboreum*

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)															
		ALS				BLB				Grey Mildew						MLS	
		Khandwa		Bharuch		Akola		Bharuch		Khandwa		Akola		Nagpur		Akola	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
231	CNA 1085	12.5	R	0.0	DF	2.2	R	0.0	DF	7.5	R	3.3	R	32.5	MR	1.1	R
232	GAM 296	7.5	R	0.0	DF	1.7	R	0.0	DF	5.0	R	1.7	R	31.5	MR	1.7	R
233	PA 919	0.0	DF	0.0	DF	1.1	R	0.0	DF	5.0	R	2.8	R	32.3	MR	2.2	R
234	GBav 181	0.0	DF	0.0	DF	1.7	R	0.0	DF	2.5	R	2.2	R	34.9	MR	2.2	R
235	JLA 1707	22.5	R	0.0	DF	2.2	R	0.0	DF	2.5	R	2.8	R	37.6	MR	2.8	R
236	ZC (AKA 7)	12.5	R	0.0	DF	1.1	R	0.0	DF	0.0	DF	3.3	R	22.1	R	3.9	R
237	PA 929	12.5	R	0.0	DF	2.8	R	0.0	DF	7.5	R	2.2	R	29.6	MR	3.9	R
238	CNA 1084	17.5	R	0.0	DF	2.2	R	0.0	DF	2.5	R	2.8	R	27.2	MR	1.7	R
239	GVav 1332	32.5	MR	0.0	DF	1.1	R	0.0	DF	5.0	R	1.7	R	26.7	MR	3.3	R
240	LC	15.0	R	0.0	DF	2.2	R	0.0	DF	7.5	R	2.2	R	30.1	MR	1.7	R
241	CNA20178	20.0	R	0.0	DF	2.2	R	0.0	DF	5.0	R	3.3	R	44.5	MR	1.7	R
242	AKA 2016-3	27.5	MR	0.0	DF	1.7	R	0.0	DF	2.5	R	2.2	R	27.5	MR	1.7	R
243	CNA 1086	25.0	R	0.0	DF	2.2	R	0.0	DF	2.5	R	3.9	R	27.7	MR	1.7	R
244	GAM 288	7.5	R	0.0	DF	2.2	R	0.0	DF	0.0	DF	2.2	R	16.5	R	2.2	R
245	QC (PA 255)	25.0	R	0.0	DF	1.7	R	0.0	DF	0.0	DF	2.2	R	28.8	MR	2.2	R
246	JLA 1641	10.0	R	0.0	DF	2.2	R	0.0	DF	0.0	DF	1.7	R	19.5	R	2.8	R
247	GBav 137	7.5	R	0.0	DF	2.2	R	0.0	DF	0.0	DF	3.3	R	27.2	MR	2.8	R
	AKA. 8					2.8	R					3.9	R			2.2	R

Table 34: Br. 32b IET of *G. herbaceum*

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)							
		Bacterial leaf blight				Alternaria Leaf blight			
		Surat		Bharuch		Surat		Bharuch	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR
251	CNh 66	0.0	DF	0.0	DF	0.0	DF	0.0	DF
252	GBhv 340	0.0	DF	0.0	DF	0.0	DF	0.0	DF
253	CNh-33	0.0	DF	0.0	DF	0.0	DF	0.0	DF
254	GBhv 334	0.0	DF	0.0	DF	0.0	DF	0.0	DF
255	ZC (G Cot 23)	0.0	DF	0.0	DF	0.0	DF	0.0	DF
256	GBhv 356	0.0	DF	0.0	DF	0.0	DF	0.0	DF
257	GShv 843/17	0.0	DF	0.0	DF	0.0	DF	0.0	DF
258	LC	0.0	DF	0.0	DF	0.0	DF	0.0	DF
259	GShv 812/17	0.0	DF	0.0	DF	0.0	DF	0.0	DF

ZONAL TRIAL: NORTH ZONE

Table 35: Br-04 a – Coordinated Variety trial of *G. hirsutum*

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)															
		Bacterial leaf blight				FFS				CLCuD							
		Faridkot		Bathinda		Faridkot		Bathinda		Faridkot		Bathinda		Sirsa		Sriganganagar	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
2001	Quality Check (CSH 3129)	0.0	DF	1.8	R	1.8	R	4.0	R	38.4	MS	78.3	HS	54.0	HS	39.0	MS
2002	F 2732	0.0	DF	2.0	R	1.6	R	3.3	R	37.8	MS	84.2	HS	51.4	HS	45.8	S
2003	ZC (F 2228)	0.0	DF	1.3	R	2.0	R	4.3	R	48.4	S	76.7	HS	53.5	HS	27.8	MR
2004	F 2743	0.0	DF	1.0	R	0.8	R	2.8	R	36.5	MS	84.2	HS	51.7	HS	23.1	MR
2005	LC	0.0	DF	1.0	R	2.0	R	4.0	R	44.4	S	49.2	S	53.1	HS	45.8	S
	F846(SC)			1.5	R			5.3	R			100.0	HS				
	RST-9(SC)															52.8	HS

Table 36: Br-24 a - Coordinated Variety trial of *G. arboreum*

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)							
		Bacterial leaf blight				FFS			
		Faridkot		Bathinda		Faridkot		Bathinda	
		PDI	DR	PDI		PDI	DR	PDI	DR
2011	FDK 315	0.0	DF	4.0	R	0.0	DF	29.0	MR
2012	FDK 124 (ZC)	0.0	DF	4.3	R	0.0	DF	27.5	MR
2013	RG 888	0.0	DF	3.3	R	0.0	DF	28.8	MR
2014	CISA 33-7	0.0	DF	3.5	R	0.0	DF	28.3	MR
2015	FDK 312	0.0	DF	4.0	R	0.0	DF	31.3	MR
2016	FDK 325	0.0	DF	3.8	R	0.0	DF	29.5	MR
2017	Local Check	0.0	DF	3.0	R	0.0	DF	29.5	MR
2018	PBD 156	0.0	DF	2.8	R	0.0	DF	29.0	MR
2019	RG 868	0.0	DF	3.5	R	0.0	DF	28.3	MR
2020	FDK 324	0.0	DF	2.5	R	0.0	DF	28.0	MR
	LD 949(LC)			7.0	R			30.5	MR

Table 37: Br-25 a Coordinated Desi Hybrid trial

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)							
		Bacterial leaf blight				FFS			
		Faridkot		Bathinda		Faridkot		Bathinda	
		PDI	DR	PDI		PDI	DR	PDI	DR
2021	KR 153	0.0	DF	3.0	R	0.0	DF	22.0	R
2022	KR 149	0.0	DF	4.0	R	0.0	DF	26.8	MR
2023	Zonal Check (KR 64)	0.0	DF	4.8	R	0.0	DF	33.0	MR
2024	CISAA 20-1	0.0	DF	3.8	R	0.0	DF	27.0	MR
2025	Local Check	0.0	DF	0.8	R	0.0	DF	14.3	R
2026	KR 150	0.0	DF	4.0	R	0.0	DF	27.0	MR
2027	KR 152	0.0	DF	1.8	R	0.0	DF	13.8	R
2028	CISAA 19-4	0.0	DF	1.3	R	0.0	DF	18.8	R
	LD 949(LC)			4.8	R			27.3	MR

ZONAL TRIAL: CENTRAL ZONE

Table 38: Br-03 a/b – PVT Coloured cotton - Irrigated

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)									
		Bacterial leaf blight		Alternaria leaf spot		Corynespora leaf spot				Grey mildew	
		Surat		Khandwa		Surat		Nagpur		Khandwa	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
2101	CCH 20452	0.0	DF	17.5	R	0.0	DF	23.5	R	2.5	R
2102	Phule Yamuna (ZC)	19.3	R	7.5	R	0.0	DF	33.6	MR	0.0	DF
2103	DHCC 2151	26.2	MR	15.0	R	0.0	DF	25.6	MR	2.5	R
2104	CNH 19325	0.0	DF	27.5	MR	0.0	DF	31.7	MR	7.5	R
2105	CNH 19480	0.0	DF	20.0	R	3.5	R	21.6	R	0.0	DF
2106	16301 DB	0.0	DF	37.5	MR	0.0	DF	20.8	R	0.0	DF
2107	CNH 17395	6.8	R	20.0	R	0.0	DF	24.5	R	7.5	R
2108	CNH 20449	0.0	DF	22.5	R	0.0	DF	20.5	R	0.0	DF
2109	Local Check	39.5	MR	52.5	MS	0.0	DF	25.9	MR	5.0	R
	*LRA 5166 (SC)	62.5	MS			0.0	DF				

* Susceptible check

Table 39: Br-24 b CVT – *G. arboreum*

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)											
		Bacterial leaf blight		MLS		Alternaria blight		Grey Mildew					
		Akola		Akola		Khandwa		Akola		Khandwa		Nagpur	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
2111	JLA-1430	2.2	R	1.1	R	7.5	R	3.3	R	2.5	R	25.6	MR
2112	GAM 269	1.7	R	1.7	R	25.0	R	1.7	R	2.5	R	21.9	R
2113	ZC (AKA 7)	1.1	R	2.2	R	10.0	R	2.8	R	0.0	DF	23.2	R
2114	GAM 283	1.7	R	2.2	R	20.0	R	2.2	R	0.0	DF	28.5	MR
2115	CNA 1072	2.2	R	2.8	R	15.0	R	2.8	R	2.5	R	26.9	MR
2116	QC (PA 255)	1.1	R	3.9	R	12.5	R	3.3	R	5.0	R	20.0	R
2117	AKA 2016-11	2.8	R	3.9	R	7.5	R	2.2	R	5.0	R	18.4	R
2118	GAM 266	2.2	R	1.7	R	12.5	R	2.8	R	0.0	DF	17.3	R
2119	LC	1.1	R	3.3	R	12.5	R	1.7	R	7.5	R	15.7	R
2120	JLA 1204	2.2	R	1.7	R	5.0	R	2.2	R	5.0	R	28.3	MR
	AKA 8	2.8	R	3.9	R			3.9	R				

Table 40: Br-24b – CVT Coloured Cotton – G. arboreum

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)									
		Bacterial leaf blight		Alternaria leaf spot		Corynespora leaf spot		Grey Mildew			
		Surat		Khandwa		Surat		Khandwa		Nagpur	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
2121	CNA 1092	0.0	DF	7.5	R	0.0	DF	2.5	R	27.5	MR
2122	Local Check	0.0	DF	22.5	R	0.0	DF	0.0	DF	24.0	R
2123	CNA 20402	0.0	DF	2.5	R	0.0	DF	5.0	R	28.0	MR
2124	CNA 19475	0.0	DF	12.5	R	0.0	DF	2.5	R	30.9	MR
2125	AKA 7 (Zonal Check)	0.0	DF	5.0	R	0.0	DF	7.5	R	19.5	R
2126	DDCC 2001	0.0	DF	5.0	R	0.0	DF	2.5	R	26.4	MR
	*LRA 5166 (SC)	62.5	MS			0.0	DF				

* Susceptible check

ZONAL TRIAL: SOUTH ZONE

Table 41: Br-03 a/b (CC) – PVT Colour Cotton – Irrigated

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)			
		Corynespora leaf spot		Rust	
		Lam		Lam	
		PDI	DR	PDI	DR
2201	DHCC 2002	25.0	R	20.5	R
2202	Suraj (Zonal Check)	27.0	MR	17.3	R
2203	DHCC 2151	26.0	MR	20.8	R
2204	Local Check	21.5	R	25.8	MR
2205	Vaidehi 1 (ZC CC)	31.0	MR	23.3	R
	L 1060	39.0	MR	42.0	MR
	Jaadoo BG II	31.5	MR	37.8	MR
	RCH 2 BG II	30.0	MR	33.5	MR

Table 42: Br-04a – CVT – Irrigated

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)					
		Corynespora leaf spot		Rust		Grey mildew	
		Lam		Lam		Junagarh	
		PDI	DR	PDI	DR	PDI	DR
2211	RAH 1083	25.0	R	25.5	MR		
2212	ZC (Suraj)	27.8	MR	26.0	MR		
2213	RAH 1081	27.5	MR	25.5	MR		
2214	TSH 387	25.8	MR	30.0	MR		
2215	LC	29.0	MR	28.3	MR		
2216	RAH 1082	26.8	MR	27.5	MR		
	L 1060	39.0	MR	42.0	MR		
	Jaadoo BG II	31.5	MR	37.8	MR		
	RCH 2 BG II	30.0	MR	33.5	MR		

Table 43: Br – 14 a CVT *G. barbadense*

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)											
		Bacterial leaf blight		Alternaria leaf spot				Root Rot		Grey mildew		Rust	
		Dharwad		Dharwad		Coimbatore		Coimbatore		Dharwad		Dharwad	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
2221	CCB 26	15.0	R	18.7	R	33.5	MR	33.3	S	0	DF	15.0	R
2222	CCB22-2	15.3	R	19.0	R	30.5	MR	17.5	MS	0	DF	15.3	R
2223	ZC (Rhcb-011-CZ; Suvin-SZ)	14.6	R	19.6	R	18.7	R	40.5	S	0	DF	15.1	R
2224	CCB22-1	15.1	R	18.5	R	9.5	R	9.3	R	0	DF	15.3	R
2225	SIMA B-8	13.6	R	19.4	R	60.7	MS	19.5	MS	0	DF	14.0	R
2226	CCB 6	13.5	R	17.7	R	62.5	MS	17.5	MS	0	DF	14.9	R
	Jayadhar	30.8	MR	39.0	MR					41.0	MR	29.0	MR
	Abhadita	36.3	MR	35.5	MR					36.2	MR	31.8	MR
	RCHIIBGII (SC)					65.5	MS	55.0	S				

Table 44: Br. 24b CVT – G. arboretum

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)							
		Bacterial leaf blight		Alternaria leaf spot		Grey mildew		Rust	
		Dharwad		Dharwad		Dharwad		Dharwad	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR
2231	CNA 2034	0	DF	14.9	R	18.8	R	15.5	R
2232	DWDa 2051	0	DF	17.6	R	19.7	R	14.0	R
2233	PAIG 411	0	DF	14.6	R	17.5	R	15.4	R
2234	MDL 2674	0	DF	19.5	R	14.5	R	14.6	R
2235	NDLA 3152-1	0	DF	12.4	R	10.1	R	12.1	R
2236	PA 887	0	DF	14.9	R	16.8	R	14.9	R
2237	CNA 1085	0	DF	17.0	R	19.0	R	16.4	R
2238	DWDa 2252	0	DF	16.1	R	14.6	R	15.4	R
2239	LC	0	DF	15.8	R	19.6	R	15.4	R
2240	CNA 1086	0	DF	15.5	R	19.4	R	14.9	R
2241	NDLA 3146-2	0	DF	14.6	R	18.8	R	14.6	R
2242	ZC (DLSa 17)	0	DF	18.8	R	14.6	R	15.0	R
2243	PA 888	0	DF	16.5	R	19.5	R	15.3	R
2244	PA 898	0	DF	16.9	R	18.8	R	15.6	R
2245	DWDa 2251	0	DF	14.9	R	19.8	R	14.5	R
2246	CNA 1084	0	DF	16.4	R	16.0	R	15.4	R
	Jayadhar	30.8	MR	39.0	MR	41.0	MR	29.0	MR
	Abhadita	36.3	MR	35.5	MR	36.2	MR	31.8	MR

Path 2 (b) Confirmation and maintenance of disease-resistant lines
NORTH ZONE

Table 45: Confirmation and maintenance of disease-resistant lines (*G. hirsutum*) against Cotton leaf curl disease (CLCuD) at Faridkot

Entry name	Year of start	CLCuD PDI and Disease reaction					
		First year (2020)		Second year (2021)		Third year (2022)	
		Field trial		Field trial		Field trial	
		PDI	Reaction	PDI	Reaction	PDI	Reaction
RHC 1307	2020	3.3	HR	23.7	MR	25.7	MR
CSH 3012		7.7	HR	25.8	MR	27.2	MR
RS 2909		2.7	HR	18.5	R	19.1	R
F 2687		4.8	HR	19.1	R	18.6	R
GSHV 208		9.4	HR	24.7	MR	28.1	MR
RAH 1076		2.6	HR	19.9	R	18.1	R
F 2228		41.3	S	41.2	S	49.1	S
F 846		42.0	S	41.2	S	46.3	S
RST 9		40.7	S	40.3	S	51.0	S

CENTRAL ZONE

Table 46a: Confirmation and maintenance of disease-resistant lines (*G. hirsutum*) against bacterial leaf blight at Junagarh (Gujarat) and CRS Surat

S.No.	Entry	Bacterial Leaf Blight (BLB) PDI and Disease Reaction													
		Screening at CRS, Junagarh										Screening at CRS, Surat			
		1st year (2019)		2nd year (2020)		3rd year (2021)		4th year (2022)				Year (2022-23)			
		Field trial		Field trial		Field trial		Field trial		Artificial		Field trial		Artificial	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1	CCH 19-2	8.0	R	7.8	R	0.5	R	0.5	R	40.8	MR	26.5	MR	40.8	MR
2	GJHV 557	**1.5**	**R**	**12.0**	**R**	**0.5**	**R**	**3.0**	**R**	**21.8**	**R**	**10.5**	**R**	**21.8**	**R**
3	GISV 323	**0.5**	**R**	**4.5**	**R**	**0.5**	**R**	**0.5**	**R**	**8.3**	**R**	**2.5**	**R**	**8.3**	**R**
4	LC	1.0	R	6.3	R	5.0	R	3.5	R	32.0	MR	18.5	R	32.0	MR
5	RHC 1409	5.3	R	3.3	R	7.5	R	0.5	R	27.8	MR	18.5	R	27.8	MR
6	BGDS 1047	1.5	R	0.8	R	0.5	R	9.0	R	0.0	DF	0.0	DF	0.0	DF
7	LRA-5166 (SC)	39.5	MR	79.1	S	60.1	MS	65.2	MS	62.5	MS	62.5	MS	62.5	MS

Table 46b: Confirmation and maintenance of disease-resistant lines (*G. hirsutum*) against Alternaria leaf spot at Junagarh (Gujarat)

S.No.	Entry	Alternaria Leaf Spot (ALS) PDI and Disease Reaction									
		Screening at CRS, Junagarh									
		1st year (2019)		2nd year (2020)		3rd year (2021)		4th year (2022)			
		Field trial		Field trial		Field trial		Field trial		Artificial	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1	CCH 19-2	30.7	MR	24.0	R	14.5	R	3.5	R	Need to be screened	
2	GJHV 557	**22.5**	**R**	**14.5**	**R**	**22.0**	**R**	**2.5**	**R**		
3	GISV 323	**19.8**	**R**	**12.5**	**R**	**7.5**	**R**	**8.0**	**R**		
4	LC	21.8	R	18.8	R	14.5	R	8.5	R		
5	RHC 1409	**18.0**	**R**	**10.3**	**R**	**5.0**	**R**	**3.5**	**R**		
6	BGDS 1047	**21.0**	**R**	**9.0**	**R**	**11.5**	**R**	**9.5**	**R**		
7	LRA-5166 (SC)	45.5	MR	78.1	S	60.1	MS	55.5	MS		

Table 46c: Confirmation and maintenance of disease-resistant lines (*G. hirsutum*) against Corynespora leaf spot at Junagarh (Gujarat) and CRS Surat

S.No.	Entry	Corynespora Leaf Spot (CoLS) PDI and Disease Reaction													
		Screening at CRS, Junagarh										Screening at CRS, Surat			
		1st year (2019)		2nd year (2020)		3rd year (2021)		4th year (2022)				Year (2022-23)			
		Field trial		Field trial		Field trial		Field trial		Artificial		Field trial		Artificial	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1	CCH 19-2	**CoLS was** not **observed**				69.5	MS	5.5	R	Need to be screened		0.0	DF	0.0	DF
2	GJHV 557					15.5	R	2.5	R			0.0	DF	0.0	DF
3	GISV 323					4.5	R	9.5	R			0.0	DF	0.0	DF
4	LC					27.0	MR	9.5	R			0.0	DF	0.0	DF
5	RHC 1409					9.5	R	8.2	R			0.0	DF	0.0	DF
6	BGDS 1047					13.5	R	0.5	R			0.0	DF	0.0	DF
7	LRA-5166 (SC)					77.1	S	45.0	MR			0.0	DF	0.0	DF

Table 46d: Confirmation and maintenance of disease-resistant lines (*G. hirsutum*) against Grey mildew at Junagarh (Gujarat)

S.No.	Entry	Grey Mildew (GM) PDI and Disease Reaction									
		Screening at CRS, Junagarh									
		1st year (2019)		2nd year (2020)		3rd year (2021)		4th year (2022)			
		Field trial		Field trial		Field trial		Field trial		Artificial	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1	CCH 19-2	**GM was** not **observed**						5.5	R	Need to be screened	
2	GJHV 557							8.0	R		
3	GISV 323							4.0	R		
4	LC							2.0	R		
5	RHC 1409							8.0	R		
6	BGDS 1047							3.5	R		
7	LRA-5166 (SC)							60.0	MS		

Table 47a: Confirmation of disease resistance (*G. hirsutum*) against Bacterial Leaf Blight and Alternaria leaf Spot at Junagarh (Gujarat)

S.No.	Entry	Bacterial Leaf Blight (BLB)						Alternaria leaf Spot (ALS)					
		1st year (2020)		2nd year (2021)		3rd year (2022)		1st year (2020)		2nd year (2021)		3rd year (2022)	
		Field Trial		Field Trial		Field Trial		Field Trial		Field Trial		Field Trial	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1.	GJHV 548	12.8	R	7.5	R	12.0	R	9.5	R	14.5	R	7.0	R
2.	RB 602	2.5	R	1.0	R	0.5	R	8.0	R	22.0	R	10.5	R
3.	TSH 354	2.8	R	0.5	R	8.0	R	11.0	R	7.5	R	3.5	R
4.	CPD 2003	8.5	R	3.0	R	9.0	R	7.8	R	14.5	R	7.5	R
5.	GISV 328	2.0	R	1.5	R	0.5	R	7.5	R	5.0	R	2.0	R
6.	RAH 1081	3.0	R	0.5	R	0.5	R	20.5	R	11.5	R	4.5	R
7.	LRA-5166 (SC)	39.5	MR	79.1	S	65.2	MS	45.5	MR	56.0	MS	55.5	MS

Table 47b: Confirmation of disease resistance (*G. hirsutum*) against Corynespora leaf spot and Grey Mildew at Junagarh (Gujarat)

S.No.	Entry	Corynespora Leaf spot (CoLS)						Grey Mildew (GM)					
		1st year (2020)		2nd year (2021)		3rd year (2022)		1st year (2020)		2nd year (2021)		3rd year (2022)	
		Field Trial		Field Trial		Field Trial		Field Trial		Field Trial		Field Trial	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1.	GJHV 548	23.3	R	4.5	R	4.5	R	GM was not observed				3.0	R
2.	RB 602	11.0	R	4.5	R	11.0	R					5.0	R
3.	TSH 354	3.5	R	3.0	R	9.5	R					3.5	R
4.	CPD 2003	2.0	R	2.3	R	9.0	R					11.8	R
5.	GISV 328	8.0	R	2.8	R	8.0	R					6.8	R
6.	RAH 1081	15.8	R	0.5	R	7.5	R					6.5	R
7.	LRA-5166 (SC)	45.5	MR	77.0	MS	45.0	MR					60.5	MS

Table 48: Confirmation of disease resistance (*G. hirsutum*) against BLB, ALS, CoLS and Grey mildew at Junagarh (Gujarat)

S.No.	Entry	Bacterial Leaf Blight (BLB)				Alternaria leaf Spot (ALS)				Corynespora Leaf spot (CoLS)				Grey Mildew (GM)			
		1st year (2021)		2nd year (2022)		1st year (2021)		2nd year (2022)		1st year (2021)		2nd year (2022)		1st year (2021)		2nd year (2022)	
		Field Trial		Field Trial		Field Trial		Field Trial		Field Trial		Field Trial		Field Trial		Field Trial	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1.	GISV 310	0.5	R	14.5	R	11.5	R	13.0	R	30.0	MR	6.0	R	GM was not observed		9.5	R
2.	CPD 1602	4.5	R	22.0	R	10.5	R	13.5	R	13.0	R	6.5	R			11.5	R
3.	RCH 1217	0.5	R	7.5	R	12.0	R	5.0	R	30.5	R	12.5	R			3.5	R
4.	RAH 1071	0.5	R	14.5	R	9.0	R	3.5	R	57.5	MS	6.0	R			0.5	R
5.	LRA-5166 (SC)	56.0	MS	65.2	MS	60.0	MS	55.5	MS	60.0	MS	45.0	MR			60.5	MS

Table 49: Confirmation of disease resistance (*G. hirsutum*) against BLB, ALS, CoLS and Grey mildew at Junagarh (Gujarat)

S.No.	Entry	Bacterial Leaf Blight (BLB)		Alternaria leaf Spot (ALS)		Corynespora Leaf spot (CoLS)		Grey Mildew (GM)	
		1st year (2022)		1st year (2022)		1st year (2022)		1st year (2022)	
		Field Trial		Field Trial		Field Trial		Field Trial	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR
1.	GJHV-592	4.0	R	10.5	R	6.5	R	4.5	R
2.	GJHV-598	6.5	R	2.5	R	6.5	R	10.5	R
3.	GJHV-600	1.0	R	12.0	R	13.0	R	17.5	R
4.	GJHV-604	14.5	R	17.5	R	7.5	R	10.5	R
5.	GJHV-605	0.5	R	6.0	R	9.5	R	10.0	R
6.	LRA-5166 (SC)	65.2	MS	55.0	MS	45.0	MR	58.5	MS

Table 50a: Confirmation and maintenance of disease-resistant lines (*G. hirsutum*) against Bacterial leaf blight at MCRS, NAU – Surat

Sr. No	Entry	Bacterial Leaf Blight (BLB) PDI and Disease reaction															
		First year (2019)				Second year (2020)				Third year (2021)				Fourth-year (2022)			
		Field trail		Artificial		Field trail		Artificial		Field trail		Artificial		Field trial		Artificial	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1	GSHH 15032	**0.0**	**DF**	**0.0**	**DF**	**0.0**	**DF**	**22.0**	**R**	**-**	**-**	**-**	**-**	**0.0**	**DF**	**0.0**	**DF**
2	GSHH 15035	**0.0**	**DF**	**0.0**	**DF**	**0.0**	**DF**	**20.0**	**R**	**0.0**	**DF**	**0.0**	**DF**	**0.0**	**DF**	**0.0**	**DF**
3	GISV 312	0.0	DF	0.0	DF	0.0	DF	19.3	R	8.3	R	16.5	R	18.5	R	27.3	MR
4	GISV 319	0.0	DF	0.0	DF	0.0	DF	16.0	R	22.5	R	33.2	MR	21.5	R	38.8	MR
5	GISV 323	0.0	DF	0.0	DF	0.0	DF	17.8	R	0.0	DF	0.0	DF	0.0	DF	0.0	DF
6	Gshv 807/17	-	-	-	-	-	-	-	-	-	-	-	-	0.0	DF	0.0	DF
7	Gshv 810/17	-	-	-	-	-	-	-	-	-	-	-	-	0.0	DF	0.0	DF
8	Gshv 831/17	-	-	-	-	-	-	-	-	-	-	-	-	0.0	DF	0.0	DF
	LRA 5166 (SC)	36.5	MR	-	-	55.5	MS	-	-	65.0	MS	3.0	R	62.5	MS	75.5	MS

Table 50b: Confirmation and maintenance of disease-resistant lines (*G. hirsutum*) against Corynespora Leaf Spot at MCRS, NAU - Surat

Sr. No	Entry	Corynespora Leaf Spot (CoLS) PDI and Disease reaction															
		First year (2019)				Second year (2020)				Third year (2021)				Fourth Year (2022)			
		Field trail		Artificial		Field trail		Artificial		Field trail		Artificial		Field trail		Artificial	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1	GSHH 15032	0.0	DF	0.0	DF	0.0	DF	0.0	DF	-	-	-	-	0.0	DF	0.0	DF
2	GSHH 15035	0.0	DF	0.0	DF	0.0	DF	0.0	DF	6.2	R	0.0	DF	0.0	DF	0.0	DF
3	GISV 312	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF
4	GISV 319	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF
5	GISV 323	0.0	DF	0.0	DF	0.0	DF	0.0	DF	8.2	R	0.0	DF	0.0	DF	0.0	DF
6	Gshv 807/17	-	-	-	-	-	-	-	-	-	-	-	-	0.0	DF	0.0	DF
7	Gshv 810/17	-	-	-	-	-	-	-	-	-	-	-	-	0.0	DF	0.0	DF
8	Gshv 831/17	-	-	-	-	-	-	-	-	-	-	-	-	0.0	DF	0.0	DF
	LRA 5166 (SC)	0.0	DF	0.0	-	8.0	R	-	-	8.0	R	1.0	R	0.0	DF	0.0	DF

Table 51: Confirmation and maintenance of disease-resistant lines against Bacterial leaf blight, Alternaria leaf spot and Grey mildew at Nanded

Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)											
	Bacterial leaf blight				Alternaria leaf spot				Grey Mildew			
	1st year (2021-22)		2nd year (2022-23)		1st year (2021-22)		2nd year (2022-23)		1st year (2021-22)		2nd year (2022-23)	
	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
ZC (NH 615)	5.6	R	3.3	R	5.2	R	5.0	R	9.7	R	1.8	R
CNH 119	2.9	R	4.0	R	5.0	R	3.8	R	11.4	R	2.1	R
Local Check	2.2	R	2.0	R	3.8	R	2.7	R	9.0	R	1.1	R
TVH 007	8.0	R	5.0	R	6.8	R	7.1	R	8.2	R	2.6	R
RAH 1081	7.3	R	5.5	R	6.7	R	6.2	R	8.4	R	2.9	R
AKH 2013-2	1.0	R	3.4	R	3.2	R	1.5	R	8.5	R	1.7	R
Quality Check (Suraj)	4.8	R	2.4	R	4.3	R	3.8	R	8.4	R	1.3	R
AKH 2013-3	5.2	R	4.2	R	5.5	R	5.1	R	10.3	R	2.2	R
LRA 5166 (SC)	9.8	R	-	-	7.2	R	-	-	11.8	R	-	-

SOUTH ZONE

Table 52a: Confirmation and maintenance of disease-resistant lines against Alternaria leaf spot and grey mildew at UAS Dharwad

S. No	Entry	Species	Year of start	Alternaria leaf spot								Grey mildew							
				1st year (2013-14)		2nd year (2015-16)		3rd year (2018-19)				1st year (2013-14)		2nd year (2015-16)		3rd year (2018-19)			
				Field trial		Field trial		Field trial		Artificial inoculation		Field trial		Field trial		Field trial		Artificial inoculation	
				PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1	**DB-14**	*Barbadense*	2013-14	37.0	MR	30.1	MR	34.1	MR	47.5	MR	27.0	MR	20.1	R	24.1	R	37.5	MR
2	**SVA-1118**	*Arboreum*		9.3	**R**	**11.9**	**R**	**9.7**	**R**	**12.6**	**R**	**4.3**	**R**	**6.9**	**R**	**4.7**	**R**	**7.6**	**R**
3	GSB-41	*Barbadense*		15.1	**R**	**22.3**	**R**	**22.6**	**R**	**24.6**	**R**	**10.1**	**R**	**17.3**	**R**	**15.6**	**R**	**18.6**	**R**
4	**DB-40**	*Barbadense*		12.6	**R**	**17.1**	**R**	**16.3**	**R**	**21.3**	**R**	**7.6**	**R**	**10.1**	**R**	**9.3**	**R**	**14.3**	**R**
5	DB-16	*Barbadense*		21.3	R	22.6	R	20.1	R	27.6	MR	**11.3**	**R**	**12.6**	**R**	**10.1**	**R**	**17.6**	**R**
6	Suvin	*Hirsutum*		39.4	MR	41.4	MR	43.7	MR	49.4	MR	29.4	MR	21.4	R	23.7	R	29.4	MR
7	**SCS-1206**	*Hirsutum*		25.0	R	30.9	MR	24.6	R	31.1	MR	25.0	**R**	**14.9**	**R**	**14.6**	**R**	**21.1**	**R**
8	RHB-1005	HXB		41.1	MR	46.4	MR	39.2	MR	48.9	MR	26.1	MR	31.4	MR	29.2	MR	28.9	MR
9	DB-1302	*Barbadense*		22.3	R	24.4	R	31.4	MR	25.0	R	16.3	R	18.4	R	19.4	R	22.0	R
10	GSHB-989	HXB		30.1	MR	36.4	MR	30.9	MR	41.4	MR	15.1	R	16.4	R	18.9	R	21.4	R
11	Abhadita (SC)	*Hirsutum*		39.0	MR	39.0	MR	39.0	MR	39.0	MR	39.0	MR	39.0	MR	39.0	MR	39.0	MR
12	Jaydhar (SC)	*Herbaceum*		35.5	MR	35.5	MR	35.5	MR	35.5	MR	35.5	MR	35.5	MR	35.5	MR	35.5	MR

Table 52b: Confirmation and maintenance of disease-resistant lines against Alternaria leaf spot and grey mildew at UAS Dharwad

S. No	Entry	Species	Year of start	Alternaria leaf spot								Grey mildew							
				4th year (2021-22)				5th year (2022-23)				4th year (2021-22)				5th year (2022-23)			
				Field trial		Artificial inoculation		Field trial		Artificial inoculation		Field trial		Artificial inoculation		Field trial		Artificial inoculation	
				PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1	**DB-14**	*Barbadense*	2021-22	**13.3**	**R**	**11.2**	**R**	*	-	*	-	**5.2**	**R**	**6.5**	**R**	*	-	*	-
2	**SVA-1118**	*Arboreum*		**0.0**	**DF**	**0.0**	**DF**	**12.5**	**R**	**14.5**	**R**	**3.5**	**R**	**4.6**	**R**	**2.5**	**R**	**3.7**	**R**
3	**DB-40**	*Barbadense*		16.5	R	14.5	R	24.8	R	28.7	MR	**6.7**	**R**	**7.7**	**R**	**6.5**	**R**	**8.6**	**R**
4	**SCS-1206**	*Hirsutum*		17.0	R	15.3	R	23.4	R	27.6	MR	**8.4**	**R**	**10.4**	**R**	**6.8**	**R**	**9.5**	**R**
5	CPD-2052	*Hirsutum*		15.6	R	17.9	R	26.0	MR	30.6	MR	5.3	R	7.3	R	6.0	R	7.3	R
6	DSC-1951	*Hirsutum*		17.5	R	19.6	R	19.6	R	26.5	MR	3.6	R	5.6	R	4.6	R	6.7	R
7	DSC-2051	*Hirsutum*		17.5	R	19.6	R	25.8	R	29.7	MR	8.6	R	11.6	R	5.7	R	8.5	R
8	NDLA3118-3	*Hirsutum*		14.9	R	22.1	R	28.8	MR	32.5	MR	10.7	R	11.2	R	9.0	R	10.3	R
9	CNA-1042	*Arboreum*		15.2	R	19.8	R	12.7	R	18.7	R	10.2	R	12.4	R	5.5	R	7.6	R
10	PA-778	*Arboreum*		14.4	R	21.2	R	14.4	R	16.8	R	8.6	R	9.4	R	4.5	R	5.3	R
11	GBhv-206	*Hirsutum*		13.6	R	19.8	R	13.0	R	15.6	R	6.5	R	7.3	R	5.9	R	8.7	R
12	AKH-2013-3	*Hirsutum*	2022-23	-	-	-	-	16.5	R	18.4	R	-	-	-	-	5.7	R	8.0	R
13	CCH-19-2	*Hirsutum*		-	-	-	-	16.8	R	17.9	R	-	-	-	-	8.6	R	10.3	R
14	CCB-26	*Barbadense*		-	-	-	-	16.5	R	18.4	R	-	-	-	-	7.8	R	10.4	R
15	CCB-06	*Barbadense*		-	-	-	-	17.6	R	19.7	R	-	-	-	-	6.9	R	9.7	R
16	SBSD-5-6	*Barbadense*		-	-	-	-	10.4	R	12.5	R	-	-	-	-	8.3	R	12.5	R
17	CNA-1072	*Arboreum*		-	-	-	-	18.1	R	19.5	R	-	-	-	-	6.8	R	9.3	R
18	NDLA3104-4	*Arboreum*		-	-	-	-	17.0	R	18.6	R	-	-	-	-	7.0	R	9.6	R
19	Abhadita (SC)	*Hirsutum*		35.0	MR	42.5	MR	35.0	MR	42.5	MR	38.5	MR	42.5	MR	38.5	MR	42.5	MR
20	Jaydhar (SC)	*Herbaceum*		40.5	MR	55.0	MS	40.5	MR	55.0	MS	42.5	MR	55.0	MS	42.5	MR	55.0	MS

*** Not Planted during 2022-23**

Table 53a: Confirmation and maintenance of disease-resistant lines against Corynespora leaf spot at Guntur (Lam)

Entry Code	Entry Name	Species	Year of start	Corynespora leaf spot PDI and Disease reaction							
				First Year (2020)		Second Year (2021)		Third Year (2022)			
				Field trial		Field trial		Field trial		Artificial Inoculation	
				PDI	DR	PDI	DR	PDI	DR	PDI	DR
304	TSH 354	*G. hirsutum*	2020	18.3	R	17.3	R	26.0	MR	30.2	MR
306	ZC (Suraj)	*G. hirsutum*	2020	24.5	R	8.0	R	20.3	R	29.0	MR
319	RAH 1083	*G. hirsutum*	2020	26.8	MR	8.0	R	22.3	R	28.5	MR
394	CNH 19480	*G. hirsutum*	2020	17.0	R	8.5	R	23.0	R	29.3	MR
402	**CNH 20-31**	***G. hirsutum***	**2020**	**20.0**	**R**	**7.0**	**R**	**19.8**	**R**	**25.0**	**R**
409	RAHC 1032	*G. hirsutum*	2020	18.0	R	10.8	R	25.0	R	30.5	MR
412	RB 1918	*G. hirsutum*	2020	19.5	R	12.5	R	24.5	R	32.0	MR
2502	ZC (Suraj)	*G. hirsutum*	2020	22.3	R	11.5	R	26.5	MR	33.5	MR
2507	RAH 1046	*G. hirsutum*	2020	17.0	R	8.0	R	23.0	R	29.0	MR
2511	**DHCC 1801**	***G. hirsutum***	**2020**	**18.3**	**R**	**9.8**	**R**	**21.5**	**R**	**25.0**	**R**
2516	CNH 17395	*G. hirsutum*	2020	17.8	R	9.3	R	21.5	R	26.0	MR
2518	**DHCC 1902**	***G. hirsutum***	**2020**	**17.8**	**R**	**6.5**	**R**	**21.8**	**R**	**25.0**	**R**
2534	RAH 1075	*G. hirsutum*	2020	17.5	R	11.3	R	24.3	R	29.8	MR
2553	RHC-HD 1312	*G. hirsutum*	2020	27.8	MR	16.3	R	23.8	R	28.5	MR
2556	RHC-HD 1438	*G. hirsutum*	2020	30.0	MR	11.8	R	24.3	R	31.0	MR
1212	DHCC 2151	*G. hirsutum*	2021	-	-	7.8	R	25.0	R	-	-
1213	DHCC 2001	*G. hirsutum*	2021	-	-	16.5	R	20.8	R	-	-
1233	RAH 1083	*G. hirsutum*	2021	-	-	11.3	R	20.3	R	-	-
1235	ZC (Suraj)	*G. hirsutum*	2021	-	-	9.8	R	25.0	R	-	-
1240	CPD 1902	*G. hirsutum*	2021	-	-	13.5	R	22.5	R	-	-
1242	RHC 1409	*G. hirsutum*	2021	-	-	9.8	R	24.8	R	-	-
C	L 1060	*G. hirsutum*	2020	33.0	MR	44.3	MR	39.0	MR	48.8	MR
C	Jaadoo BG II	*G. hirsutum*	2020	21.5	R	39.5	MR	31.5	MR	42.5	MR
C	RCH 2 BG II	*G. hirsutum*	2020	16.0	R	33.8	MR	30.0	MR	43.5	MR

Table 53b: Confirmation and maintenance of disease-resistant lines against Grey Mildew at Guntur (Lam)

Entry Code	Entry Name	Species	Year of start	Grey Mildew PDI and Disease reaction					
				First Year (2020)		Second Year (2021)		Third Year (2022)	
				Field trial		Field trial		Field trial	
				PDI	DR	PDI	DR	PDI	DR
1212 c/c	DHCC 2151	*G. hirsutum*	2021	-	-	-	-	6.3	R
1213 c/c	DHCC 2001	*G. hirsutum*	2021	-	-	-	-	6.0	R
1233	RAH 1083	*G. hirsutum*	2021	-	-	-	-	3.3	R
1238	ZC (Suraj)	*G. hirsutum*	2021	-	-	-	-	5.8	R
1240	CPD 1902	*G. hirsutum*	2021	-	-	-	-	6.8	R
1242	RHC 1409	*G. hirsutum*	2021	-	-	-	-	3.3	R
C	L 1060	*G. hirsutum*	2021	-	-	-	-	7.5	R
C	Jaadoo BG II	*G. hirsutum*	2021	-	-	35.5	MR	19.0	R
C	RCH 2 BG II	*G. hirsutum*	2021	-	-	-	-	7.0	R

Table 53c: Confirmation and maintenance of disease-resistant lines against Cotton rust at Guntur (Lam)

Entry Code	Entry Name	Species	Year of start	Cotton rust PDI and Disease reaction							
				First Year (2020)		Second Year (2021)		Third Year (2022)			
				Field trial		Field trial		Field trial		Artificial Inoculation	
				PDI	DR	PDI	DR	PDI	DR	PDI	DR
304	TSH 354	*G. hirsutum*	2020	21.5	R	29.0	MR	32.0	MR	35.0	MR
306	ZC (Suraj)	*G. hirsutum*	2020	16.5	R	12.5	R	18.5	R	24.0	R
319	RAH 1083	*G. hirsutum*	2020	20.8	R	11.3	R	19.0	R	25.0	R
394	CNH 19480	*G. hirsutum*	2020	14.0	R	10.8	R	17.0	R	23.0	R
402	CNH 20-31	*G. hirsutum*	2020	11.0	R	10.5	R	14.5	R	17.5	R
409	RAHC 1032	*G. hirsutum*	2020	22.0	R	19.0	R	27.3	MR	31.8	MR
412	RB 1918	*G. hirsutum*	2020	29.0	MR	26.8	MR	26.8	MR	30.5	MR
2502	ZC (Suraj)	*G. hirsutum*	2020	18.8	R	22.3	R	30.0	MR	33.0	MR
2507	RAH 1046	*G. hirsutum*	2020	23.0	R	24.8	R	23.8	R	26.3	MR
2511	DHCC 1801	*G. hirsutum*	2020	22.0	R	31.3	MR	25.8	MR	28.0	MR
2516	CNH 17395	*G. hirsutum*	2020	21.8	R	24.8	R	26.0	MR	29.8	MR
2518	DHCC 1902	*G. hirsutum*	2020	15.8	R	6.5	R	25.3	MR	30.5	MR
2534	RAH 1075	*G. hirsutum*	2020	22.8	R	20.0	R	28.3	MR	35.3	MR
2553	RHC-HD 1312	*G. hirsutum*	2020	24.0	R	23.0	R	29.8	MR	37.0	MR
2556	RHC-HD 1438	*G. hirsutum*	2020	11.8	R	21.0	R	23.8	R	29.0	MR
C	L 1060	*G. hirsutum*	2020	32.5	MR	27.0	MR	42.0	MR	49.5	MR
C	Jaadoo BG II	*G. hirsutum*	2020	34.8	MR	40.3	MR	37.8	MR	45.5	MR
C	RCH 2 BG II	*G. hirsutum*	2020	26.8	MR	42.0	MR	33.5	MR	42.8	MR

Table 54: Confirmation and maintenance of disease-resistant lines against Alternaria leaf spot at TNAU Coimbatore

S.No.	Entry Code	Entry Name	Species	Year of Start	Alternaria leaf spot (ALS) PDI and Disease reaction							
					1st Year (2020)		2nd Year (2021)		3rd Year (2022)			
					Field trial		Field trial		Field trial		Artificial Inoculation	
					PDI	DR	PDI	DR	PDI	DR	PDI	DR
Br06a IET												
1.	285	GTHV18/17	*G.hirsutum*	2020	9.1	R	10.7	R	15.3	R	45.0	MR
2.	287	CCH 15-1	*G.hirsutum*	2020	8.5	R	12.3	R	17.1	R	42.0	MR
3.	288	GJHV 584	*G.hirsutum*	2020	**8.7**	**R**	**13.5**	**R**	**18.5**	**R**	**21.3**	**R**
4.	289	RAHC 1902	*G.hirsutum*	2020	8.1	R	14.3	R	12.7	R	47.0	MR
5.	291	TCH1875	*G.hirsutum*	2020	**8.0**	**R**	**8.7**	**R**	**19.6**	**R**	**20.3**	**R**
Br13a PVT												
6.	9574	CCB 28	*G.barbedense*	2020	11.8	R	23.7	R	26.0	MR	62.0	MS
7.	**9575**	**CCB 29**	***G.barbedense***	**2020**	**8.7**	**R**	**15.3**	**R**	**12.5**	**R**	29.5	MR
8.	Check	RCHIIBGII	*G.hirsutum*	2020	12.1	R	30.5	MR	47.3	MR	77.3	S

Table 55: Confirmation and maintenance of disease-resistant lines against Alternaria leaf spot at TNAU Coimbatore

S.No.	Entry Code	Entry Name	Species	Year of Start	Alternaria leaf spot (ALS) PDI and Disease reaction					
					1st Year (2021)		2nd Year (2022)			
					Field trial		Field trial		Artificial Inoculation	
					PDI	DR	PDI	DR		
Br02a (NT) IET										
1.	302	RB602	*Gossypium hirsutum*	2021	15.3	R	12.3	R	32.7	MR
2.	307	TCH1941	*Gossypium hirsutum*	2021	20.5	R	9.3	R	17.3	R
3.	308	CPD2002	*Gossypium hirsutum*	2021	9.3	R	8.5	R	20.5	R
4.	313	ADB727	*Gossypium hirsutum*	2021	8.5	R	7.3	R	23.9	R
5.	314	TSH387	*Gossypium hirsutum*	2021	7.3	R	10.0	R	24.3	R
6.	315	GISV 332	*Gossypium hirsutum*	2021	25.5	MR	27.7	MR	47.5	MR
7.	319	RAH1083	*Gossypium hirsutum*	2021	17.7	R	18.3	R	48.3	MR
8.	320	RAH 101	*Gossypium hirsutum*	2021	17.7	R	15.7	R	62.7	MS
Br06a (NT) IET-Compact										
9.	402	CNH 20-31	*Gossypium hirsutum*	2021	33.3	MR	40.5	MR	62.3	MS
10.	408	RB1901	*Gossypium hirsutum*	2021	26.3	MR	7.5	R	29.5	MR
11.	409	RAHC 1032	*Gossypium hirsutum*	2021	15.5	R	9.5	R	`21.3	R
12.	Check	RCHIIBGII	*Gossypium hirsutum*	2021	30.5	MR	45.5	MR	78.4	S

Table 56: Confirmation and maintenance of disease-resistant lines against Alternaria leaf spot at TNAU Coimbatore

S.No.	Entry Code	Entry Name	Species	Year of start	Alternaria leaf spot (ALS) PDI and Disease reaction			
					Field Trial		Artificial Inoculation	
					PDI	DR	PDI	DR
Br14a (ZT)								
1	1254	DB 1901	*Gossypium barbadense*	2022	9.5	R	23.5	R
2	1259	CCB 6	*Gossypium barbadense*	2022	8.3	R	19.3	R
3	Check	RCHIIBGII	*Gossypium hirsutum*	2022	43.5	MR	79.4	S

Path 2 (c): Monitoring of resistance against CLCuD in cotton

Table 57: Monitoring of resistance against CLCuD in North Zone

Name of variety/ hybrid	Sriganganagar			Hisar			Bathinda		
	CLCuD		WF adult per 3 leaves	CLCuD		WF adult per 3 leaves	CLCuD		WF adult per 3 leaves
	PDI	DR		PDI	DR		PDI	DR	
Susceptible variety									
HS-6	58.3 (49.7)	HS	53.8 (7.4)	60.0	HS	19.8	78.3	HS	12.1
F-846	54.4 (47.5)	HS	49.5 (7.1)	63.3	HS	24.5	86.1	HS	12.2
RST-9	60.8 (51.2)	HS	58.1 (7.7)	56.6	HS	25.5	82.7	HS	11.3
Moderately tolerant varieties									
H 1098 (i)	43.6 (41.3)	S	47.4 (6.9)	51.7	HS	19.9	80.6	HS	11.9
F 2228	34.7 (36.1)	MS	45.5 (6.8)	46.7	S	18.2	71.1	HS	11.5
CSH 3075	43.0 (41.0)	S	44.9 (6.7)	50.0	HS	15.4	71.9	HS	10.9
Moderately susceptible BG II hybrid									
NSPL-531	53.6 (47.1)	HS	45.2 (6.8)	48.3	S	23.8	85.7	HS	11.6
Moderately tolerant BGII hybrid									
RCH 773	40.8 (39.7)	S	49.7 (7.1)	41.7	S	17.8	69.3	HS	10.6

Path 3: Management of Diseases of cotton

Path 3 (f): Management of sooty mold (Capnodium spp.) in cotton
Path 58: Treatment details of management of sooty mold (Capnodium spp.) in cotton

S.No.	Treatments
T_1	Copper oxychloride (COC) 50 WP @ 1.25 g/litre of water
T_2	Copper oxychloride (COC) 50 WP @ 2.5 g/litre of water
T_3	Propiconazole 25 EC @ 1 ml / liter of water
T_4	Mancozeb 50 WP @2.0 g /liter of water
T_5	Neem oil 1500 ppm@ 5 ml/liter of water
T_6	Flonicamid
T_7	Control

North Zone

Table 59: Management of sooty mold (*Capnodium* spp.) in cotton (Field Experiment (Spray thrice) Faridkot

S.No.	Treatments	PDI (BS)	PDI (7 DAS)	PDI (15 DAS)	Reduction (15 Days after 3rd Spray)
T_1	Copper oxy chloride (COC) 50 WP @ 1.25 g/litre of water	37.5 (37.8)	26.7 (31.1)	22.5 (28.3)	29.6
T_2	Copper oxy chloride (COC) 50 WP @ 2.5 g/litre of water	32.5 (34.8)	18.3 (25.4)	12.5 (20.7)	48.5
T_3	Propiconazole 25 EC @ 1 ml / liter of water	21.7 (27.7)	15.8 (23.5)	**10.0 (18.4)**	**54.2**
T_4	Mancozeb 50 WP @2.0 g /liter of water	35.0 (36.3)	20.0 (26.6)	13.3 (21.4)	46.7
T_5	Neem oil 1500 ppm@ 5 ml/liter of water	25.0 (30.0)	17.5 (24.7)	**10.8 (19.2)**	**52.2**
T_6	Flonicamid @200g/ha	23.3 (28.9)	16.7 (24.1)	**9.2 (17.6)**	**56.2**
T_7	Control	39.2 (38.7)	40.8 (39.7)	41.7 (40.2)	0.0
	CD 0.05%	2.5	4.7	3.0	

Table 60: Effect of different treatments on the sooty mold in Cotton (*Bt* Hybrid US 51) Hisar

S.No.	Treatments	Sooty mold PDI (%)				Whitefly population / 3 leaves				SCY (Q/ha)
		Before I spray	15 DAS II spray	15 DAS III spray	Reduction over control	Before I spray	15 DAS II spray	15 DAS III spray	Reduction over control	
T1	Copper oxy chloride (COC) 50 WP @ 1.25 g/litre of water	19.4	18.0	21.2	39.9	21.0	12.7	10.6	46.9	11.3
T2	Copper oxy chloride (COC) 50 WP @ 2.5 g/litre of water	17.2	10.2	9.2	73.9	25.7	14.2	12.2	39.2	11.1
T3	Propiconazole 25 EC @ 1 ml / liter of water	12.2	9.5	**7.3**	**79.4**	24.6	15.2	15.6	22.0	12.5
T4	Mancozeb 50 WP @2.0 g /liter of water	19.0	20.8	23.8	32.4	29.9	17.0	16.7	16.7	11.0
T5	Neem oil 1500 ppm@ 5 ml/liter of water	16.7	17.3	15.7	55.4	19.4	11.6	8.1	59.5	10.0
T6	Flonicamid @200g/ha	13.0	11.3	**8.3**	**76.6**	15.5	9.3	6.1	69.4	10.2
T7	Control	24.1	27.3	35.3		34.6	19.1	20.0		13.1

South Zone

Table 61: Management of sooty mold (*Capnodium* spp.) in cotton: Aphid infestation (Field Experiment- Spray thrice) Coimbatore

Treatment No.	Treatment details	Sooty mould (%)	Reduction over control (%)	SCY (Q/ha)
T_1	Copper oxychloride (COC) 50 WP @ 1.25 g/litre of water	4.6 (12.6)	52.5	15.4
T_2	Copper oxychloride (COC) 50 WP @ 2.25 g/litre of water	**2.7 (11.0)**	**72.2**	17.7
T_3	Propiconazole 25EC @ 1ml / litre of water	**3.6 (11.7)**	**62.8**	16.3
T_4	Mancozeb 50 WP @ 2.0g / litre of water	5.8 (14.4)	40.2	15.5
T_5	Neem oil 1500 ppm @ 5ml/ litre of water	5.0 (14.3)	48.4	15.3
T_6	Flonicamid @ 0.6g/ litre of water	5.4 (14.8)	44.3	14.3
T_7	Control	9.7 (20.7)	-	12.3
	CD (P= 0.05)	1.8		1.7
	S.E(m)	7.4		0.9
	CV%	1.1		7.4

Path 3 (h): Evaluation of efficacy of bioagents against cotton diseases

Table 62: List of treatments for Evaluation of efficacy of bioagents against cotton diseases

Treatment	Details
T_1	ST+ SA of *Bacillus aryabhattai* ST: 10^8cfu/g @10g per kg of seed at the time of sowing SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost
T_2	ST+ SA of *Bacillus tequeilencis* SA: 10^8cfu/g @10g per kg of seed at the time of sowing SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost
T_3	T_1+T_2 ST: 10^8cfu/g @10g per kg of seed at the time of sowing SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost
T_4	ST+ SA of Commercial product *Bacillus subtilis* SA: 10^8cfu/g @10g per kg of seed at the time of sowing; Soil application: 2.5 kg/ha (30 & 60 DAS) with FYM/compost
T_5	ST+ SA of *Pf CICR* ; SA: 10^8cfu/g @10g per kg of seed at the time of sowing; SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost
T_6	Chemical ST (Carboxin 37.5+ Thiram37.5%WS @ 0.2%); 2 gm/kg seed at the time of sowing
T_7	Foliar application of Pyraclostrobin @ 0.1%; gm/lit of water
T_8	Control

Table 63: Evaluation of efficacy of bioagents against cotton diseases and seed cotton yield at Akola and Surat

Treatment	Alternaria Leaf spot PDI (%)	Bacterial Leaf Blight PDI (%)		Grey mildew PDI (%)	SCY (Q/ha)	
	Akola	Surat	Akola	Akola	Akola	Surat (RCH2BG II)
T_1	**5.4 (13.3)**	38.0 (38.0)	6.4 (14.6)	6.7 (14.9)	12.5	18.3
T_2	7.2 (15.6)	**36.7 (37.2)**	6.3 (14.5)	6.5 (14.7)	12.3	20.0
T_3	**5.6 (13.7)**	**33.5 (35.2)**	5.0 (13.0)	5.8 (13.9)	**14.2**	**20.6**
T_4	6.2 (14.6)	41.0 (39.8)	5.7 (13.7)	6.1 (14.2)	12.5	18.9
T_5	5.8 (13.9)	**23.2 (28.7)**	**4.7 (12.4)**	**5.5 (13.6)**	12.7	**24.4**
T_6	**4.5 (12.2)**	43.7 (41.3)	**3.8 (11.2)**	**4.9 (12.7)**	**13.5**	17.4
T_7	**3.0 (10.0)**	45.2 (42.2)	**2.9 (9.7)**	**3.8 (11.2)**	**12.8**	**21.7**
T_8	10.1 (18.5)	52.7 (46.5)	9.4 (17.9)	10.9 (19.3)	10.3	16.1
S.E(m)±	0.6	2.1	0.7	0.6	0.2	159.1
C.D at 5%	1.8	6.1	2.2	1.9	0.5	4.768
CV %	7.4	9.3	9.6	7.5	2.2	1.38

Path 3 (i): Integrated Management of CLCuD through its vector management (2022-23)

Table 64: Treatments detail for the Integrated Management of CLCuD through its vector management (2022-23)

	IPM/Biomodule	I spray based on ETL	II spray based on ETL	III spray based on ETL	IV spray based on ETL	Fifth spray based on ETL
T1	IPM existing module	Neem 300 ppm @2.5L/ha	Neem 300 ppm @2.5L/ha	Diafenthiuron 50%WP @ 150g/ha /Flonicamid50WG@120g/ha	Spiromesifen22.9EC@ 500ml/ha	Repeat the fourth spray treatment of the respective module if required
T2	IPM module-1	Neem 300 ppm @2.5L/ha	Neem 300 ppm @2.5L/ha	Diafenthiuron 50%WP @ 150g/ha /Flonicamid50WG@120g/ha	CICRRS-Ij102@10^8 c.f.u./ml	
T3	IPM module-2	Neem 300 ppm @2.5L/ha	Neem 300 ppm @2.5L/ha	Diafenthiuron 50%WP @ 150g/ha /Flonicamid50WG@120g/ha	CICRRS-Bb4511 @10^8 c.f.u./ml	
T4	IPM module- 3	Neem 300 ppm @2.5L/ha	Neem 300 ppm @2.5L/ha	Diafenthiuron 50%WP @ 150g/ha /Flonicamid50WG@120g/ha	CICRRS Ma1299 @10^8 c.f.u./ml	
T5	Biomodule-1	Neem 300 ppm @2.5L/ha	Neem 300 ppm @2.5L/ha	CICRRS-Ij102 @10^8 c.f.u./ml	CICRRS-Ij102 @10^8 c.f.u./ml	
T6	Biomodule-2	Neem 300 ppm @2.5L/ha	Neem 300 ppm @2.5L/ha	CICRRS-Bb4511 @10^8 c.f.u./ml	CICRRS-Bb4511 @10^8 c.f.u./ml	
T7	Biomodule-3	Neem 300 ppm @2.5L/ha	Neem 300 ppm @2.5L/ha	CICRRS Ma1299 @10^8 c.f.u./ml	CICRRS Ma1299 @10^8 c.f.u./ml	
T8	Exixting Biomodule-4	Neem 300 ppm @2.5L/ha	Neem 300 ppm @2.5L/ha	*L. lacanii commercial formulation*	*L. lacanii commercial formulation*	
T9	Control	No spray	No spray	No spray	No spray	

Table 65a: Integrated Management of CLCuD through its vector management (Sirsa)

Treatments	IPM/Biomodule	Corrected Nymphal mortality (%)							
		1st spray		2nd spray		3rd spray		4th spray	
		5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS
T1	IPM existing module	31.9 (34.3)	33.6 (35.3)	20.1 (26.6)	25.4 (30.2)	57.6 (49.3)	**62.0 (51.9)**	60.4 (51.0)	**71.1 (57.5)**
T2	IPM module-1	29.8 (33.0)	32.8 (34.9)	17.8 (24.8)	22.6 (28.2)	53.5 (47.0)	58.3 (49.8)	51.6 (45.9)	**64.4 (53.4)**
T3	IPM module-2	29.0 (32.4)	30.3 (33.3)	16.5 (23.9)	21.1 (27.3)	54.1 (47.3)	57.6 (49.3)	48.2 (44.0)	61.6 (51.7)
T4	IPM module- 3	24.9 (29.9)	23.2 (28.7)	15.3 (22.9)	20.2 (26.4)	56.1 (48.5)	59.0 (50.2)	52.6 (46.5)	59.4 (50.4)
T5	Biomodule-1	33.8 (35.4)	32.8 (34.9)	22.2 (27.9)	27.5 (31.5)	55.4 (48.1)	**61.1 (51.4)**	59.6 (50.5)	**69.5 (56.4)**
T6	Biomodule-2	25.8 (30.2)	29.5 (32.7)	16.2 (23.5)	18.6 (25.1)	48.0 (43.8)	58.2 (49.7)	56.8 (48.9)	**64.3 (53.3)**
T7	Biomodule-3	27.1 (31.2)	27.8 (31.5)	15.0 (22.7)	19.8 (26.3)	39.4 (38.9)	49.1 (44.5)	57.6 (49.4)	63.0 (52.5)
T8	Biomodule-4	26.4 (30.8)	24.0 (29.2)	14.0 (21.8)	20.6 (26.9)	26.8 (31.2)	33.1 (35.1)	32.7 (34.9)	41.8 (40.3)
T9	Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	C.D. at 5%	7.0	7.5	6.2	7.0	2.8	3.2	4.1	4.1
	SE(m)	2.3	2.5	2.1	2.3	0.9	1.1	1.4	1.3
	SE(d)	3.3	3.5	2.9	3.3	1.3	1.5	1.9	1.9
	C.V.	14.1	14.8	16.5	16.2	4.0	4.3	5.7	5.1

Table 65b: Integrated Management of CLCuD through its vector management (Sirsa)

Treatments	IPM/Biomodule	Corrected adult mortality (%)							
		1st spray		2nd spray		3rd spray		4th spray	
		5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS
T1	IPM existing module	38.5 (38.3)	32.5 (34.7)	23.4 (28.9)	19.3 (26.0)	52.5 (46.4)	**60.4 (51.0)**	42.6 (40.7)	33.5 (35.3)
T2	IPM module-1	37.2 (37.5)	32.1 (34.4)	21.6 (27.7)	20.9 (27.2)	52.0 (46.1)	**57.8 (49.5)**	57.4 (49.2)	**49.7 (44.8)**
T3	IPM module-2	35.2 (36.4)	35.4 (36.5)	21.2 (27.0)	14.4 (21.1)	49.0 (44.4)	**57.5 (49.3)**	52.1 (46.2)	**48.1 (43.9)**
T4	IPM module- 3	38.9 (38.5)	33.9 (35.5)	20.4 (26.8)	14.1 (22.0)	47.5 (43.5)	**58.1 (49.6)**	55.3 (48.1)	**49.8 (44.9)**
T5	Biomodule-1	38.7 (38.4)	23.2 (28.4)	25.4 (30.2)	24.4 (29.5)	39.7 (39.0)	46.7 (43.1)	58.6 (49.9)	**48.0 (43.8)**
T6	Biomodule-2	40.3 (39.4)	25.1 (30.0)	21.5 (27.5)	21.1 (27.3)	35.3 (36.4)	48.8 (44.3)	54.3 (47.4)	46.8 (43.2)
T7	Biomodule-3	38.9 (38.5)	24.0 (29.3)	22.6 (28.2)	25.8 (30.5)	41.3 (40.0)	43.6 (41.3)	56.5 (48.7)	45.1 (42.2)
T8	Biomodule-4	37.3 (37.6)	28.1 (31.7)	20.1 (26.6)	24.2 (29.4)	32.7 (34.9)	38.8 (38.5)	35.5 (36.5)	40.5 (39.5)
T9	Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	C.D. at 5%	4.7	7.9	5.6	6.9	2.3	3.6	3.4	3.2
	SE(m)	1.5	2.6	1.9	2.3	0.8	1.2	1.1	1.1
	SE(d)	2.2	3.7	2.6	3.2	1.1	1.7	1.6	1.5
	C.V.	7.9	15.7	12.9	16.7	3.7	5.0	4.7	4.9

Table 65c: Integrated Management of CLCuD through its vector management (Sirsa)

Treatments	IPM/Biomodule	Corrected thrips mortality (%)					
		1st spray		2nd spray		3rd spray	
		5DAS	7DAS	5DAS	7DAS	5DAS	7DAS
T1	IPM existing module	20.7 (26.8)	19.8 (26.3)	16.4 (23.8)	19.6 (26.1)	35.3 (36.4)	**57.8 (49.5)**
T2	IPM module-1	21.6 (27.5)	20.9 (27.1)	17.7 (24.7)	**21.4 (27.5)**	34.7 (36.1)	**55.6 (48.2)**
T3	IPM module-2	18.8 (25.5)	23.8 (28.7)	18.6 (25.2)	**23.7 (28.8)**	32.5 (34.7)	52.7 (46.5)
T4	IPM module- 3	20.5 (26.7)	26.6 (30.9)	15.1 (22.7)	**22.7 (28.4)**	34.3 (35.8)	**55.1 (47.9)**
T5	Biomodule-1	19.1 (25.3)	25.7 (29.9)	16.8 (24.2)	19.8 (26.4)	36.1 (36.9)	**54.5 (47.6)**
T6	Biomodule-2	16.4 (23.8)	21.3 (27.4)	15.4 (23.1)	18.2 (24.8)	40.9 (39.7)	**54.2 (47.4)**
T7	Biomodule-3	18.1 (25.1)	24.6 (29.7)	14.2 (21.9)	19.9 (26.3)	30.0 (33.2)	52.8 (46.6)
T8	Biomodule-4	19.4 (26.1)	25.3 (29.6)	17.9 (24.5)	20.9 (27.1)	25.7 (30.4)	32.3 (34.6)
T9	Control	0.0	0.0	0.0	0.0	0.0	0.0
	C.D. at 5%	5.5	7.4	6.4	6.3	2.6	3.2
	SE(m)	1.8	2.4	2.1	2.1	0.9	1.1
	SE(d)	2.6	3.5	3.0	3.0	1.2	1.5
	C.V.	13.8	16.6	17.4	15.2	4.7	4.5

Table 65d: Integrated Management of CLCuD through its vector management (Sirsa)

Treatments	FFS		CLCuD						Natural Enemies*	SCY (Q/ha)
	90 DAS		60 DAS		90 DAS		120 DAS		120 DAS	
	PDI	Reduction %	PDI	Reduction %	PDI	Reduction %	PDI	Reduction %		
T1	18.3 (25.3)	48.6	18.5 (25.5)	26.9	30.6 (33.5)	24.7	33.4 (35.3)	44.9	1.4 (1.5)	**21.4**
T2	18.0 (25.1)	49.5	19.9 (26.5)	21.7	29.6 (32.9)	27.2	37.2 (37.6)	**38.6**	1.8 (1.7)	19.5
T3	16.3 (23.7)	54.2	18.8 (25.6)	26.1	31.5 (34.1)	22.6	35.7 (36.6)	41.1	1.9 (1.7)	**20.2**
T4	32.0 (34.4)	10.3	20.3 (26.8)	19.9	27.4 (31.6)	32.5	36.3 (37.0)	40.0	2.6 (1.9)	**21.1**
T5	28.0 (31.9)	21.5	20.7 (27.0)	18.5	31.7 (34.3)	21.9	38.4 (38.2)	**36.7**	3.1 (2.0)	**20.2**
T6	19.7 (26.2)	44.9	19.6 (26.2)	22.7	29.5 (32.8)	27.5	37.0 (37.5)	**38.9**	2.4 (1.8)	**22.7**
T7	17.0 (24.3)	52.3	20.8 (27.0)	18.1	30.8 (33.7)	24.2	40.8 (39.7)	**32.6**	2.7 (1.9)	**20.6**
T8	30.0 (33.2)	15.9	18.7 (25.6)	26.1	33.5 (35.3)	17.6	43.6 (41.3)	**27.9**	2.0 (1.7)	18.8
T9	35.7 (36.6)	0.0	25.4 (30.1)	0.0	40.6 (39.6)	0.0	60.6 (51.1)	0.0	2.7 (1.9)	18.3
C.D. at 5%	4.0		2.3		3.3		3.2		0.2	1.8
SE(m)	1.3		0.7		1.1		1.1		0.1	0.6
SE(d)	1.9		1.1		1.5		1.5		0.1	0.8
C.V.	7.9		4.8		5.5		4.7		5.7	5.1

***Honey bees, lady bird beetle, Chrysoperla, Spiders**

Table 66a: Integrated Management of CLCuD through its vector management (Hisar)

Treatments	IPM/Biomodule	No.of Whitefly adults/ 3 leaves											
		1st Spray			2nd Spray			3rd Spray			4th Spray		
		BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS
T1	IPM existing module	30.3	18.8	24.0	40.2	24.7	32.0	30.2	17.5	21.5	36.2	22.4	26.8
T2	IPM module-1	35.6	25.0	30.0	46.5	28.8	36.8	33.7	27.4	31.4	41.1	28.1	34.1
T3	IPM module-2	38.5	24.7	30.7	48.9	30.3	38.3	34.9	26.4	33.4	43.4	29.4	35.9
T4	IPM module- 3	34.6	22.0	29.0	42.4	26.4	34.4	33.6	20.3	23.0	38.3	25.3	28.7
T5	Biomodule-1	36.2	19.3	24.0	39.8	23.5	31.5	28.0	17.0	27.3	34.1	20.3	27.4
T6	Biomodule-2	29.9	20.5	26.5	45.2	25.3	35.3	30.8	17.0	24.5	39.8	21.2	29.9
T7	Biomodule-3	28.4	19.4	23.1	38.7	24.5	35.0	32.2	19.7	23.8	35.5	23.1	30.4
T8	Biomodule-4	32.8	22.0	28.3	47.3	31.4	41.4	34.5	23.5	29.5	41.7	28.8	35.5
T9	Control	36.5	28.2	34.2	54.2	48.8	52.8	38.9	33.2	37.7	47.6	42.1	45.3

Table 66b: Integrated Management of CLCuD through its Vector Management (Hisar)

Treatments	IPM/Biomodule	Corrected adult mortality (%)							
		1st spray		2nd spray		3rd spray		4th Spray	
		5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS
T1	IPM existing module	33.3	29.8	49.5	39.4	47.4	**43.0**	46.7	**40.9**
T2	IPM module-1	21.3	22.3	41.0	30.3	17.7	16.8	33.2	24.7
T3	IPM module-2	22.5	20.2	37.9	27.5	20.6	11.5	30.2	20.8
T4	IPM module- 3	21.9	25.1	46.0	34.9	39.0	**39.0**	39.8	**36.6**
T5	Biomodule-1	31.7	29.8	51.8	40.3	48.9	27.7	51.8	**39.5**
T6	Biomodule-2	27.3	22.5	48.2	33.1	48.8	**35.0**	49.7	**33.9**
T7	Biomodule-3	31.2	32.3	49.8	33.6	40.8	**37.0**	45.0	32.8
T8	Biomodule-4	22.0	17.4	35.6	21.5	29.3	21.8	31.6	21.6
T9	Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 66c: Integrated Management of CLCuD through its Vector Management (Hisar)

Treatments	IPM/Biomodule	No.of Whitefly nymphs/ 3 leaves											
		1st Spray			2nd Spray			3rd Spray			4th Spray		
		BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS
T1	IPM existing module	15.5	11.4	13.0	75.3	60.5	73.0	48.4	31.0	40.9	58.8	44.7	56.0
T2	IPM module-1	19.0	12.6	16.0	83.5	66.5	78.0	54.6	37.8	45.4	65.1	51.2	60.7
T3	IPM module-2	19.4	12.0	15.0	85.2	69.0	80.3	58.2	36.6	45.0	70.1	53.8	61.6
T4	IPM module- 3	17.3	11.5	14.0	78.6	60.7	76.7	45.4	33.2	45.2	62.2	50.9	59.9
T5	Biomodule-1	13.8	9.2	11.0	76.4	56.1	72.0	52.6	37.2	45.1	63.5	40.6	51.2
T6	Biomodule-2	14.8	10.0	12.5	74.9	58.5	70.0	60.3	42.4	49.4	65.9	45.4	58.7
T7	Biomodule-3	15.3	11.2	13.0	80.3	61.4	77.1	56.5	38.7	46.9	67.4	50.3	61.0
T8	Biomodule-4	16.9	11.0	14.0	77.8	59.9	70.0	62.8	46.5	54.5	70.3	48.2	61.3
T9	Control	20.9	19.6	21.0	98.3	83.8	87.0	70.3	58.2	62.2	80.1	68.8	77.4

Table 66d: Integrated Management of CLCuD through its Vector Management (Hisar)

Treatments	IPM/Biomodule	Corrected Nymphal mortality (%)							
		1st spray		2nd spray		3rd spray		4th Spray	
		5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS
T1	IPM existing module	41.8	38.1	27.8	16.0	46.8	**34.3**	35.0	**27.7**
T2	IPM module-1	35.7	23.8	20.7	10.3	35.1	**27.0**	25.5	21.5
T3	IPM module-2	38.8	28.6	17.7	7.7	37.2	**27.7**	21.8	20.3
T4	IPM module- 3	41.3	33.3	27.6	11.9	43.0	**27.4**	26.0	**22.5**
T5	Biomodule-1	53.1	47.6	33.1	17.2	36.1	**27.4**	40.9	**33.8**
T6	Biomodule-2	49.0	40.5	30.2	19.5	27.1	20.6	33.9	**24.1**
T7	Biomodule-3	42.9	38.1	26.7	11.4	33.5	24.7	26.9	21.2
T8	Biomodule-4	43.9	33.3	28.5	19.5	20.1	12.4	29.9	20.8
T9	Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 66e: Integrated Management of CLCuD through its vector management (Hisar)

Treatment	IPM/Biomodule	CLCuD PDI (%)				Reduction over control (%)	Plant height (cm)	Sympods	Yield (Q/ha)
		60 DAS	75 DAS	90 DAS	115 DAS				
T_1	IPM existing module	3.9	20.0	21.0	**47.6**	4.8	182.7	37.6	21.4
T_2	IPM module-1	5.8	19.1	27.4	**47.0**	6.0	182.0	39.8	23.0
T_3	IPM module-2	5.0	18.4	23.4	**46.0**	8.0	188.0	47.8	23.5
T_4	IPM module- 3	8.3	19.5	23.3	**46.0**	8.0	183.0	36.0	21.9
T_5	Biomodule-1	6.3	18.6	20.6	**47.6**	4.8	176.3	34.2	22.9
T_6	Biomodule-2	6.6	19.2	22.2	**47.9**	4.2	182.3	36.0	20.0
T_7	Biomodule-3	7.2	21.4	29.6	48.8	2.4	180.0	34.6	20.2
T_8	Biomodule-4	11.5	19.3	28.2	48.0	4.0	190.3	40.8	21.0
T_9	Control	12.2	23.1	30.6	50.0	0	181.7	38.1	18.3

Table 67a: Integrated Management of CLCuD through its Vector Management (Sriganganagar)

Treatments	No. of Whitefly nymphs/ 3 leaves														
	1st Spray			2nd Spray			3rd Spray			4th Spray			5th Spray		
	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS
T1	11.6 (3.5)	7.3 (2.8)	9.6 (3.2)	14.6 (3.9)	17.8 (4.3)	25.9 (5.1)	43.9 (6.7)	40.1 (6.4)	45.5 (6.8)	35.5 (6.0)	23.6 (4.9)	24.9 (5.0)	21.6 (4.7)	18.2 (4.3)	17.3 (4.2)
T2	12.2 (3.6)	7.8 (2.9)	10.2 (3.3)	16.2 (4.1)	18.6 (4.4)	27.1 (5.3)	44.8 (6.7)	40.9 (6.4)	46.4 (6.8)	33.1 (5.8)	25.5 (5.1)	26.2 (5.2)	22.9 (4.8)	19.1 (4.4)	18.5 (4.4)
T3	10.9 (3.4)	7.1 (2.8)	9.3 (3.1)	14.9 (3.9)	17.6 (4.3)	25.5 (5.1)	43.1 (6.6)	39.8 (6.4)	44.2 (6.7)	34.2 (5.9)	23.2 (4.9)	24.1 (4.9)	20.8 (4.6)	17.7 (4.3)	17.1 (4.2)
T4	11.5 (3.5)	7.89 (2.9)	10.2 (3.3)	15.6 (3.9)	18.9 (4.4)	27.2 (5.3)	44.9 (6.7)	41.1 (6.4)	45.9 (6.8)	32.5 (5.7)	25.9 (5.1)	27.0 (5.2)	23.7 (4.9)	18.9 (4.4)	18.5 (4.4)
T5	12.5 (3.6)	7.7 (2.9)	10.1 (3.3)	14.8 (3.9)	18.2 (4.3)	26.2 (5.2)	44.2 (6.7)	40.8 (6.4)	45.6 (6.8)	35.6 (5.9)	24.6 (5.0)	26.2 (5.2)	22.8 (4.8)	18.9 (4.4)	17.9 (4.3)
T6	10.8 (3.4)	7.7 (2.9)	10.3 (3.3)	15.3 (3.9)	19.0 (4.4)	27.3 (5.3)	47.9 (6.9)	41.5 (6.5)	46.2 (6.8)	36.2 (6.0)	25.6 (5.1)	26.9 (5.2)	23.6 (4.9)	19.3 (4.4)	18.4 (4.3)
T7	11.8 (3.5)	7.3 (2.8)	9.6 (3.2)	16.3 (4.1)	18.1 (4.3)	25.8 (5.1)	46.8 (6.9)	40.2 (6.4)	45.4 (6.8)	35.4 (5.9)	23.3 (4.9)	25.0 (5.0)	21.7 (4.7)	18.4 (4.3)	17.3 (4.2)
T8	11.9 (3.5)	7.6 (2.8)	9.9 (3.2)	15.6 (4.0)	18.2 (4.3)	26.4 (5.2)	43.8 (6.7)	40.3 (6.4)	45.2 (6.8)	35.2 (5.9)	23.7 (4.9)	25.3 (5.1)	21.9 (4.7)	18.7 (4.4)	17.7 (4.3)
T9	11.5 (3.5)	14.3 (3.8)	17.4 (4.2)	25.8 (5.1)	35.5 (6.0)	46.9 (6.9)	70.6 (8.4)	76.9 (8.8)	78.5 (8.9)	58.5 (7.7)	46.8 (6.9)	43.9 (6.7)	37.9 (6.2)	34.2 (5.9)	29.3 (5.5)
CD at 5%	0.5	0.4	0.5	0.7	0.6	0.7	0.9	0.93	1.2	1.1	0.8	0.8	0.8	0.7	0.7
S.Em (±)	0.2	0.1	0.5	0.2	0.2	0.2	0.3	0.31	0.4	0.4	0.3	0.3	0.3	0.2	0.2
CV %	6.1	5.7	5.9	6.5	5.7	5.3	5.5	5.71	6.9	7.3	6.6	6.4	6.8	6.4	6.2

Table 67b: Integrated Management of CLCuD through its Vector Management (Sriganganagar)

Treatments	IPM/Biomodule	Reduction of nymphal population over control (%)									
		1st spray		2nd spray		3rd spray		4th spray		5th Spray	
		5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS
T1	IPM existing module	48.8 (44.3)	44.8 (41.9)	49.8 (44.8)	44.9 (42.0)	47.6 (43.6)	**42.0 (40.4)**	49.6 (44.7)	**43.1 (40.9)**	**46.6 (43.1)**	**40.7 (39.6)**
T2	IPM module-1	45.8 (42.6)	41.6 (40.1)	47.5 (43.6)	42.1 (40.5)	46.7 (43.1)	40.9 (39.7)	45.6 (42.5)	40.0 (39.2)	43.9 (41.5)	36.7 (37.2)
T3	IPM module-2	50.1 (45.1)	46.3 (42.8)	50.4 (45.2)	45.7 (42.5)	48.2 (43.9)	**43.7 (41.3)**	50.4 (45.2)	**45.1 (42.1)**	**47.7 (43.6)**	**41.8 (40.2)**
T4	IPM module- 3	44.9 (42.1)	41.1 (39.7)	46.6 (43.0)	41.3 (39.9)	46.3 (42.8)	41.5 (40.1)	44.5 (41.8)	38.2 (38.0)	44.5 (41.8)	36.5 (36.9)
T5	Biomodule-1	45.9 (42.6)	42.2 (40.4)	48.7 (44.3)	43.4 (41.1)	46.9 (42.9)	42.0 (40.3)	47.4 (43.5)	**40.6 (39.5)**	44.5 (41.8)	**39.2 (38.6)**
T6	Biomodule-2	45.8 (42.6)	40.9 (39.8)	46.4 (42.9)	41.2 (39.9)	46.2 (42.8)	41.1 (39.7)	45.2 (42.2)	38.8 (38.5)	43.2 (41.1)	36.9 (37.3)
T7	Biomodule-3	48.6 (44.2)	44.5 (41.8)	49.3 (44.6)	44.7 (41.9)	47.4 (43.5)	**42.2 (40.4)**	50.4 (45.2)	**43.2 (41.1)**	**46.3 (42.8)**	**41.1 (39.8)**
T8	Biomodule-4	46.9 (43.2)	42.8 (40.9)	48.8 (44.3)	43.1 (40.9)	47.9 (43.8)	42.5 (40.6)	49.3 (44.6)	42.5 (40.6)	44.9 (42.0)	39.5 (38.9)
T9	Control	0	0	0	0	0	0	0	0	0	0
CD at 5%		9.4	10.4	8.9	8.6	8.8	6.8	10.2	6.6	8.4	5.8
S.Em (±)		3.1	3.5	2.9	2.9	2.9	2.3	3.4	2.1	2.4	1.9
CV %		9.9	11.7	9.3	9.6	9.4	9.0	10.8	8.9	8.2	8.8

Table 67c: Integrated Management of CLCuD through its Vector Management (Sriganganagar)

Treatments	No.of Whitefly adults/ 3 leaves														
	1st Spray			2nd Spray			3rd Spray			4th Spray			5th Spray		
	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS
T1	19.3 (4.4)	10.9 (3.4)	13.2 (3.7)	21.9 (4.7)	16.8 (4.2)	24.9 (5.0)	41.6 (6.5)	40.8 (6.4)	46.5 (6.9)	42.9 (6.6)	24.3 (4.9)	25.9 (5.1)	23.6 (4.9)	17.6 (4.3)	16.7 (4.1)
T2	15.6 (4.0)	11.3 (3.4)	13.4 (3.7)	21.9 (4.7)	17.6 (4.3)	26.2 (5.2)	42.8 (6.6)	41.5 (6.5)	47.1 (6.9)	43.7 (6.7)	26.1 (5.2)	27.2 (5.3)	25.6 (5.1)	18.7 (4.4)	17.8 (4.3)
T3	16.1 (4.1)	10.9 (3.4)	13.3 (3.7)	22.1 (4.8)	16.6 (4.1)	24.5 (4.9)	41.1 (6.5)	40.5 (6.4)	45.2 (6.8)	41.9 (6.5)	23.6 (4.9)	25.1 (5.1)	23.8 (4.9)	17.1 (4.2)	16.4 (4.1)
T4	17.6 (4.3)	11.6 (3.5)	13.8 (3.7)	20.9 (4.6)	17.9 (4.3)	26.3 (5.2)	42.9 (6.6)	41.8 (6.5)	46.9 (6.9)	43.5 (6.6)	26.7 (5.2)	28.0 (5.3)	26.7 (5.2)	19.3 (4.5)	18.2 (4.3)
T5	18.2 (4.3)	11.0 (3.4)	13.3 (3.7)	22.2 (4.8)	17.2 (4.2)	25.6 (5.1)	42.2 (6.5)	41.5 (6.5)	46.6 (6.8)	39.9 (6.4)	25.3 (5.1)	27.2 (5.3)	25.5 (5.1)	18.3 (4.3)	17.3 (4.2)
T6	14.8 (3.9)	11.3 (3.4)	13.4 (3.7)	21.8 (4.7)	17.7 (4.3)	25.9 (5.1)	45.9 (6.8)	42.1 (6.5)	47.2 (6.9)	43.9 (6.6)	26.3 (5.2)	27.9 (5.3)	26.3 (5.2)	18.9 (4.4)	18.1 (4.3)
T7	15.3 (3.9)	10.7 (3.3)	12.9 (3.7)	21.6 (4.7)	17.1 (4.2)	24.8 (5.0)	44.8 (6.7)	40.9 (6.4)	46.4 (6.8)	43.1 (6.6)	23.9 (4.9)	26.0 (5.1)	24.7 (5.0)	17.4 (4.2)	16.6 (4.1)
T8	16.2 (4.1)	11.1 (3.4)	13.1 (3.7)	23.1 (4.9)	17.2 (4.2)	25.1 (5.1)	41.8 (6.5)	40.9 (6.4)	46.2 (6.8)	39.5 (6.3)	24.4 (4.9)	26.3 (5.2)	24.6 (5.0)	18.0 (4.3)	17.4 (4.2)
T9	18.5 (4.4)	22.5 (4.8)	25.7 (5.1)	32.4 (5.7)	37.2 (6.1)	51.6 (7.2)	68.3 (8.3)	76.9 (8.8)	80.5 (9.0)	60.5 (7.8)	58.1 (7.7)	54.6 (7.4)	51.9 (7.2)	40.2 (6.4)	34.3 (5.9)
CD at 5%	0.8	0.5	0.6	0.7	0.6	0.7	0.9	0.9	1.1	0.9	0.8	0.9	0.8	0.8	0.7
S.Em (±)	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.2
CV %	7.4	5.3	5.8	5.5	5.6	5.4	5.7	5.3	6.3	5.3	6.2	6.6	6.2	7.1	6.4

Table 67d: Integrated Management of CLCuD through its Vector Management (Sriganganagar)

Treatments	IPM/Biomodule	Reduction of adult population over control (%)									
		1st spray		2nd spray		3rd spray		4th spray		5th Spray	
		5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS
T1	IPM existing module	51.9 (46.1)	48.7 (44.2)	54.6 (47.7)	51.9 (46.0)	46.7 (43.1)	**42.2 (40.5)**	58.2 (49.7)	**52.4 (46.4)**	56.2 (48.5)	**51.3 (45.7)**
T2	IPM module-1	49.7 (44.8)	47.8 (43.7)	52.5 (46.4)	49.2 (44.5)	45.8 (42.6)	41.5 (40.1)	55.0 (47.9)	49.9 (44.9)	52.9 (46.7)	47.8 (43.7)
T3	IPM module-2	51.3 (45.7)	48.3 (44.0)	55.3 (48.0)	52.6 (46.4)	47.3 (43.4)	**43.9 (41.5)**	59.5 (50.5)	**54.1 (47.3)**	57.3 (49.3)	**52.2 (46.2)**
T4	IPM module- 3	48.3 (44.0)	46.3 (42.8)	51.7 (45.9)	48.5 (44.1)	45.5 (42.4)	41.8 (40.2)	54.2 (47.4)	48.5 (44.1)	51.9 (46.1)	46.9 (43.2)
T5	Biomodule-1	50.8 (45.4)	48.3 (43.9)	53.6 (47.1)	49.9 (44.9)	45.7 (42.5)	**42.0 (40.3)**	56.6 (48.8)	**50.3 (45.2)**	54.2 (47.4)	**49.8 (44.8)**
T6	Biomodule-2	49.4 (44.6)	47.7 (43.7)	52.5 (46.4)	49.2 (44.9)	45.4 (42.3)	**41.3 (39.9)**	54.8 (47.8)	**48.8 (44.3)**	52.9 (46.6)	**47.1 (43.3)**
T7	Biomodule-3	51.9 (46.1)	49.5 (44.7)	54.2 (47.4)	51.6 (45.9)	46.6 (42.9)	**42.5 (40.6)**	58.8 (50.1)	**52.5 (46.4)**	56.5 (48.8)	**51.6 (45.9)**
T8	Biomodule-4	50.6 (45.3)	48.9 (44.3)	53.6 (47.0)	50.9 (45.5)	46.9 (43.3)	**42.5 (40.7)**	57.9 (49.6)	**51.9 (46.1)**	55.1 (47.9)	49.4 (44.6)
T9	Control	0	0	0	0	0	0	0	0	0	0
CD at 5%		7.7	9.1	7.9	7.5	8.4	8.6	8.1	9.5	9.6	8.5
S.Em (±)		2.6	3.1	2.6	2.5	2.8	2.8	2.7	3.2	3.2	2.8
CV %		7.8	9.6	7.7	7.6	9.0	9.4	7.6	9.6	9.3	9.1

Table 67e: Integrated Management of CLCuD through its Vector Management (Sriganganagar)

Treatments	PDI (CLCuD)				Reduction over control (%)	Branches		Plant Height (cm)	No.of open bolls/plant	SCY (Q/ha)
	60 DAS	75 DAS	90 DAS	115 DAS		Monopods	Sympods			
T1	24.3 (29.6)	27.9 (31.9)	34.2 (35.8)	**41.3 (40.0)**	5.3	3.4	12.2	151.6	48.8	**18.7**
T2	25.5 (30.3)	27.2 (31.4)	34.6 (36.0)	**41.7 (40.2)**	4.4	3.4	13.4	158.8	50.0	17.7
T3	26.6 (31.0)	28.8 (32.4)	35.3 (36.4)	42.1 (40.4)	3.4	3.1	12.8	156.6	47.0	17.6
T4	26.2 (30.8)	28.9 (32.5)	35.7 (36.7)	43.7 (41.4)	0.2	3.4	14.2	154.8	46.0	**18.0**
T5	22.9 (28.6)	24.7 (29.8)	32.1 (33.7)	**40.8 (39.7)**	6.4	3.2	14.4	160.8	46.8	**18.9**
T6	25.9 (30.6)	29.0 (32.6)	35.8 (36.8)	42.2 (40.5)	3.2	3.2	12.7	159.6	43.4	17.9
T7	26.6 (31.0)	29.7 (33.0)	35.5 (36.6)	43.4 (41.2)	0.5	3.4	13.6	158.0	48.0	17.7
T8	25.6 (30.4)	27.3 (31.5)	33.6 (35.4)	**41.9 (40.4)**	3.9	3.5	14.0	157.4	47.4	**18.4**
T9	24.2 (29.4)	27.4 (31.6)	35.5 (36.6)	43.6 (41.3)	0.0	3.2	12.4	154.4	45.6	16.6
CD(0.05)	3.1	2.2	3.0	2.9						3.2
CV	**8.2**	**4.8**	**6.5**	**6.4**						**10.4**

Table 68a: Integrated Management of CLCuD through its Vector Management (Bathinda)

Treatments	No. of Whitefly adults/ 3 leaves											
	1st Spray			2nd Spray			3rd Spray			4th Spray		
	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS
T1	16.0	8.7	6.7	12.3	4.7	3.7	12.0	9.0	6.3	14.2	9.8	5.0
T2	15.3	8.0	5.7	14.0	6.0	4.0	10.0	7.7	6.0	12.0	8.2	4.6
T3	14.0	7.3	6.0	14.0	5.7	3.0	6.3	4.0	2.7	8.0	3.8	1.2
T4	15.3	7.3	4.7	13.3	7.0	4.7	12.0	7.0	4.3	14.2	7.4	2.8
T5	15.3	8.3	7.0	11.3	4.0	3.0	10.0	7.7	5.0	12.0	8.2	3.5
T6	16.3	8.7	6.3	12.0	4.0	2.7	11.3	7.7	6.0	13.5	8.2	4.6
T7	15.7	9.0	7.0	13.0	5.0	4.0	6.3	4.0	2.0	8.0	3.8	0.5
T8	15.3	9.7	8.0	14.0	6.0	3.7	9.3	6.0	3.3	11.3	6.2	1.7
T9	16.0	11.7	11.7	15.7	9.0	9.0	10.3	10.0	9.3	12.4	11.0	8.3

Table 68b: Integrated Management of CLCuD through its Vector Management (Bathinda)

Treatments	IPM/Biomodule	Corrected Adult mortality (%)							
		1st spray		2nd spray		3rd spray		4th spray	
		5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS
T1	IPM existing module	25.7	42.9	34.1	48.2	22.5	41.6	22.4	47.7
T2	IPM module-1	28.4	49.3	25.4	50.3	20.8	33.6	23.2	42.7
T3	IPM module-2	28.2	41.2	29.5	62.7	34.7	**53.4**	46.4	**76.8**
T4	IPM module- 3	34.4	58.3	8.6	39.1	39.7	**60.0**	41.4	**70.9**
T5	Biomodule-1	25.5	37.4	38.6	53.9	20.8	44.6	23.2	**56.4**
T6	Biomodule-2	27.2	46.8	42.0	61.3	30.1	41.4	31.5	48.9
T7	Biomodule-3	21.2	38.7	33.0	46.4	34.7	**65.0**	46.4	**90.6**
T8	Biomodule-4	13.5	28.4	25.4	54.4	33.6	**60.5**	38.1	**77.9**
T9	Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 68c: Integrated Management of CLCuD through its Vector Management (Bathinda)

Treatments	No.of Whitefly nymphs/ 3 leaves											
	1st Spray			2nd Spray			3rd Spray			4th Spray		
	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS
T1	4.3	3.0	1.7	3.0	1.7	1.3	3.0	1.7	1.3	5.3	3.1	2.7
T2	3.3	2.0	1.3	4.3	2.7	2.0	4.7	3.0	2.3	7.1	5.1	4.3
T3	3.7	3.0	2.3	4.0	2.7	2.0	3.0	2.3	1.3	5.3	4.6	3.0
T4	4.7	3.3	2.7	3.3	1.7	2.0	4.3	2.0	1.3	6.8	4.2	3.7
T5	4.3	3.3	2.7	3.3	2.0	1.7	4.3	3.3	2.7	6.8	5.7	5.0
T6	3.7	2.7	2.0	4.3	3.7	2.3	3.0	2.3	2.3	5.3	4.6	3.7
T7	4.0	2.3	1.7	3.7	2.3	2.0	4.7	2.0	1.3	7.1	4.0	3.3
T8	2.7	2.3	2.0	4.0	3.7	3.0	3.0	2.0	2.3	5.3	4.2	3.0
T9	6.0	6.0	4.3	6.0	5.3	5.3	6.0	6.0	5.0	8.6	10.2	11.7

Table 68d: Integrated Management of CLCuD through its Vector Management (Bathinda)

Treatments	IPM/Biomodule	Corrected Nymphal mortality (%)							
		1st spray		2nd spray		3rd spray		4th spray	
		5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS
T1	IPM existing module	30.8	46.7	37.5	50.0	44.4	46.7	51.4	**62.9**
T2	IPM module-1	40.0	44.6	30.8	48.1	35.7	40.0	39.9	55.2
T3	IPM module-2	18.2	11.9	25.0	43.8	22.2	46.7	37.6	**58.3**
T4	IPM module- 3	28.6	20.9	43.8	32.5	53.8	63.1	47.8	**60.1**
T5	Biomodule-1	23.1	14.8	32.5	43.8	23.1	26.2	39.6	45.5
T6	Biomodule-2	27.3	24.5	34.8	39.4	22.2	26.7	37.6	49.0
T7	Biomodule-3	41.7	42.3	28.4	38.6	57.1	65.7	52.5	**65.6**
T8	Biomodule-4	12.5	13.8	23.1	15.6	33.3	6.7	33.4	58.3
T9	Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 68e: Integrated Management of CLCuD through its Vector Management (Bathinda)

Treatments	PDI (CLCuD)				Reduction over control (%)	Branches		Plant Height (cm)	No. of open bolls/plant	SCY (Q/ha)
	60 DAS	75 DAS	90 DAS	115 DAS		Monopods	Sympods			
T1	26.7 (31.1)	47.2 (43.4)	56.7 (48.8)	66.7 (54.7)	**9.8**	1.8	24.6	137.7	44.4	8.5
T2	27.8 (31.8)	49.4 (44.7)	57.2 (49.1)	67.2 (55.1)	**9.0**	1.7	23.2	132.8	41.3	7.8
T3	28.9 (32.5)	51.7 (45.9)	59.4 (50.4)	69.4 (56.4)	6.0	1.1	18.7	127.6	39.0	7.4
T4	28.3 (32.1)	50.6 (45.3)	60.0 (50.8)	70.0 (56.8)	5.3	0.7	21.4	125.0	40.0	7.1
T5	27.8 (31.8)	56.7 (48.8)	56.1 (48.5)	66.7 (54.7)	**9.8**	1.2	21.7	127.1	37.1	6.5
T6	28.9 (32.5)	54.4 (47.6)	58.3 (49.8)	68.9 (56.1)	6.8	0.4	19.7	128.3	37.0	6.2
T7	27.8 (31.8)	50.6 (45.3)	60.0 (50.8)	70.6 (57.1)	4.5	0.7	15.1	123.7	35.5	6.3
T8	30.0 (33.2)	56.7 (48.8)	61.1 (51.4)	71.1 (57.5)	3.8	0.8	21.6	113.2	36.3	5.9
T9	31.1 (33.9)	58.9 (50.1)	62.2 (52.1)	73.9 (59.3)	0.0	0.3	14.7	109.1	31.7	4.7
CD(0.05)	NS	3.9	1.8	1.8		0.5	NS	NS	NS	1.8
CV	3.7	4.9	2.0	1.8		32.1	19.4	10.9	11.5	15.2

Table 69a: Integrated Management of CLCuD through its Vector Management (Faridkot)

Treatments	No. of Whitefly adults/ 3 leaves											
	1st Spray			2nd Spray			3rd Spray			4th Spray		
	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS
T1	38.6	27.1	26.2	31.2	22.6	22.2	17.4	7.9	8.6	14.4	9.1	8.2
T2	36.9	26.5	26.5	33.7	22.2	24.7	18.2	6.9	5.9	17.8	10.8	12.8
T3	37.2	21.6	28.8	32.1	25.6	21.5	16.6	6.5	9.5	19.3	10.6	14.8
T4	35.2	26.9	25.2	33.4	27.9	22.0	15.1	6.4	7.9	21.2	12.1	15.6
T5	30.5	20.7	25.9	31.1	23.1	23.4	17.9	11.2	11.8	15.3	9.7	9.8
T6	35.3	25.5	27.7	36.1	26.9	25.3	14.2	9.5	9.7	25.4	15.8	15.1
T7	39.3	24.1	25.4	38.5	26.8	30.6	15.5	10.8	10.0	16.0	10.1	8.3
T8	28.5	16.2	26.0	33.6	28.9	17.5	13.0	10.4	9.2	18.9	13.9	11.9
T9	36.8	40.1	43.8	31.5	33.7	33.9	13.6	17.4	13.3	14.4	12.9	14.4

Table 69b: Integrated Management of CLCuD through its Vector Management (Faridkot)

Treatments	IPM/Biomodule	Corrected Adult mortality (%)							
		1st spray		2nd spray		3rd spray		4th spray	
		5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS
T1	IPM existing module	35.5	42.9	32.1	33.6	64.5	**49.3**	29.5	**43.1**
T2	IPM module-1	33.9	39.6	38.2	31.8	70.4	**67.0**	32.7	28.6
T3	IPM module-2	46.7	35.0	25.2	37.6	69.2	**41.0**	38.8	23.5
T4	IPM module- 3	29.8	39.7	21.8	38.8	67.1	**46.2**	36.3	26.6
T5	Biomodule-1	37.6	28.7	30.5	30.0	51.2	32.5	29.7	36.6
T6	Biomodule-2	33.7	34.0	30.1	34.6	47.8	30.4	30.8	**41.0**
T7	Biomodule-3	43.6	45.7	34.9	26.1	45.4	34.1	29.5	**48.5**
T8	Biomodule-4	47.9	23.3	19.5	51.5	37.5	27.7	18.5	37.2
T9	Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 69c: Integrated Management of CLCuD through its Vector Management (Faridkot)

Treatments	No. of Whitefly nymphs/ 3 leaves											
	1st Spray			2nd Spray			3rd Spray			4th Spray		
	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS	BS	5 DAS	7 DAS
T1	41.2	31.3	32.8	42.7	40.8	43.2	22.0	18.5	17.1	12.2	5.0	4.9
T2	37.8	30.2	32.6	46.6	34.6	51.3	22.3	21.6	15.5	15.5	10.0	11.5
T3	38.9	33.2	28.2	39.1	42.3	35.4	27.8	24.5	21.5	14.3	11.2	10.2
T4	38.2	31.8	33.1	39.8	38.4	39.1	24.7	22.6	20.9	17.4	16.4	9.3
T5	37.9	31.8	29.6	38.7	36.0	40.0	26.7	20.0	28.3	13.9	9.8	10.5
T6	36.9	31.0	30.3	45.0	36.9	45.2	22.1	21.8	20.7	16.7	11.8	10.7
T7	37.7	31.7	26.9	33.7	30.1	35.1	26.2	25.2	18.4	15.8	11.4	8.9
T8	36.6	28.6	29.0	41.3	37.8	37.3	20.2	20.5	18.8	13.5	11.4	11.2
T9	40.6	45.2	44.6	34.8	48.3	38.3	19.3	21.1	22.5	14.4	14.4	14.5

Table 69d: Integrated Management of CLCuD through its Vector Management (Faridkot)

Treatments	IPM/Biomodule	Corrected Nymphal mortality (%)							
		1st spray		2nd spray		3rd spray		4th spray	
		5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS
T1	IPM existing module	31.8	27.7	31.1	18.0	22.7	**33.1**	55.7	**60.5**
T2	IPM module-1	28.3	21.7	46.5	11.1	31.4	**40.1**	30.3	36.6
T3	IPM module-2	23.5	34.2	22.0	17.7	29.2	33.3	25.9	39.4
T4	IPM module- 3	25.4	21.3	30.5	10.7	26.2	37.1	21.3	**47.1**
T5	Biomodule-1	24.8	29.2	32.8	16.0	31.3	48.8	24.5	34.9
T6	Biomodule-2	24.7	25.4	40.9	18.5	29.8	39.5	24.1	36.6
T7	Biomodule-3	24.7	35.1	35.8	15.5	22.1	39.6	22.7	**44.2**
T8	Biomodule-4	29.9	28.0	33.9	17.8	26.9	20.1	12.0	16.5
T9	Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 69e: Integrated Management of CLCuD through its Vector Management (Faridkot)

	CLCuD (PDI)				Reduction over control (%)	Yield character			
Treatment	60 Days	75 Days	90 Days	115 days		Plant height (cm)	Sympods	SCY (Q/ha)	Density (%)
T1	15.8	20.8	25.8	**38.3**	**25.9**	126	23	4.98	100
T2	16.7	23.3	28.3	**41.7**	**19.3**	121	22	4.83	100
T3	15.0	21.7	27.5	**40.8**	**21.1**	130	23	4.17	100
T4	17.5	22.5	29.2	45.0	13.0	122	19	4.39	100
T5	19.2	24.2	27.5	47.5	8.1	120	22	4.17	100
T6	18.3	25.0	30.0	47.5	8.1	127	21	3.95	100
T7	16.7	23.3	26.7	43.3	16.2	130	21	4.76	100
T8	19.2	25.8	30.8	40.8	**21.1**	129	22	3.95	100
T9	20.8	29.2	34.2	51.7	0.0	117	18	2.63	100
CD at 5%						N/A	N/A	83.7	
CV						**6.1**	**10.4**	**11.4**	

Table 70a: Integrated Management of CLCuD through its Vector Management (Reduction in whitefly adults)

T.No.	Whitefly adults% mean reduction over control (7 DAS)																					Mean Reduction at last Spray
	Bathinda				Faridkot				Sriganganagar					Hisar				Sirsa				
	Spray				Spray				Spray					Spray				Spray				
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	
T1	42.9	48.2	41.6	47.7	42.9	33.6	49.3	43.1	48.7	51.9	42.2	52.4	51.3	29.8	39.4	43.0	40.9	32.5	19.3	60.4	33.5	43.7
T2	49.3	50.3	33.6	42.7	39.6	31.8	67.0	28.6	47.8	49.2	41.5	49.9	47.8	12.3	30.3	16.8	24.7	32.1	20.9	57.8	49.7	37.1
T3	41.2	62.7	53.4	76.8	35.0	37.6	41.0	23.5	48.3	52.6	44.0	54.1	52.2	10.2	27.5	11.5	20.8	35.4	14.4	57.5	48.1	42.4
T4	58.3	39.1	60.0	70.9	39.7	38.8	46.2	26.6	46.3	48.5	41.8	48.5	46.9	15.1	34.9	39.0	36.6	33.9	14.1	58.1	49.8	**46.6**
T5	37.4	53.9	44.6	56.4	28.7	30.0	32.5	36.6	48.3	49.9	42.0	50.3	49.7	29.8	40.3	27.7	39.5	23.2	24.4	46.7	48.0	43.7
T6	46.8	61.3	41.4	48.9	34.0	34.6	30.4	41.0	47.7	49.2	41.3	48.8	47.1	22.5	33.1	35.0	33.9	25.1	21.1	48.8	46.8	43.8
T7	38.7	46.4	65.0	90.6	45.7	26.1	34.1	48.5	49.5	51.6	42.5	52.5	51.6	32.3	33.6	37.0	32.8	24.0	25.8	43.6	45.1	**54.6**
T8	28.4	54.4	60.5	77.9	23.3	51.5	27.7	37.2	48.9	50.9	42.5	51.9	49.4	17.4	21.5	21.8	21.6	28.1	24.2	38.8	40.5	**45.4**
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 70b: Integrated Management of CLCuD through its Vector Management (Reduction in whitefly nymphs)

T.No.	Nymphs % mean reduction over control (7 DAS)																					Mean Reduction at last Spray
	Bathinda				Faridkot				Sriganganagar					Hisar				Sirsa				
	Spray				Spray				Spray					Spray				Spray				
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	
T1	46.7	50.0	46.7	62.9	27.7	18.0	33.1	60.5	44.8	44.9	42.0	43.1	40.7	38.1	16.0	34.3	27.7	33.6	25.4	62.0	71.1	**52.6**
T2	44.6	48.1	40.0	55.2	21.7	11.1	40.1	36.6	41.6	42.1	40.9	40.0	36.7	23.8	10.3	27.0	21.5	32.8	22.6	58.3	64.4	42.9
T3	11.9	43.8	46.7	58.3	34.2	17.7	33.3	39.4	46.3	45.7	43.7	45.1	41.8	28.6	7.7	27.7	20.3	30.3	21.1	57.6	61.6	44.3
T4	20.9	32.5	63.1	60.1	21.3	10.7	37.1	47.1	41.1	41.3	41.5	38.2	36.5	33.3	11.9	27.4	22.5	23.2	20.2	59.0	59.4	**45.1**
T5	14.8	43.8	26.2	45.5	29.2	16.0	48.8	34.9	42.2	43.4	42.0	40.6	39.2	47.6	17.2	27.4	33.8	32.8	27.5	61.1	69.5	**44.6**
T6	24.5	39.4	6.7	49.0	25.4	18.5	39.5	36.6	41.0	41.2	41.0	38.8	36.9	40.5	19.5	20.6	24.1	29.5	18.6	58.2	64.3	42.2
T7	42.3	38.6	65.7	65.6	35.1	15.5	39.6	44.2	44.5	44.7	42.2	43.2	41.1	38.1	11.4	24.7	21.2	27.8	19.8	49.1	63.0	**47.0**
T8	3.8	15.6	6.7	58.3	28.0	17.8	20.1	16.5	42.8	43.1	42.5	42.5	39.5	33.3	19.5	12.4	20.8	24.0	20.6	33.1	41.8	35.4
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 70c: Integrated Management of CLCuD through its Vector Management (CLCuD PDI)

Treatment	IPM/Bio-module	CLCuD PDI (%)											
		Bathinda		Faridkot		Sriganganagar		Hisar		Sirsa		Mean	
		90 DAS	115 DAS	90 DAS	115 DAS	90 DAS	115 DAS	90 DAS	115 DAS	90 DAS	115 DAS	90 DAS	115 DAS
T1	IPM existing module	56.7	66.7	25.8	38.3	34.2	41.3	21.0	47.6	30.6	33.4	**33.7**	**45.5**
T2	IPM module-1	57.2	67.2	28.3	41.7	34.6	41.7	27.4	47.0	29.6	37.2	35.4	**47.0**
T3	IPM module-2	59.4	69.4	27.5	40.8	35.3	42.1	23.4	46.0	31.5	35.7	35.4	**46.8**
T4	IPM module- 3	60.0	70.0	29.2	45.0	35.7	43.7	23.3	46.0	27.4	36.3	35.1	48.2
T5	Biomodule-1	56.1	66.7	27.5	47.5	32.1	40.8	20.6	47.6	31.7	38.4	**33.6**	48.2
T6	Biomodule-2	58.3	68.9	30.0	47.5	35.8	42.2	22.2	47.9	29.5	37.0	**35.2**	48.7
T7	Biomodule-3	60.0	70.6	26.7	43.3	35.5	43.4	29.6	48.8	30.8	40.8	36.5	49.4
T8	Biomodule-4	61.1	71.1	30.8	40.8	33.6	41.9	28.2	48.0	33.5	43.6	37.4	49.1
T9	Control	62.2	73.9	34.2	51.7	35.5	43.6	30.6	50.0	40.6	60.6	40.6	56.0

Table 70d: Integrated Management of CLCuD through its Vector Management (Seed cotton yield)

Treatments	IPM/Bio-module	Seed Cotton Yield (Q/ha)						Increase over control (%)
		Bathinda	Faridkot	Sriganganagar	Hisar	Sirsa	Overall mean	
T1	IPM existing module	5.0	8.5	18.7	21.4	21.4	**15.0**	24.0
T2	IPM module-1	4.8	7.8	17.7	23.0	19.5	14.6	20.7
T3	IPM module-2	4.2	7.4	17.6	23.5	20.2	14.6	20.7
T4	IPM module- 3	4.4	7.1	18.0	21.9	21.1	14.5	19.8
T5	Biomodule-1	4.2	6.5	18.9	22.9	20.2	14.5	19.8
T6	Biomodule-2	4.0	6.2	17.9	20.0	22.7	14.2	17.4
T7	Biomodule-3	4.8	6.3	17.7	20.2	20.6	13.9	14.9
T8	Biomodule-4	4.0	5.9	18.4	21.0	18.8	13.6	12.4
T9	Control	2.6	4.7	16.6	18.3	18.3	12.1	0.0
CD at 5%		83.7	1.8	3.2		1.8		
CV%		**11.4**	**15.2**	**10.4**		**5.1**		

Path 3 (j): Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations

Table 71: List of treatments for Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations

Treatments	Details
T_1	Kresoxim methyl 44.3% SC @ 1 ml/litre of water
T_2	Propiconazole 25% EC @ 1 ml/litre of water
T_3	Propineb 70% WP @ 2.5 g/litre of water
T_4	Fluxapyroxad 167 g/litre + Pyraclostrobin 333 g/litre SC @ 0.6 g/litre of water
T_5	Metiram 55% + Pyraclostrobin 5% WG @ 2 g/litre of water
T_6	Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1 ml/ litre of water
T_7	Copper sulphate 47.15% + Mancozeb 30% WDG @ 5 g/ litre of water
T_8	Captan 70 % + Hexaconazole 5 % WP @ 1.5 g/ litre of water
T_9	Copper oxychloride 50 % WP @ 2.5 g
T_{10}	Flonicamid 80 g/acre (60 & 90 days)/ Diafenthiuron/ Dinotefuran (110 – 120 days)
T_{11}	Fluvalinate (for bugs)
T_{12}	Control (Water spray)

North Zone

Table 72a: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides (Bathinda)

Treatments	Boll rot % Incidence		Fungal Foliar Leaf Spot			
	Internal	External	DI (100 DAS)**(BS)	PDI (15 DAS)	Reduction over control (%)	SCY (Q/ha)
T_1	0.0	0.0	83.3	5.1 (12.9)*	**63.1**	**8.8**
T_2	1.7	0.0	76.6	10.0 (17.9)	28.5	5.6
T_3	1.7	0.0	80.0	10.6 (18.9)	48.8	5.2
T_4	0.0	0.0	83.3	8.0 (16.3)	42.8	6.7
T_5	0.0	0.0	80.0	8.6 (16.9)	38.1	6.1
T_6	0.0	0.0	76.6	5.8 (13.8)	**58.3**	**8.5**
T_7	0.0	0.0	80.0	7.0 (15.1)	50.0	6.9
T_8	0.0	0.0	83.3	7.1 (15.4)	**52.3**	6.7
T_9	3.3	0.0	86.6	8.1 (16.5)	47.6	**7.3**
T_{10}	1.7	1.7	73.3	11.5 (19.7)	29.7	5.2
T_{11}	3.3	1.7	90.0	10.0 (18.2)	28.5	4.7
T_{12}	8.3	3.3	96.6	14.0 (21.9)	--	3.9
CD at 5%				4.8		1.2
C.V.				**16.7**		**10.9**

**DAS- Days after sowing, BS-Before spray

Table 72b: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides (Hisar)

Treatments	Boll rot %						
	I Spray (% Incidence)		II Spray (% Incidence)		III Spray (% Incidence)		SCY (Q/ha)
	15 DAS	Reduction % over control	15 DAS	Reduction % over control	15 DAS	Reduction % over control	
T_1	2.6	24.8	5.1	21.5	7.0	17.9	6.1
T_2	2.7	20.4	5.5	15.9	7.2	15.9	5.9
T_3	1.8	47.8	4.2	35.4	5.3	37.9	6.6
T_4	1.5	54.9	3.4	47.7	4.0	**53.1**	**7.5**
T_5	1.6	52.2	3.8	42.0	4.4	**48.4**	**7.3**
T_6	1.8	48.4	4.0	38.0	5.0	**41.4**	6.7
T_7	2.0	41.3	4.8	26.6	6.2	27.7	6.3
T_8	2.4	30.1	5.0	23.1	6.5	23.8	6.2
T_9	1.8	46.9	4.5	30.3	6.0	30.0	6.4
T_{10}	2.7	21.2	5.9	9.7	7.7	10.1	5.8
T_{11}	2.8	18.6	6.0	7.7	7.9	7.7	5.6
T_{12}	3.4	-	6.5	-	8.5	-	5.2

Central Zone

Table 73: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides (Surat)

Treatments	Bacterial leaf blight (PDI)	Control (%)	Boll rot (PDI)	Control (%)	Seed cotton yield (Q/ha)
T_1	34.2 (35.7)	36.3	18.0 (25.0)	32.9	19.5
T_2	37.7 (37.8)	29.8	21.3 (27.4)	20.5	17.3
T_3	35.8 (36.7)	33.2	19.5 (26.1)	27.3	18.4
T_4	25.2 (29.9)	**53.1**	13.7 (21.6)	**49.1**	**24.1**
T_5	28.8 (32.4)	**46.3**	14.7 (22.5)	**45.3**	**22.3**
T_6	32.2 (34.4)	40.1	16.5 (23.9)	38.5	20.9
T_7	40.3 (39.4)	24.8	22.7 (28.4)	15.5	15.4
T_8	38.5 (38.3)	28.3	22.3 (28.2)	16.8	16.1
T_9	23.5 (28.9)	**56.2**	12.8 (20.8)	**52.2**	**73**
T_{10}	41.5 (40.0)	22.7	23.3 (28.9)	13.0	15.2
T_{11}	43.0 (40.9)	19.9	24.8 (29.9)	7.5	15.1
T_{12}	53.7 (47.1)	0.0	26.8 (31.2)	0.0	15.0
S. Em.± (T)	1.8	-	1.3	-	144.0
C.D.at 5% (T)	5.4	-	3.7	-	422.4
C.D. (Y x T)	-	-	-	-	-
C.V. %	8.6	-	8.3	-	13.4

Table 74: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides – Nanded

Treatments	Boll rot % Incidence	Alternaria leaf spot		Grey mildew		No. of bugs/plant	Seed cotton Yield (Q/ha)
		PDI	Control (%)	PDI	Control (%)		
T_1	No incidence of Boll rot noticed	4.5 (12.2)	46.0	7.2 (15.5)	69.9	1.7 (1.6)	**11.7**
T_2		4.8 (12.7)	42.0	12.0 (20.2)	49.7	1.5 (1.6)	10.8
T_3		4.7 (12.4)	44.0	10.2 (18.5)	**57.3**	1.7 (1.7)	**11.3**
T_4		2.7 (9.3)	**68.0**	4.8 (12.7)	**79.7**	1.8 (1.7)	**13.0**
T5		3.3 (10.5)	**60.0**	9.7 (18.1)	**59.4**	1.6 (1.6)	10.7
T_6		3.7 (10.9)	**56.0**	10.2 (18.6)	**57.3**	1.7 (1.6)	11.0
T_7		5.5 (13.5)	34.0	15.3 (22.9)	35.7	1.7 (1.6)	9.3
T_8		5.3 (13.3)	36.0	14.7 (22.5)	38.5	1.7 (1.6)	8.8
T_9		5.7 (13.7)	32.0	15.8 (23.4)	33.6	1.6 (1.6)	9.0
T_{10}		7.5 (15.9)	10.0	19.7 (26.3)	17.5	0.7 (1.3)	7.8
T_{11}		7.7 (16.1)	8.0	20.0 (26.6)	16.1	1.0 (1.4)	7.7
T_{12}		8.3 (16.8)	0.0	22.8 (29.2)	0.0	1.8 (1.7)	7.3
CD @ 5%		1.7		2.3		0.2	0.7
SE(m) ±		0.6		0.8		0.1	0.2
CV %		7.6		6.3		5.4	12.1

* Angular transformed values; **Square root transformed values

Table 75: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides (CICR-Nagpur)

Treatments	Boll rot (% Incidence)		*Corynespora* leaf spot (PDI)		Grey mildew (PDI)		Yield (Q/ha)
	I st Spray	II spray	I st Spray	IInd spray	I st Spray	II nd spray	
T_1	22.2	26.7	6.0	12.0	0.3	**4.3**	**17.7**
T_2	20.0	20.0	7.3	**9.7**	2.3	**5.3**	16.3
T_3	20.0	**13.4**	7.0	15.0	1.0	15.7	**18.5**
T_4	24.4	**13.4**	3.3	**7.7**	2.0	**4.3**	17.2
T5	17.8	16.7	3.7	12.3	1.0	13.7	16.2
T_6	11.1	20.0	8.0	**9.3**	7.7	12.3	17.5
T_7	13.3	**13.4**	7.3	21.7	1.0	19.3	17.5
T_8	13.3	16.7	7.7	11.3	0.3	15.7	15.1
T_9	11.1	**10.0**	4.7	12.3	1.0	22.0	**17.7**
T_{10}	26.7	30.0	7.3	15.7	7.3	28.7	14.8
T_{11}	24.4	30.0	6.0	18.3	8.7	31.3	15.8
T_{12}	28.9	36.7	8.7	27.3	5.7	38.0	14.4
C.D.	N/A	N/A	2.4	10.0	N/A	11.3	N/A
SE(m)	4.4	1.5	0.8	3.4	2.6	3.8	1.5
C.V.	29.8	15.3	22.1	40.8	141.8	37.8	15.3

Note: Figures in Parenthesis are angular transformed values

South Zone

Table 76: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides (Lam Guntur)

Treatments	Corynespora leaf spot (PDI)					Grey mildew (PDI)				Rust (PDI)				Boll rot (%)	Yield (Q/ha)
	1st Spray			2nd Spray		1st Spray		2nd Spray		1st Spray		2nd Spray			
	Before Spray	After Spray	Control (%)	After Spray	Control (%)	After Spray	Control (%)	After Spray	Control (%)	After Spray	Control (%)	After Spray	Control (%)		
T_1	4.7 (12.5)	12.2 (20.4)	58.5	7.5 (15.9)	**70.2**	9.8 (18.2)	53.7	7.2 (15.5)	**56.6**	13.7 (21.7)	55.3	9.0 (17.5)	**62.5**	0.8	**19.3**
T_2	4.5 (12.3)	13.4 (21.5)	54.2	8.3 (16.7)	**66.9**	10.2 (18.6)	51.8	7.6 (15.9)	54.1	15.4 (23.1)	49.6	8.8 (17.3)	**63.2**	0.7	**19.1**
T_3	3.8 (11.2)	13.3 (21.4)	54.6	7.9 (16.3)	65.5	10.6 (18.9)	49.8	7.6 (15.9)	54.1	14.3 (22.2)	53.4	8.7 (17.1)	**63.9**	0.9	18.0
T_4	3.8 (11.2)	15.5 (23.2)	47.2	8.5 (16.9)	66.2	11.3 (19.6)	46.3	7.3 (15.7)	55.6	15.3 (23.0)	49.9	10.6 (18.9)	55.9	0.5	16.0
T5	4.7 (12.5)	14.9 (22.7)	49.1	8.3 (16.7)	**66.9**	8.6 (17.0)	59.3	7.3 (15.7)	55.6	15.7 (23.3)	48.8	10.6 (18.9)	55.9	0.7	15.0
T_6	4.5 (12.3)	10.8 (19.1)	63.4	8.3 (16.7)	67.2	7.5 (15.9)	64.4	7.2 (15.5)	**56.6**	11.9 (20.1)	61.0	10.7 (19.1)	55.5	0.8	14.3
T_7	4.5 (12.3)	13.9 (21.9)	52.5	8.6 (17.0)	65.9	9.9 (18.3)	52.9	7.5 (15.9)	54.6	13.7 (21.7)	55.3	10.8 (19.2)	54.9	0.8	16.2
T_8	3.0 (9.9)	13.4 (21.5)	54.2	8.4 (16.9)	66.6	10.8 (19.1)	49.0	6.7 (14.9)	**59.6**	12.8 (20.9)	58.0	10.1 (18.5)	58.0	0.7	14.7
T_9	4.3 (11.9)	12.3 (20.5)	58.0	8.4 (16.9)	66.6	8.8 (17.2)	58.5	7.3 (15.6)	56.1	13.9 (21.9)	54.5	9.9 (18.3)	58.7	0.7	14.8
T_{10}	4.3 (11.9)	22.3 (28.2)	24.1	19.3 (26.0)	23.5	16.6 (24.0)	21.4	11.5 (19.8)	30.3	27.5 (31.6)	10.1	16.6 (24.0)	30.9	1.1	10.9
T_{11}	3.5 (10.8)	22.2 (28.1)	24.4	20.1 (26.6)	20.2	16.8 (24.2)	20.2	11.5 (19.8)	30.3	28.3 (32.1)	7.5	16.6 (24.0)	30.9	1.1	10.2
T_{12}	3.7 (11.0)	29.3 (32.8)		25.2 (30.0)		21.1 (28.3)		16.5 (23.9)		30.6 (33.6)		24.0 (29.3)		1.8	7.1
CD at 5%	NS	3.1		1.3		2.6		1.4		3.3		2.1			2.7
CV%	15.4	11.3		6.9		13.1		9.6		11.0		10.1			11.0

Table 77: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations (Dharwad)

Treatments	Alternaria blight		Rust		Boll rot		Yield/ha (Qtls)
	PDI	Control (%)	PDI	Control (%)	PDI	Control (%)	
T_1	23.6 (29.1)	27.9	16.4 (23.3)	33.9	10.8 (19.2)	42.4	17.5
T_2	22.4 (28.2)	31.6	15.6 (24.9)	37.1	10.0 (18.5)	46.4	16.8
T_3	24.6 (29.7)	24.8	17.7 (19.8)	28.7	11.2 (19.6)	39.9	16.0
T_4	17.1 (24.4)	**47.8**	11.4 (21.2)	**53.9**	7.2 (15.5)	**61.7**	**20.5**
T5	19.2 (26.0)	**41.3**	13.1 (22.7)	**47.2**	8.5 (16.9)	**54.7**	**19.2**
T_6	21.6 (27.7)	**34.0**	14.9 (25.9)	**40.0**	9.9 (18.4)	**47.0**	**18.6**
T_7	26.2 (30.8)	20.0	19.0 (26.0)	23.4	13.8 (21.8)	26.7	14.6
T_8	26.9 (31.3)	17.8	19.2 (25.1)	22.5	12.3 (20.5)	34.3	14.0
T_9	25.6 (30.4)	21.8	18.0 (27.1)	27.3	11.9 (20.2)	36.4	15.8
T_{10}	27.0 (31.3)	17.4	20.8 (27.4)	16.0	14.5 (22.4)	22.5	13.8
T_{11}	28.8 (32.4)	12.1	21.2 (23.9)	14.5	15.8 (23.4)	18.3	13.0
T_{12}	32.7 (34.3)	--	24.8 (29.9)	--	18.7 (25.6)	--	11.0
CD at 5%	0.6		0.7		0.7		2.3
S.E.(m)±	0.2		0.2		0.2		0.8
CV%	1.1		1.7		2.0		8.5

Table 78: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations (Coimbatore)

S.No.	Alternaria Blight		Grey Mildew		Bacterial Blight		Boll rot		SCY (Q/ha)
	PDI	% Control	PDI	% Control	PDI	% Control	PDI	% Control	
T_1	8.2 (16.6)	60.0	8.5 (16.9)	**70.0**	10.5 (18.9)	30.0	8.1 (16.5)	34.1	16.4
T_2	10.4 (18.8)	49.0	13.5 (21.5)	47.5	11.1 (19.4)	26.0	8.5 (16.9)	30.8	14.7
T_3	6.2 (14.3)	**69.7**	11.3 (19.6)	56.0	12.0 (20.2)	20.0	6.8 (15.0)	44.7	17.5
T_4	7.3 (15.7)	**64.3**	10.8 (19.2)	57.9	7.9 (16.3)	**47.0**	3.6 (10.6)	**69.9**	**19.5**
T5	8.5 (16.9)	58.5	10.3 (18.7)	**60.0**	9.1 (17.6)	39.3	4.6 (12.3)	**62.6**	**18.3**
T_6	7.8 (16.2)	**61.9**	9.8 (18.2)	**61.8**	9.8 (18.2)	34.7	5.5 (13.5)	55.2	**17.1**
T_7	9.6 (18.0)	53.0	14.7 (22.5)	42.8	7.5 (15.9)	**50.0**	7.7 (16.0)	37.3	14.8
T_8	10.9 (19.3)	46.8	12.9 (21.0)	49.8	8.7 (17.5)	42.0	7.5 (15.8)	39.0	15.3
T_9	11.5 (19.8)	48.9	15.7 (23.3)	39.0	8.1 (16.5)	**46.0**	7.0 (15.2)	**43.0**	14.5
T_{10}	17.3 (24.8)	15.7	21.3 (27.4)	17.1	12.8 (20.9)	14.7	8.7 (17.8)	29.2	13.5
T_{11}	16.4 (23.8)	20.0	20.5 (26.9)	22.1	13.2 (21.2)	12.0	9.9 (18.3)	19.5	13.3
T_{12}	20.5 (26.8)		25.7 (30.3)		15.0 (22.7)		12.3 (20.4)		12.0
CD at 5%	1.6		1.7		1.1		1.5		2.0
S.E.(m)±	0.8		1.0		0.4		0.8		1.4
CV%	4.7		4.5		3.5		5.7		7.5

Path 3 (K): Field evaluation (Rhizospheric fungi & chemicals etc.) for seed and soil borne disease management

Table 79: Treatment details of field evaluation (Rhizospheric fungi & chemicals etc.) for seed and soil borne disease management

Treatment No	Treatment Details
1	Trichoderma spp. isolate (CICR-Rf-B/Th-11) as seed treatment @ 5 g/kg seed
2	Trichoderma spp. isolate (CICR Rf-B/Th-11) as soil treatment @ 1 kg/acre with 100 kg well-decomposed FYM/Compost at sowing time
3	Trichoderma spp. isolate (CICR Rf-B/Th-11) as seed + soil treatment at sowing time
4	Trichoderma spp. isolate (CICR Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2 ml/L
5	Trichoderma spp. isolate (CICR Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2 ml/L + Mak Adjuvol mineral paraffin oil) @1.5% (15 ml/L)
6	Trichoderma spp. isolate (CICR Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2 ml/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L)
7	Seed treatment with carboxin 37.5% + thiram 37.5% @ 3.5g/kg
8	Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L at 60 and 90 DAS
9	Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @1.5% (15 ml/L) at 60 and 90 DAS
10	Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L) at 60 and 90 DAS
11	Mak Adjuvol (mineral paraffin oil) @1.5% (15 ml/L) only
12	Mak Adjuvol (mineral paraffin oil) @0.75% (7.5 ml/L) only
13	Untreated control

North Zone

Table 80: Field evaluation (Rhizospheric fungi & chemicals etc.) for seed and soil borne disease management – Sirsa

Treatments	Plants Mortality (%)			
	30 DAS	60 DAS	90 DAS	120 DAS
T1	7.5 (15.9)	**10.4 (18.8)**	22.6 (28.4)	25.2 (30.1)
T2	16.2 (23.7)	16.7 (24.1)	23.5 (29.0)	24.6 (29.6)
T3	9.2 (17.6)	11.4 (19.7)	17.0 (24.3)	**18.7 (25.5)**
T4	7.9 (16.3)	**10.4 (18.8)**	16.5 (23.9)	**18.7 (25.4)**
T5	9.1 (17.5)	**10.4 (18.8)**	15.8 (23.4)	**18.0 (25.0)**
T6	2.2 (8.5)	**8.7 (17.2)**	14.3 (22.1)	**15.4 (23.1)**
T7	10.3 (18.6)	14.9 (22.7)	24.9 (29.9)	29.3 (32.7)
T8	13.2 (21.2)	19.5 (26.2)	25.9 (30.6)	25.2 (29.4)
T9	17.4 (24.6)	26.8 (31.2)	28.3 (32.1)	29.9 (33.1)
T10	20.5 (26.9)	22.9 (28.6)	27.1 (31.3)	28.9 (32.5)
T11	18.8 (25.7)	21.5 (27.6)	33.8 (35.6)	35.4 (36.5)
T12	13.3 (21.3)	18.8 (25.7)	30.6 (33.5)	32.6 (34.8)
T13	21.5 (27.6)	30.8 (33.7)	41.0 (39.8)	46.6 (43.0)
C.D.	2.9	2.2	2.5	4.7
SE(m)	1.0	0.7	0.8	1.6
SE(d)	1.4	1.0	1.2	2.3
C.V.	8.3	5.3	5.0	9.0

Table 81: Field evaluation (Rhizospheric fungi & chemicals etc.) for seed and soil borne disease management – Bathinda

Treatments	Germination (%)	Plants Mortality (%)				FFS (PDI)			BLB (PDI)			Monopods	Sympods	Plant Height (cm)	Open bolls/ plant	SCY (Q/ha)
	7 DAS	30 DAS	60 DAS	90 DAS	120 DAS	60 DAS	90 DAS	120 DAS	60 DAS	90 DAS	120 DAS					
T1	88.7	1.3	0.0	0.0	0.0	2.2 (8.4)	13.0 (21.1)	15.0 (22.8)	1.2 (6.2)	2.5 (9.1)	5.0 (12.9)	0.6	8.4	85.0	14.9	9.9
T2	88.0	1.3	0.0	0.0	0.0	1.7 (7.3)	13.2 (21.3)	15.2 (22.9)	0.7 (4.6)	2.7 (9.3)	5.2 (13.1)	0.8	9.3	89.7	17.8	10.9
T3	89.3	1.3	0.0	0.0	0.0	1.5 (7.0)	11.3 (19.7)	12.8 (21.0)	1.0 (5.7)	2.3 (8.7)	4.3 (12.0)	0.9	9.9	94.4	19.4	11.5
T4	**90.0**	1.3	0.0	0.0	0.0	1.7 (7.3)	13.0 (21.1)	15.0 (22.8)	0.7 (4.6)	2.7 (9.3)	5.0 (13.0)	1.1	10.3	100.3	20.0	12.2
T5	**91.3**	1.3	0.0	0.0	0.0	1.7 (7.3)	12.3 (20.6)	14.3 (22.2)	0.7 (4.6)	2.0 (8.1)	4.5 (12.2)	1.1	12.9	104.4	24.8	14.1
T6	89.3	1.3	0.0	0.0	0.0	1.7 (7.3)	13.7 (21.7)	15.7 (23.3)	0.7 (4.6)	3.0 (9.8)	5.5 (13.5)	1.2	12.2	101.7	22.4	13.2
T7	89.3	1.3	0.7	0.0	0.0	2.2 (8.4)	14.3 (22.2)	15.7 (23.3)	1.2 (6.2)	4.0 (11.4)	6.5 (14.7)	1.7	8.9	87.8	16.1	9.9
T8	88.7	1.3	0.7	0.0	0.0	1.7 (7.3)	8.7 (17.1)	**8.8 (17.3)**	0.7 (4.6)	1.8 (7.7)	**4.3 (12.0)**	1.4	13.3	106.1	26.6	**15.5**
T9	88.0	1.3	0.7	0.0	0.0	1.2 (6.0)	7.3 (15.7)	**7.5 (15.9)**	0.2 (1.4)	0.7 (4.6)	**3.2 (10.2)**	1.7	15.8	116.9	31.7	**18.4**
T10	87.3	1.3	0.0	0.0	0.0	1.2 (6.0)	8.3 (16.7)	**8.5 (16.9)**	0.2 (1.4)	1.5 (7.0)	**4.0 (11.5)**	1.2	14.7	110.1	31.1	**16.8**
T11	86.7	2.7	0.7	0.0	0.0	1.7 (7.3)	14.0 (21.9)	16.0 (23.5)	0.7 (4.6)	4.0 (11.4)	6.8 (15.1)	1.2	6.9	77.8	12.1	8.6
T12	87.3	2.0	0.7	0.0	0.0	1.7 (7.3)	14.5 (22.4)	16.3 (23.8)	0.7 (4.6)	4.0 (11.4)	6.5 (14.7)	0.3	7.8	81.7	12.7	9.2
T13	85.3	2.7	0.7	0.0	0.0	2.5 (9.1)	15.3 (23.0)	17.8 (25.0)	1.2 (6.2)	4.5 (12.2)	7.0 (15.3)	0.1	6.6	65.0	10.1	8.2
CD (5%)						0.7	0.7	1.8	1.0	1.0	0.8	0.6	2.4	5.8	6.4	1.1
CV						6.1	2.1	4.9	13.8	6.4	3.6	34.1	13.7	3.6	19.0	5.6

Table 82: Field evaluation (Rhizospheric fungi & chemicals etc.) for seed and soil borne disease management – Hisar

Treatments	Germination (%)	Plants Mortality (%)				CLCuD (PDI)			Foliar diseases (Incidence)	Plant Height (cm)	Sympods	SCY (Q/ha)
		30 DAS	60 DAS	90 DAS	120 DAS	60 DAS	90 DAS	120 DAS				
T1	76.5	1.0	3.1	5.1	7.2	16.3	36.7	56.6	25.1	96.5	16.3	4.5
T2	78.3	0.0	1.1	3.4	4.5	13.3	28.3	51.7	22.5	114.3	18.9	4.9
T3	80.5	0.0	1.1	2.7	**3.8**	11.7	26.7	48.3	21.0	121.9	22.3	**5.1**
T4	80.5	0.0	1.2	3.5	4.0	11.7	25.0	43.3	20.7	139.7	25.3	**5.2**
T5	82.3	0.0	0.0	1.1	**1.7**	10.0	20.0	**40.0**	**15.3**	157.5	30.7	**5.6**
T6	**84.6**	0.0	0.0	1.0	**1.5**	11.7	21.7	**41.7**	**17.4**	147.3	28.4	**5.2**
T7	80.5	0.0	1.2	5.2	8.7	13.7	35.0	53.3	23.3	101.6	16.6	4.6
T8	80.2	0.0	1.5	4.4	6.5	11.7	23.3	50.0	21.7	111.8	18.1	4.8
T9	**82.3**	0.0	1.3	3.2	5.1	6.3	16.7	43.3	**18.4**	109.2	16.9	4.7
T10	**82.3**	0.0	1.7	3.4	5.1	8.3	18.3	45.0	20.3	86.4	15.1	4.3
T11	78.3	1.5	3.0	6.1	8.3	15.0	31.7	55.0	28.8	76.2	14.6	4.0
T12	76.5	1.3	3.3	5.9	7.9	15.0	33.3	56.6	29.6	68.6	13.8	3.7
T13	78.3	1.9	5.7	10.2	13.4	16.3	38.3	63.3	31.9	63.5	12.7	3.3

Central Zone

Table 83: Field evaluation (Rhizospheric fungi & chemicals etc.) for seed and soil-borne disease management – Junagarh

Treatments	Germination (%)	Plant mortality %	Fungal PDI		Sympodial branches	Mono podial	No of Boll	Boll weight (g)	Yield (Kg/ha)
		120 DAS	90 DAS	120 DAS					
T1	**94.3**	1.8 (3.2)	31.8 (27.8)	32.8 (34.9)	14.0	1.2	30.1	3.4	**18.8**
T2	**91.9**	1.7 (2.9)	38.8 (39.3)	44.3 (41.7)	13.9	1.0	28.6	3.4	17.0
T3	**95.7**	**1.5 (2.4)**	28.5 (22.8)	27.8 (31.8)	13.7	1.2	29.0	3.5	**22.3**
T4	88.1	1.8 (3.1)	31.1 (26.6)	31.7 (34.2)	14.3	1.2	28.1	3.3	17.9
T5	87.6	**1.4 (1.9)**	31.6 (27.4)	32.4 (34.7)	13.3	1.0	28.3	3.2	17.5
T6	84.8	1.7 (2.8)	27.8 (21.8)	26.9 (31.2)	14.5	1.3	30.3	3.3	16.8
T7	86.7	2.5 (6.2)	28.9 (23.3)	24.5 (29.7)	15.0	1.0	31.4	3.5	16.4
T8	91.4	2.2 (4.9)	22.4 (14.5)	**19.5 (26.2)**	12.8	1.0	27.3	3.5	18.5
T9	91.9	**1.2 (1.5)**	21.1 (12.9)	**15.9 (23.6)**	14.7	1.0	29.9	3.4	**19.0**
T10	90.5	**1.5 (2.4)**	20.9 (12.8)	**14.2 (22.1)**	14.5	1.2	31.1	3.2	17.6
T11	86.7	2.1 (4.5)	25.6 (18.6)	23.6 (29.1)	13.3	1.0	31.5	3.4	15.0
T12	87.1	1.9 (3.6)	26.7 (20.2)	25.2 (30.1)	14.3	1.3	30.1	3.1	15.8
T13	88.1	2.1 (4.6)	31.4 (27.2)	32.2 (34.6)	13.9	1.0	31.0	3.1	16.1
S.Em.±	4.2	0.3	1.2	1.4	0.8	0.2	2.1	0.1	136.2
CD	NS	NS	3.6	4.0	NS	NS	NS	NS	NS
CV%	8.1	31.1*	7.6#	7.6#	9.8	25.6	12.5	5.7	13.4

* Square root transformation # Arcsine transformation

Table 84: Field evaluation (Rhizospheric fungi & chemicals etc.) for seed and soil borne disease management – Nanded

S.No	Treatments	Germination (%)	Plant mortality (%)	ALS		GM		Plant height (cm)	Sympods	Monopods	No of Bolls	Yield (Q/ha)
				PDI	Control (%)	PDI	Control (%)					
T1	Trichoderma spp. isolate (CICR -Rf- BTh-11) as seed treatment @ 5 g/kg seed	94.6 (76.6)	5.4 (13.4)	5.0 (12.9)	36.2	18.0 (29.5)	23.2	156.2	32.3	0.8	56.3	11.6
T2	Trichoderma spp. isolate (CICR -Rf- BTh-11) as soil treatment @ 1kg/acre with 100 kg well decomposed FYM/ compost at sowing time	96.5 (79.3)	3.5 (10.7)	4.7 (12.5)	40.4	19.2 (28.8)	26.8	154.9	30.2	0.8	57.3	**12.0**
T3	Trichoderma spp. isolate (CICR -Rf- BTh-11) as seed + soil treatment at sowing time	**96.8 (79.7)**	3.3 (10.2)	4.5 (12.2)	42.6	19.8 (27.7)	31.6	160.3	26.3	0.9	56.7	**12.1**
T4	Trichoderma spp. isolate (CICR -Rf- BTh-11) as seed + soil treatment at sowing time and foliar spray at 60 and 90 DAS @ 2ml/L	**97.0 (80.0)**	3.0 (9.9)	3.3 (10.5)	57.5	24.9 (23.8)	48.4	154.1	31.1	1.0	45.3	11.3
T5	Trichoderma spp. isolate (CICR -Rf- BTh-11) as seed + soil treatment @ sowing time and foliar spray at 60 and 90 DAS @ 2ml/L + Mak Adjuvol (mineral paraffin oil) @ 12 ml/L of water	94.4 (76.3)	5.6 (13.7)	3.6 (11.0)	53.6	22.7 (22.0)	55.3	150.1	30.1	0.8	54.3	11.7
T6	Seed treatment carboxin + thiram @3.5 g/kg	**96.5 (79.4)**	3.5 (10.6)	4.2 (11.8)	46.8	20.9 (27.8)	31.1	155.3	29.1	0.9	59.7	11.4
T7	Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml @ 60 and 90 DAS	93.7 (75.6)	6.3 (14.4)	3.7 (11.0)	53.2	22.6 (21.3)	58.4	156.4	28.4	0.7	51.7	**12.3**
T8	Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml + Mak Adjuvol @ 12 ml/L (mineral paraffin oil) @ 60 and 90 DAS	**97.2 (80.4)**	2.8 (9.6)	3.0 (10.0)	61.7	23.8 (20.2)	**62.1**	155.0	31.3	0.9	56.7	**12.3**
T9	Mak Adjuvol (mineral paraffin oil) @ 12 ml/L only	94.6 (76.7)	5.4 (13.3)	4.0 (11.5)	48.9	21.5 (21.0)	59.5	151.7	30.2	1.0	49.3	11.9
T10	Untreated Control	87.9 (69.7)	12.1 (20.3)	7.8 (16.2)	0.0	8.0 (34.2)	0.0	149.0	27.9	0.7	41.3	8.6
	CD at 5%	3.1	3.1	1.5		2.7		NS	NS	NS	NS	0.5
	S.Em.±	1.0	1.0	0.5		0.9		3.9	1.4	0.1	5.6	0.2
	CV%	2.3	14.0	7.3		6.1		4.4	8.2	22.4	18.4	7.9

South Zone

Table 85: Field evaluation (Rhizospheric fungi & chemicals etc.) for seed and soil borne disease management – Dharwad

S.No.	Treatments	Plant mortality		ALB		BLB		Rust		Yield (Q/ha)
		PDI	Control (%)	PDI	Control (%)	PDI	Control (%)	PDI	Control (%)	
T1	Trichoderma spp. isolate (CICR-Rf- BTh-11) as seed treatment @ 5 g/kg seed	11.9 (20.2)	12.3	24.4 (29.6)	20.9	10.8 (19.2)	21.9	17.7 (24.9)	11.3	12.4
T2	Trichoderma spp. isolate (CICR -Rf- BTh-11) as soil treatment @ 1kg/acre with 100 kg well decomposed FYM/ compost at sowing time	11.2 (19.5)	17.5	23.6 (29.1)	23.5	10.2 (18.6)	26.5	15.6 (23.3)	21.9	12.8
T3	Trichoderma spp. isolate (CICR -Rf- BTh-11) as seed + soil treatment at sowing time	10.6 (19.0)	21.8	22.2 (28.1)	28.1	9.7 (18.2)	29.8	14.5 (22.4)	27.4	13.7
T4	Trichoderma spp. isolate (CICR -Rf- BTh-11) as seed + soil treatment at sowing time and foliar spray at 60 and 90 DAS @ 2ml/L	10.8 (19.1)	20.7	21.8 (27.8)	29.3	8.8 (17.3)	36.2	13.6 (21.6)	31.9	14.5
T5	Trichoderma spp. isolate (CICR -Rf- BTh-11) as seed + soil treatment at sowing time and foliar spray at 60 and 90 DAS @ 2ml/L + Mak Adjuvol (mineral paraffin oil) @ 12 ml/L of water	8.2 (16.6)	**39.9**	17.9 (25.1)	**41.9**	7.0 (15.3)	**49.6**	9.7 (18.1)	**51.5**	**16.5**
T6	Seed treatment Carboxin + thiram @3.5 g/kg	9.5 (17.9)	**30.1**	19.8 (26.4)	35.8	7.0 (15.4)	49.2	10.7 (19.1)	46.5	15.2
T7	Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml @ 60 and 90 DAS	6.0 (14.2)	**55.6**	14.5 (22.4)	**53.1**	4.8 (12.6)	**65.5**	7.7 (16.1)	**61.5**	**18.8**
T8	Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml + Mak Adjuvol @ 12 ml/L (mineral paraffin oil) @ 60 and 90 DAS	7.5 (15.9)	**44.8**	16.6 (24.0)	**46.2**	5.6 (13.7)	**59.6**	8.9 (17.4)	**55.4**	**17.1**
T9	Mak Adjuvol (mineral paraffin oil) @ 12 ml/L only	11.8 (20.1)	12.7	24.6 (29.7)	20.3	9.0 (17.5)	34.7	16.2 (23.7)	18.9	13.3
T10	Control (Water Spray)	13.5 (21.8)	--	30.8 (33.7)	--	13.8 (21.8)	--	19.9 (26.5)	--	10.8
	CD at 5%	0.4		0.5		0.4		0.3		0.6
	S.Em.±	0.1		0.2		0.1		0.1		0.2
	CV%	2.5		3.0		4.1		2.8		7.4

Table 86: Field evaluation (Rhizospheric fungi & chemicals etc.) for seed and soil borne disease management – Lam Guntur

S.No	Germination %	Seedling vigour	Mortality %				Plant height (cm)	CoLS (PDI)			GM (PDI)	Rust (PDI)	Boll rot	SCY (Q/ha)
		30 DAS	30 DAS	60 DAS	90 DAS	120 DAS		60 DAS	90 DAS	120 DAS	120 DAS	120 DAS	% Incidence	
T1	66.7	4415.7	0.0	0.0	0.0	1.7	159.3	9.0 (17.5)	8.3 (16.7)	11.1(19.4)	6.3 (14.5)	7.8 (16.2)	3.6	14.2
T2	69.3	4438.0	0.0	0.0	0.0	1.7	157.8	11.8(20.1)	7.7 (16.1)	13.2(21.3)	7.8 (16.2)	10.7 (9.1)	**3.1**	14.3
T3	**71.0**	**4751.3**	0.0	0.0	0.0	1.7	172.7	11.2(19.5)	7.5 (15.9)	10.3(18.7)	5.8 (13.9)	7.8 (16.2)	3.5	14.7
T4	**69.3**	**4755.7**	0.0	0.0	0.0	1.1	171.0	9.8 (18.2)	7.3 (15.7)	7.4 (15.8)	5.6 (13.6)	7.2 (15.6)	3.7	14.8
T5	68.7	4679.3	0.0	0.0	0.0	**0.6**	173.8	11.1(19.4)	**7.0 (15.3)**	6.8 (15.1)	**4.6 (12.3)**	5.8 (13.9)	3.8	14.6
T6	**70.3**	**4805.7**	0.0	0.0	1.7	3.9	169.9	10.9(19.3)	7.7 (16.1)	**5.6 (13.6)**	**4.5 (12.3)**	5.5 (13.6)	**2.9**	16.8
T7	67.3	4712.3	0.0	0.0	3.4	7.3	166.3	10.4(18.8)	7.2 (15.5)	9.4 (17.9)	6.1 (14.3)	7.0 (15.3)	4.9	13.9
T8	62.3	4170.0	0.0	0.0	0.0	0.0	164.6	13.1(21.2)	**6.8 (15.1)**	6.4 (14.7)	**2.3 (8.6)**	4.3 (11.9)	3.5	19.9
T9	63.7	4043.7	0.0	0.0	0.0	0.0	172.4	13.3(21.4)	7.5 (15.9)	**4.0 (11.5)**	**1.3 (6.4)**	2.1 (8.2)	4.2	19.1
T10	63.3	4000.0	0.0	0.0	0.0	0.0	167.9	12.5(20.7)	7.7 (16.1)	**4.6 (12.3)**	**2.0 (8.1)**	2.9 (9.8)		18.4
T11	64.0	3897.0	0.0	0.0	0.0	0.0	158.9	14.2(22.1)	7.5 (15.9)	9.0 (17.5)	4.5 (12.3)	6.4 (14.7)	3.7	12.1
T12	62.7	4102.0	0.0	0.0	0.0	0.0	149.9	13.8(21.9)	9.1 (17.6)	12.1(20.3)	8.0 (16.4)	8.3 (16.7)	3.4	10.5
T13	62.7	3836.3	0.0	0.0	0.6	1.7	144.5	14.5(22.4)	16.8 (24.2)	22.1(28.0)	11.6 (19.9)	16.4 (23.9)	3.5	9.1
CD at 5%	5.6	471.1					17.2	2.3	2.4	2.1	1.6	2.3		3.2
CV%	5.0	6.4					6.2	11.3	17.1	13.2	17.9	19.1		12.7

Table 87: Field evaluation (Rhizospheric fungi & chemicals etc.) for seed and soil borne disease management – Coimbatore

Treatments		Germination (%)	Root rot		Alternaria blight		Grey mildew		Growth parameters			Seed cotton Yield (Q./ha)
			% incidence	% Control	PDI	% Control	PDI	% Control	Plant height cm	No.of monopodial Branches	No.of sympodial Branches	
T_1	*Trichoderma* spp. isolate (CICR-Rf-B/Th-11) as seed treatment @ 5 g/kg seed	78	24.9 (29.9)	48.1	15.1 (22.9)	23.7	15.7 (23.3)	26.3	148.0	2	19.0	15.8
T_2	*Trichoderma* spp. isolate (Rf-B/Th-11) as soil treatment @ 1 kg/acre with 100 kg well decomposed FYM/Compost at sowing time	80	23.5 (28.9)	51.0	14.7 (22.5)	25.8	15.1 (22.8)	29.1	150.0	2	20.0	16.0
T_3	*Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time	82	21.6 (27.6)	55.0	14.0 (22.1)	29.3	14.5 (22.1)	31.9	154.6	1	22.0	16.5
T_4	*Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2ml/L	**85**	16.8 (24.1)	**65.0**	11.1 (19.4)	**43.9**	11.9 (20.1)	44.1	**167.0**	1	25.0	**17.7**
T_5	*Trichoderma* spp. isolate (Rf-B/Th-11) as seed + soil treatment at sowing time and FS at 60 and 90 DAS @ 2ml/L + MakAdjuvol (mineral paraffin oil) @ 12ml/L	**87**	15.8 (23.4)	**67.0**	10.8 (19.1)	**45.5**	12.4 (20.6)	41.8	**170.0**	1	27.0	**17.3**
T_6	Seed treatment with Carboxin + Thiram @ 3.5 g/ kg of Seed	**84**	25 (29.9)	47.9	15.6 (23.2)	21.2	14.9 (22.5)	30.0	138.0	2	20	15.0
T_7	Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L at 60 and 90 DAS	77	14.7 (22.5)	**69.4**	7.8 (16.2)	**60.6**	8.3 (16.7)	61.0	158.0	1	23	**17.0**
T_8	Azoxystrobin 18.2% + Difenoconazole 11.4 @ 1ml/L + MakAdjuvol@ 12ml/L (mineralparaffin oil) at 60 and 90 DAS	79	13.4 (21.4)	72.0	8.2 (16.6)	**58.6**	8.5 (16.9)	60.0	161.0	1	24	**17.1**
T_9	MakAdjuvol (mineral paraffin oil) @ 12ml/L only	75	31.2 (33.9)	35.0	15.9 (23.4)	19.7	16.8 (24.1)	21.1	135.0	2	18	12.3
T_{10}	Untreated control	72	48.0 (43.8)	-	19.8 (26.3)		21.3 (27.4)		120.0	2	15	11.7
	CD at 5%	2.46	1.20		1.01		1.13		2.46		1.15	1.73
	S. E(m)	2.06	0.49		0.37		0.30		2.06		0.45	1.02
	Cv %	2.26	2.45		2.78		2.50		2.26		3.18	6.44

Path.4: Crop loss estimation
Path 4(e): Crop loss estimation due to CLCuD and distribution pattern of CLCuD in north zone.
Expt 1a: To work out relationship between disease index and yield reduction due to CLCuD.

NORTH ZONE

Table 88: Number of boll reduction (%) grade wise in different Bt hybrids in North Zone.

Grades	US51				RCH 773 BGII				NCS 9013 BGII				ACH 177-2 BG II				Overall average
	HSR	FDK	SGR	Avg.	HSR	FDK	SGR	Avg.	HSR	FDK	SGR	Avg.	HSR	FDK	SGR	Avg.	
0	0.0		-	0.0	0.0		-	0.0	0.0		-	0.0	0.0		-	0.0	0.0
1	24.6	0.0	0.0	8.2	19.8	0.0	0.0	6.6	8.9	0.0	0.0	3.0	20.7	0.0	0.0	6.9	6.2
2	33.0	12.6	2.7	16.1	33.7	12.1	1.2	15.7	29.2	13.4	3.0	15.2	33.6	10.1	4.2	16.0	15.7
3	47.8	20.7	14.2	27.6	52.9	19.8	18.8	30.5	51.7	19.0	23.0	31.2	48.3	18.9	29.6	32.3	30.4
4	64.2	29.9	44.9	46.3	63.4	30.0	34.9	42.8	60.9	31.5	52.0	48.1	62.5	28.7	53.5	48.2	46.4
5	70.4	46.0	68.7	61.7	70.1	45.7	-	57.9	74.1	44.8	-	59.5	68.7	39.7	-	54.2	58.3
6	76.7	-	-	76.7	78.7	-	-	78.7	81.1	-	-	81.1	78.1	-	-	78.1	78.7
Mixed	45.3	21.4	26.2	31.0	45.5	23.4	13.8	27.6	43.7	22.3	19.6	28.5	44.6	18.4	21.8	28.3	28.8

Table 89: Boll weight reduction (%) grade wise in different Bt hybrids in North Zone.

Grades	US51				RCH 773 BGII				NCS 9013 BGII				ACH 177-2 BG II				Overall average
	HSR	FDK	SGR	Avg.	HSR	FDK	SGR	Avg.	HSR	FDK	SGR	Avg.	HSR	FDK	SGR	Avg.	
0	0.0	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0
1	6.2	-	0.0	3.1	4.7	-	0.0	2.4	4.9	-	0.0	2.5	4.1	-	0.0	2.1	2.5
2	9.1	-	3.8	6.5	8.7	-	8.4	8.6	6.7	-	6.1	6.4	6.3	-	3.3	4.8	6.6
3	18.0	-	11.0	14.5	18.3	-	19.6	19.0	15.1	-	18.8	17.0	13.4	-	9.2	11.3	15.4
4	22.3	-	32.1	27.2	24.8	-	26.6	25.7	21.8	-	29.1	25.5	19.2	-	32.8	26.0	26.1
5	26.9	-	43.8	35.4	29.7	-	-	29.7	25.1	-	-	25.1	23.8	-	-	23.8	28.5
6	28.8	-	-	28.8	33.2	-	-	33.2	28.8	-	-	28.8	26.6	-	-	26.6	29.4
Mixed	15.9	-	18.3	17.1	17.1	-	13.6	15.4	14.6	-	13.4	14.0	13.4	-	11.4	12.4	14.7

Table 90: Seed cotton yield (%) reduction disease grade wise in different Bt hybrids in North Zone.

Grades	US51				RCH 773 BGII				NCS 9013 BGII				ACH 177-2 BG II				Overall average
	HSR	FDK	SGR	Avg.	HSR	FDK	SGR	Avg.	HSR	FDK	SGR	Avg.	HSR	FDK	SGR	Avg.	
0	0.0		-	0.0	0.0		-	0.0	0.0		-	0.0	0.0		-	0.0	0.0
1	22.2	0.0	0.0	7.4	19.3	0.0	0.0	6.4	2.3	0.0	0.0	0.8	35.9	0.0	0.0	12.0	6.6
2	29.8	13.3	6.2	16.4	31.8	15.5	11.7	19.7	41.6	14.7	8.1	21.5	46.5	11.6	2.7	20.3	19.5
3	42.0	22.6	22.2	28.9	52.4	22.1	35.7	36.7	58.3	21.1	34.2	37.9	58.2	20.5	31.0	36.6	35.0
4	48.5	31.9	61.5	47.3	58.2	30.2	52.2	46.9	66.3	30.6	68.6	55.2	66.7	28.8	66.9	54.1	50.9
5	54.9	46.2	80.5	60.5	64.0	47.3	-	55.7	72.5	45.2	-	58.9	70.8	43.8	-	57.3	58.1
6	60.8	-	-	60.8	66.4	-	-	66.4	76.5	-	-	76.5	73.1	-	-	73.1	69.2
Mixed	36.9	20.4	34.1	30.5	41.7	21.7	24.9	29.4	45.4	21.4	27.7	31.5	50.2	18.2	25.1	31.2	30.6

Table 91: Crop loss estimation due to CLCuD grade wise in different Bt hybrids at farmer field (Village- Ludas, Hisar)

Grades	US51			RCH 773 BGII			NCS 9013 BGII			ACH 177-2 BG II		
	No of Boll red. %	Boll wt. red. %	SCY red. %	No of Boll red. %	Boll wt. red. %	SCY red. %	No of Boll red. %	Boll wt. red. %	SCY red. %	No of Boll red. %	Boll wt. red. %	SCY red. %
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	26.0	3.2	33.2	20.4	4.2	22.4	23.8	3.9	23.9	22.5	4.1	19.4
2	51.0	10.4	52.9	41.4	9.3	43.0	46.7	8.2	47.8	46.0	8.9	41.2
3	62.7	12.4	64.7	56.6	12.3	58.9	60.2	13.2	62.7	57.2	11.7	57.3
4	74.0	14.9	78.3	67.5	15.2	69.7	71.3	15.5	73.1	64.5	15.0	64.8
5	83.4	17.7	91.1	78.8	17.9	79.0	79.9	20.5	82.0	75.1	18.5	77.1
6	90.8	27.6	92.5	86.9	27.5	89.1	89.2	23.9	90.8	79.9	22.8	81.3
Mixed	56.1	12.4	**58.9**	50.2	14.5	**51.6**	53.0	12.1	**54.3**	49.3	11.7	**48.7**

Expt 1b: Study on distribution pattern of cotton leaf curl virus disease on local popular Bt hybrid at farmer's fields in Punjab, Rajasthan and Haryana field.

Table 92: CLCuD incidence in different districts of the North Zone - Punjab, Rajasthan and Haryana

Sr. No.	Punjab		Rajasthan		Haryana	
	Districts	Mean (PDI) (%)	Districts	Mean (PDI) (%)	Districts	Mean (PDI) (%)
1	Faridkot	24.9	Sriganganagar	27.2	Sirsa	14.5
2	Fazilka	33.3	Hanumangarh	16.2	Fatehabad	44.9
3	Muktsar	26.6			Hisar	39.9
4	Bathinda	82.6			Jind	41.9
5					Bhiwani	5.2
6					Mahendergarh	4.4
Average		**41.9**		**21.7**		**25.1**

Concluded Experiment:

Path 3: Management of Diseases of cotton

Path 3 (f): Management of sooty mold (Capnodium spp.) in cotton (Concluded 3 Years)

Path 93: Treatment details of management of sooty mold (*Capnodium* spp.) in cotton

S.No.	Treatments
T_1	Copper oxychloride (COC) 50 WP @ 1.25 g/litre of water
T_2	Copper oxychloride (COC) 50 WP @ 2.5 g/litre of water
T_3	Propiconazole 25 EC @ 1 ml / liter of water
T_4	Mancozeb 50 WP @2.0 g /liter of water
T_5	Neem oil 1500 ppm@ 5 ml/liter of water
T_6	Flonicamid @ 200g/ha or 0.6g/L of water
T_7	Control

Table 94: Management of sooty mold (*Capnodium* spp.) in cotton - Faridkot

Treatments	PDI (BS)				PDI (7 DAS)				PDI (15 DAS)				Reduction (15 Days after 3rd Spray)			
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	20.0	18.3	37.5	25.3 (29.9)	15.0	13.0	26.7	18.2 (25.0)	10.6	8.4	22.5	13.8 (21.4)	29.7	32.7	29.6	30.7 (33.6)
T2	21.7	16.9	32.5	23.7 (28.9)	12.8	11.3	18.3	14.1 (22.0)	7.2	6.3	12.5	8.7 (16.9)	41.7	42.2	48.5	**44.1 (41.6)**
T3	22.2	17.5	21.7	20.5 (26.9)	14.2	12.6	15.8	14.2 (22.1)	7.8	6.4	10.0	8.1 (16.4)	39.5	41.4	54.2	**45.0 (42.1)**
T4	19.7	16.1	35.0	23.6 (28.7)	16.1	11.0	20.0	15.7 (23.2)	8.1	6.7	13.3	9.4 (17.6)	38.4	40.4	46.7	41.8 (40.3)
T5	21.9	14.4	25.0	20.4 (26.7)	16.9	9.4	17.5	14.6 (22.3)	6.4	5.1	10.8	7.4 (15.6)	45.3	47.9	52.2	**48.5 (44.1)**
T6	21.1	13.3	23.3	19.2 (25.9)	13.3	8.9	16.7	13.0 (20.9)	4.2	3.3	9.2	5.6 (13.3)	60.0	58.1	56.2	**58.1 (49.6)**
T7	23.6	18.6	39.2	27.1 (31.1)	21.4	17.4	40.8	26.5 (30.6)	20.3	18.0	41.7	26.7 (30.7)	0.0	0.0	0.0	0.0
C.D.				N/A				4.4				4.0				3.7
SE(m)				1.5				1.4				1.3				1.2
SE(d)				2.1				2.0				1.8				1.7
C.V.				8.9				10.4				11.7				5.7

Table 95: Management of sooty mold (*Capnodium* spp.) in cotton - Hisar

S.No.	Sooty mold PDI (%)															
	I spray				II spray				III spray				Reduction over control			
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	35.7	25.5	19.4	26.9 (31.0)	41.0	20.7	18.0	26.6 (30.6)	44.0	18.2	21.2	27.8 (31.4)	27.3	50.9	39.9	39.4 (38.7)
T2	33.3	21.3	17.2	23.9 (29.1)	39.0	16.2	10.2	21.8 (27.0)	41.3	8.8	9.2	19.8 (25.0)	31.5	76.3	73.9	**60.6 (51.4)**
T3	30.7	16.0	12.2	19.6 (25.9)	32.0	10.7	9.5	17.4 (23.8)	36.3	5.9	7.3	16.5 (22.3)	40.2	84.1	79.4	**67.9 (56.3)**
T4	37.7	26.3	19.0	27.7 (31.5)	43.3	23.9	20.8	29.3 (32.5)	45.3	21.0	23.8	30.0 (32.9)	23.8	43.2	32.4	33.1 (35.0)
T5	38.5	21.0	16.7	25.4 (29.9)	44.0	20.7	17.3	27.3 (31.1)	44.7	17.2	15.7	25.9 (29.9)	23.1	53.6	55.4	44.0 (41.3)
T6	37.7	17.7	13.0	22.8 (28.0)	43.0	11.0	11.3	21.8 (26.7)	44.3	7.7	8.3	20.1 (24.9)	24.5	79.3	76.6	**60.1 (51.2)**
T7	45.3	32.0	24.1	33.8 (35.4)	56.7	35.0	27.3	39.7 (38.9)	65.7	37.0	35.3	46.0 (42.7)	0.0	0.0	0.0	0.0
C.D.				2.5				3.4				4.5				12.1
SE(m)				0.8				1.1				1.4				3.9
SE(d)				1.1				1.5				2.0				5.5
C.V.				**4.5**				**6.3**				**8.4**				**17.3**

Table 96: Management of sooty mold (*Capnodium* spp.) in cotton - Hisar

S.No.	Whitefly population / 3 leaves																SCY (Q/ha)			
	I spray				II spray				III spray				Reduction over control							
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	-	35.6	21.0	28.3 (5.4)	-	26.4	12.7	19.6 (4.5)	-	15.0	10.6	12.8 (3.7)	-	46.2	46.9	**46.6 (43.0)**	25.0	26.0	11.3	20.8
T2	-	30.7	25.7	28.2 (5.4)	-	25.1	14.2	19.7 (4.5)	-	15.9	12.2	14.1 (3.9)	-	42.8	39.2	41.0 (39.8)	27.0	26.0	11.1	**21.4**
T3	-	28.5	24.6	26.6 (5.2)	-	25.1	15.2	20.2 (4.6)	-	16.4	15.6	16.0 (4.1)	-	41.3	22.0	31.7 (34.0)	29.0	23.0	12.5	**21.5**
T4	-	24.4	29.9	27.2 (5.3)	-	21.8	17.0	19.4 (4.5)	-	16.3	16.7	16.5 (4.2)	-	41.4	16.7	29.1 (32.1)	21.0	23.0	11.0	18.3
T5	-	27.1	19.4	23.3 (4.9)	-	20.8	11.6	16.2 (4.1)	-	10.8	8.1	9.5 (3.2)	-	61.2	59.5	**60.4 (51.0)**	23.0	25.0	10.0	19.3
T6	-	28.8	15.5	22.2 (4.8)	-	19.0	9.3	14.2 (3.8)	-	9.5	6.1	7.8 (3.0)	-	66.0	69.4	**67.7 (55.4)**	25.0	28.0	10.2	**21.1**
T7	-	41.7	34.6	38.2 (6.3)	-	31.2	19.1	25.2 (5.1)	-	27.9	20.0	24.0 (5.0)	-	0.0	0.0	0.0	19.0	22.0	13.1	18.0
C.D.				N/A				0.5				0.5				12.3				N/A
SE(m)				0.3				0.2				0.1				3.5				1.4
SE(d)				0.5				0.2				0.2				4.9				1.9
C.V.				**8.7**				**4.8**				**5.4**				**13.5**				**11.8**

Table 97: Management of sooty mold (*Capnodium* spp.) in cotton - Coimbatore

Treatments	Sooty mould (%)				Inhibition over control (%)				SCY (Q/ha)			
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	12.1	8.2	4.6	8.3 (16.5)	15.4	61.0	52.5	43.0 (40.3)	16.0	16.3	15.4	15.9
T2	11.9	5.9	2.7	6.8 (14.6)	16.8	72.0	72.2	**53.7 (46.8)**	16.7	18.2	17.7	**17.5**
T3	9.4	6.8	3.6	6.6 (14.6)	34.3	68.0	62.8	**55.0 (47.9)**	17.5	17.5	16.3	**17.1**
T4	8.2	9.9	5.8	8.0 (16.3)	42.7	53.0	40.2	**45.3 (42.3)**	18.5	15.0	15.5	**16.3**
T5	11.4	10.1	5.0	8.8 (17.1)	20.3	52.0	48.4	40.2 (39.0)	17.1	15.5	15.3	16.0
T6	13.4	11.2	5.4	10.0 (18.1)	6.3	47.0	44.3	32.5 (33.2)	15.3	14.3	14.3	14.6
T7	14.3	21.0	9.7	15.0 (22.5)	0.0	0.0	0.0	0.0	14.8	12.7	12.3	13.3
C.D.				3.6				13.5				1.6
SE(m)				1.1				4.3				0.5
SE(d)				1.6				6.1				0.7
C.V.				**11.6**				**21.1**				**5.7**

Path 3 (h): Evaluation of efficacy of bio-agents against cotton diseases (Concluded at Akola – 3 Years and Surat – 4 Years)

Table 98: List of treatments for Evaluation of efficacy of bio-agents against cotton diseases

Treatment	Details
T_1	ST+ SA of *Bacillus aryabhattai* ST: 10^8cfu/g @10g per kg of seed at the time of sowing SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost
T_2	ST+ SA of *Bacillus tequeilencis* SA: 10^8cfu/g @10g per kg of seed at the time of sowing SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost
T_3	T_1+T_2 ST: 10^8cfu/g @10g per kg of seed at the time of sowing SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost
T_4	ST+ SA of Commercial product *Bacillus subtilis* SA: 10^8cfu/g @10g per kg of seed at the time of sowing; Soil application: 2.5 kg/ha (30 & 60 DAS) with FYM/compost
T_5	ST+ SA of *Pf* CICR ;SA: 10^8cfu/g @10g per kg of seed at the time of sowing; SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost
T_6	Chemical ST (Carboxin 37.5+ Thiram37.5%WS @ 0.2%); 2 gm/kg seed at the time of sowing
T_7	Foliar application of Pyraclostrobin @ 0.1%; gm/lit of water
T_8	Control

Table 99: Evaluation of efficacy of bio-agents against cotton diseases and seed cotton yield at Akola (Three years)

Treatments	Alternaria leaf spot (ALS) PDI				Bacterial leaf Blight (BLB) PDI				Grey Mildew (GM) PDI				Seed Cotton Yield (Q/ha)			
	2019-20	2021-22	2022-23	Pooled	2019-20	2021-22	2022-23	Pooled	2019-20	2021-22	2022-23	Pooled	2019-20	2021-22	2022-23	Pooled
T1	5.7	3.6	5.4	4.9 (12.7)	5.3	3.9	6.4	5.2 (13.1)	5.8	3.2	6.7	5.2 (13.1)	11.9	12.2	12.5	12.2
T2	6.2	3.9	7.2	5.8 (13.8)	4.8	4.1	6.3	5.1 (13.0)	6.0	3.4	6.5	5.3 (13.2)	10.5	12.7	12.3	11.8
T3	4.3	3.4	5.6	**4.4 (12.1)**	4.3	3.6	5.0	**4.3 (11.9)**	4.9	2.9	5.8	**4.5 (12.2)**	13.7	14.1	14.2	**14.0**
T4	5.9	3.6	6.2	5.2 (13.1)	5.6	3.8	5.7	5.0 (12.9)	6.4	3.4	6.1	5.3 (13.2)	10.5	12.3	12.5	11.8
T5	6.3	3.6	5.8	5.2 (13.1)	4.9	3.9	4.7	4.5 (12.2)	7.0	3.2	5.5	5.2 (13.1)	11.7	12.4	12.7	12.3
T6	5.3	3.8	4.5	**4.5 (12.3)**	5.1	4.1	3.8	**4.3 (12.0)**	6.1	3.6	4.9	4.9 (12.7)	13.0	13.8	13.5	**13.4**
T7	4.7	4.1	3.0	**3.9 (11.4)**	4.9	4.1	2.9	**4.0 (11.4)**	5.2	3.6	3.8	**4.2 (11.8)**	12.4	12.4	12.8	**12.5**
T8	7.4	4.3	10.1	7.3 (15.4)	7.6	4.5	9.4	7.2 (15.4)	7.8	4.3	10.9	7.7 (15.8)	9.7	11.0	10.3	10.3
C.D.				2.2				2.2				2.0				0.8
SE(m)				0.7				0.7				0.7				0.3
SE(d)				1.0				1.0				0.9				0.4
C.V.				**9.8**				**9.8**				**8.8**				**3.6**

Table 100: Evaluation of efficacy of bio-agents against cotton diseases and seed cotton yield at Surat (Four years)

Treatments	Alternaria leaf spot (ALS) PDI					Bacterial leaf Blight (BLB) PDI					Seed Cotton Yield (Q/ha)				
	2019-20	2020-21	2021-22	2022-23	Pooled	2019-20	2020-21	2021-22	2022-23	Pooled	2019-20	2020-21	2021-22	2022-23	Pooled
T1	8.3	14.5	13.3	-	12.0 (20.2)	17.2	26.7	26.2	38.0	27.0 (31.1)	21.1	19.0	19.3	18.3	19.4
T2	7.5	12.3	11.5	-	**10.4 (18.7)**	15.7	22.5	23.3	36.7	**24.6 (29.4)**	23.0	21.0	21.1	20.0	21.3
T3	4.2	10.5	10.5	-	**8.4 (16.5)**	9.7	20.8	20.3	33.5	**21.1 (26.8)**	26.8	21.2	21.6	20.6	**22.6**
T4	11.5	15.7	14.2	-	13.8 (21.8)	19.7	28.2	29.7	41.0	29.7 (32.8)	19.5	19.6	19.9	18.9	19.5
T5	6.0	18.3	15.8	-	13.4 (21.0)	13.5	14.3	14.5	23.2	**16.4 (23.7)**	24.2	25.8	26.1	24.4	**25.1**
T6	12.2	16.5	16.3	-	15.0 (22.7)	20.8	29.5	30.7	43.7	31.2 (33.8)	18.1	18.1	18.4	17.4	18.0
T7	10.2	8.7	8.2	-	**9.0 (17.5)**	18.8	32.5	33.2	45.2	32.4 (34.5)	20.4	22.5	22.8	21.7	**21.9**
T8	17.5	20.3	19.3	-	19.0 (25.8)	42.3	40.5	42.3	52.7	44.5 (41.8)	17.2	16.3	16.6	16.1	16.6
C.D.					3.7					2.8					1.8
SE(m)					1.2					0.9					0.6
SE(d)					1.7					1.3					0.9
C.V.					10.1					6.0					5.9

Path 3 (i): Integrated Management of CLCuD through its vector management (Concluded 3 Years)

Table 101: Treatments detail for the Integrated Management of CLCuD through its vector management

	IPM/Biomodule	I spray based on ETL	II spray based on ETL	III spray based on ETL	IV spray based on ETL	Fifth spray based on ETL
T1	IPM existing module	Neem 300 ppm @ 5ml/L	Neem 300 ppm@5ml/L	Diafenthiuron /Flonicamid	Spiromesifen	Repeat fourth spray treatment of respective module if required
T2	IPM module-1	Neem 300 ppm @5ml/L	Neem 300 ppm @5ml/L	Diafenthiuron /Flonicamid	CICRRS-Cj102 @10^8 cfu/ml	
T3	IPM module-2	Neem 300 ppm @5ml/L	Neem 300 ppm@5ml/L	Diafenthiuron / Flonicamid	CICRRS-Bb4511@10^8 cfu/ml	
T4	IPM module- 3	Neem 300 ppm @5ml/L	Neem 300 ppm @5ml/L	Diafenthiuron/ Flonicamid	CICRRS Ma1299 @10^8 cfu/ml	
T5	Biomodule-1	Neem 300 ppm @5ml/L	Neem 300 ppm @5ml/L	CICRRS-Cj102 @5ml/L	CICRRS-Cj102 @10^8 cfu/ml	
T6	Biomodule-2	Neem 300 ppm@5ml/L	Neem 300 ppm @5ml/L	CICRRS-Bb4511@5ml/L	CICRRS-Bb4511 @10^8 cfu/ml	
T7	Biomodule-3	Neem 300 ppm@5ml/L	Neem 300 ppm @5ml/L	CICRRS Ma1299 @5ml/L	CICRRS Ma1299 @10^8 cfu/ml	
T8	Biomodule-4	Neem 300 ppm @5ml/L	Neem 300 ppm @5ml/L	*L. lacanii* commercial formulation @5g/L	*L. lacanii* commercial formulation @5g/L	
T9	Control	No spray	No spray	No spray	No spray	

Table 102a: Integrated Management of CLCuD through its vector management (Nymph reduction % - 5DAS)-Sirsa

	Corrected mortality% (Nymph reduction% over control @ 5DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	29.7	45.6	31.9	35.7 (36.6)	21.4	28.0	20.1	23.2 (28.7)	57.5	55.8	57.6	57.0 (49.0)	51.7	55.8	60.4	**55.9 (48.4)**
T2	23.0	46.9	29.8	33.2 (35.0)	23.1	28.1	17.8	23.0 (28.6)	53.8	52.9	53.5	53.4 (46.9)	45.5	47.7	51.6	48.3 (44.0)
T3	28.4	54.5	29.0	37.3 (37.4)	25.8	30.0	16.5	24.1 (29.2)	51.4	59.2	54.1	54.9 (47.8)	37.9	38.7	48.2	41.6 (40.1)
T4	20.5	47.8	24.9	31.0 (33.5)	23.5	19.4	15.3	19.4 (26.0)	51.4	52.5	56.1	53.3 (46.9)	43.0	45.3	52.6	46.9 (43.2)
T5	30.2	50.5	33.8	38.1 (38.0)	32.3	16.4	22.2	23.6 (28.9)	53.6	53.4	55.4	54.2 (47.4)	50.4	54.8	59.6	**54.9 (47.8)**
T6	32.9	53.1	25.8	37.3 (37.4)	25.7	14.8	16.2	18.9 (25.6)	42.6	41.0	48.0	43.9 (41.5)	54.3	58.7	56.8	**56.6 (48.8)**
T7	32.8	44.5	27.1	34.8 (36.0)	28.5	39.8	15.0	27.8 (31.4)	37.0	29.9	39.4	35.4 (36.5)	50.7	48.5	57.6	**52.3 (46.3)**
T8	32.8	34.5	26.4	31.2 (33.9)	32.3	12.5	14.0	19.6 (25.8)	30.1	24.2	26.8	27.1 (31.3)	41.0	44.9	32.7	39.5 (38.9)
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C.D.				6.1				7.5				2.8				3.9
SE(m)				2.0				2.5				0.9				1.3
SE(d)				2.8				3.5				1.3				1.8
C.V.				10.9				17.2				4.1				5.6

Table 102b: Integrated Management of CLCuD through its vector management (Nymph reduction % - 7DAS)-Sirsa

	Corrected mortality% (Nymph reduction% over control @ 7DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	30.2	42.8	33.6	35.5 (36.5)	25.3	38.5	25.4	29.7 (32.9)	63.4	63.2	62.0	**62.9 (52.4)**	64.2	70.1	71.1	**68.5 (55.8)**
T2	28.7	32.4	32.8	31.3 (34.0)	27.3	35.7	22.6	28.5 (32.2)	58.9	63.0	58.3	60.1 (50.8)	62.3	68.4	64.4	**65.0 (53.7)**
T3	28.4	53.2	30.3	37.3 (37.5)	30.2	34.2	21.1	28.5 (32.1)	57.2	57.9	57.6	57.6 (49.3)	55.8	61.2	61.6	59.5 (50.5)
T4	24.9	40.6	23.2	29.6 (32.8)	29.4	28.3	20.2	26.0 (30.5)	55.3	56.8	59.0	57.0 (49.0)	51.7	55.9	59.4	55.7 (48.2)
T5	31.2	49.4	32.8	37.8 (37.8)	35.2	40.9	27.5	34.5 (35.9)	60.8	62.0	61.1	**61.3 (51.5)**	62.1	68.4	69.5	**66.7 (54.7)**
T6	33.3	48.5	29.5	37.1 (37.4)	27.3	33.7	18.6	26.5 (30.8)	54.2	53.9	58.2	55.4 (48.1)	58.7	60.0	64.3	**61.0 (51.3)**
T7	31.5	46.4	27.8	35.2 (36.3)	32.1	42.2	19.8	31.4 (33.8)	48.8	43.8	49.1	47.2 (43.4)	55.4	52.5	63.0	57.0 (49.0)
T8	34.2	34.1	24.0	30.8 (33.6)	33.7	44.8	20.6	33.0 (34.8)	43.2	44.1	33.1	40.1 (39.3)	49.0	51.8	41.8	47.5 (43.6)
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C.D.				5.5				4.4				2.8				3.4
SE(m)				1.8				1.5				0.9				1.1
SE(d)				2.6				2.1				1.3				1.6
C.V.				9.9				8.6				3.8				4.3

Table 103a: Integrated Management of CLCuD through its vector management (Whitefly adult reduction % - 5DAS)-Sirsa

	Corrected mortality% (Whitefly adult reduction% over control @ 5DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	35.5	39.0	38.5	37.7 (37.8)	36.5	30.2	23.4	30.0 (33.1)	59.7	51.2	52.5	**54.5 (47.6)**	47.9	41.5	42.6	44.0 (41.5)
T2	36.0	37.6	37.2	36.9 (37.4)	35.3	27.8	21.6	28.2 (32.0)	62.6	51.0	52.0	**55.2 (48.0)**	47.9	52.3	57.4	**52.6 (46.4)**
T3	34.2	36.8	35.2	35.4 (36.5)	33.1	30.0	21.2	28.1 (31.9)	56.2	48.9	49.0	**51.4 (45.8)**	33.1	42.1	52.1	42.4 (40.6)
T4	33.1	44.7	38.9	38.9 (38.5)	39.2	26.6	20.4	28.7 (32.2)	54.1	45.8	47.5	49.1 (44.5)	56.3	58.5	55.3	**56.7 (48.8)**
T5	28.8	43.5	38.7	37.0 (37.4)	34.4	37.0	25.4	32.3 (34.5)	33.6	43.4	39.7	38.9 (38.5)	49.6	61.6	58.6	**56.6 (48.8)**
T6	37.0	49.7	40.3	42.3 (40.6)	34.8	42.3	21.5	32.9 (34.8)	25.5	33.6	35.3	31.5 (34.1)	35.0	44.8	54.3	44.7 (41.9)
T7	34.4	45.9	38.9	39.7 (39.0)	42.5	33.0	22.6	32.7 (34.7)	37.1	45.5	41.3	41.3 (40.0)	50.9	57.0	56.5	**54.8 (47.7)**
T8	30.4	48.5	37.3	38.7 (38.4)	40.0	20.0	20.1	26.7 (30.8)	25.2	36.7	32.7	31.5 (34.1)	31.3	47.0	35.5	38.0 (37.9)
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C.D.				3.5				5.4				5.2				5.3
SE(m)				1.2				1.8				1.7				1.7
SE(d)				1.7				2.5				2.4				2.5
C.V.				6.0				10.5				8.1				7.7

Table 103b: Integrated Management of CLCuD through its vector management (Whitefly adult reduction % - 7DAS)-Sirsa

	Corrected mortality% (Whitefly adult reduction% over control @ 7DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	33.8	26.2	32.5	30.8 (33.7)	31.2	15.4	19.3	22.0 (27.7)	68.6	61.2	60.4	**63.4 (52.8)**	38.2	31.1	33.5	34.3 (35.8)
T2	33.0	12.8	32.1	26.0 (30.2)	30.5	25.3	20.9	25.6 (30.3)	69.4	58.9	57.8	**62.0 (52.0)**	39.5	43.1	49.7	**44.1 (41.6)**
T3	32.9	10.0	35.4	26.1 (30.0)	28.5	14.6	14.4	19.2 (25.7)	66.0	59.9	57.5	**61.1 (51.4)**	31.2	42.4	48.1	**40.6 (39.5)**
T4	34.8	12.0	33.9	26.9 (30.7)	34.3	11.2	14.1	19.9 (25.8)	65.2	57.5	58.1	**60.3 (50.9)**	38.8	29.0	49.8	39.2 (38.7)
T5	29.8	21.6	23.2	24.9 (29.8)	29.1	23.5	24.4	25.7 (30.4)	38.4	46.1	46.7	43.7 (41.4)	32.6	38.3	48.0	39.6 (39.0)
T6	33.3	23.6	25.1	27.3 (31.4)	32.4	41.4	21.1	31.6 (34.0)	39.5	48.0	48.8	45.4 (42.4)	28.8	39.8	46.8	38.5 (38.2)
T7	33.7	24.9	24.0	27.5 (31.6)	37.7	29.6	25.8	31.0 (33.8)	38.6	46.1	43.6	42.8 (40.8)	37.7	42.0	45.1	**41.6 (40.1)**
T8	32.8	5.4	28.1	22.1 (26.8)	33.4	10.6	24.2	22.7 (27.9)	32.3	44.9	38.8	38.7 (38.4)	31.9	43.1	40.5	38.5 (38.3)
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C.D.				8.0				7.3				5.1				5.4
SE(m)				2.7				2.4				1.7				1.8
SE(d)				3.8				3.4				2.4				2.5
C.V.				16.9				16.1				7.1				9.0

Table 104: Integrated Management of CLCuD through its vector management (CLCuD PDI %)-Sirsa

	CLCud PDI %											
	60 DAS				90 DAS				120 DAS			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	3.9	17.9	18.5	13.4 (20.6)	6.1	18.2	30.6	18.3 (24.4)	11.7	21.2	33.4	22.1 (27.6)
T2	5.0	19.8	19.9	14.9 (21.9)	7.2	20.5	29.6	19.1 (25.1)	13.3	24.8	37.2	25.1 (29.6)
T3	4.4	17.0	18.8	13.4 (20.7)	6.8	19.2	31.5	19.2 (25.1)	12.2	24.0	35.7	24.0 (28.8)
T4	5.0	16.4	20.3	13.9 (21.2)	5.8	19.4	27.4	17.5 (23.9)	7.8	25.0	36.3	23.0 (27.7)
T5	5.6	15.9	20.7	14.1 (21.4)	6.2	18.9	31.7	18.9 (24.8)	10.6	24.6	38.4	24.5 (29.0)
T6	5.6	12.2	19.6	12.5 (20.1)	8.9	17.2	29.5	18.5 (24.9)	12.8	23.1	37.0	24.3 (29.0)
T7	6.1	13.0	20.8	13.3 (20.8)	6.9	18.0	30.8	18.6 (24.7)	8.3	24.8	40.8	24.6 (28.8)
T8	5.6	16.0	18.7	13.4 (21.0)	6.1	20.2	33.5	19.9 (25.4)	7.8	25.3	43.6	25.6 (29.2)
T9	6.1	25.1	25.4	18.9 (24.9)	11.2	25.1	40.6	25.6 (29.7)	15.6	36.3	60.6	37.5 (37.1)
C.D.				N/A				1.9				4.1
SE(m)				0.9				0.6				1.4
SE(d)				1.3				0.9				1.9
C.V.				7.6				4.2				7.9

Table 105: Integrated Management of CLCuD through its vector management (CLCud Reduction % & Seed Cotton yield)-Sirsa

	CLCuD reduction % over control												Seed cotton yield			
	60 DAS				90 DAS				120 DAS				(Q/ha)			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	36.1	28.7	26.9	30.5 (33.5)	45.5	27.5	24.7	32.6 (34.6)	25.0	41.6	44.9	37.2 (37.4)	19.5	28.3	21.4	**23.1**
T2	18.0	21.1	21.6	20.3 (26.7)	35.7	18.3	27.2	27.1 (31.1)	14.7	31.7	38.6	28.3 (31.7)	18.8	25.7	19.5	21.3
T3	27.9	32.3	26.1	28.7 (32.4)	39.3	23.5	22.6	28.4 (32.1)	21.8	33.9	41.1	32.3 (34.4)	16.9	25.2	20.2	20.8
T4	18.0	34.7	19.9	24.2 (29.2)	48.2	22.7	32.5	34.5 (35.7)	50.0	31.1	40.0	40.4 (39.4)	18.7	24.7	21.1	21.5
T5	8.2	36.7	18.5	21.1 (26.5)	44.6	24.7	21.9	30.4 (33.2)	32.1	32.2	36.7	33.6 (35.4)	17.5	27.3	20.2	**21.7**
T6	8.2	51.4	22.7	27.4 (30.3)	20.5	31.5	27.5	26.5 (30.9)	17.9	36.4	38.9	31.1 (33.6)	18.7	29.3	22.7	**23.6**
T7	0.0	48.2	18.1	22.1 (23.0)	38.4	28.3	24.2	30.3 (33.3)	46.8	31.7	32.6	37.0 (37.4)	19.5	27.3	20.5	**22.4**
T8	8.2	36.3	26.1	23.5 (28.1)	45.5	19.5	17.6	27.6 (31.1)	50.0	30.3	27.9	36.1 (36.7)	15.8	24.0	18.8	19.5
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.6	22.9	18.3	19.3
C.D.				14.2				7.8				10.5	0.8	N/S	1.8	1.6
SE(m)				4.7				2.6				3.5		1.6	0.6	0.5
SE(d)				6.6				3.6				4.9		2.2	0.8	0.7
C.V.				31.9				15.3				18.9	7.6	9.1	5.1	4.3

Table 106a: Integrated Management of CLCuD through its vector management (Nymph reduction % - 5DAS) - Bathinda

	Corrected mortality% (Nymph reduction% over control @ 5DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	21.1	50.0	30.8	34.0 (35.3)	21.7	67.9	37.5	42.4 (40.3)	23.8	71.7	44.4	**46.6 (42.9)**	36.6	-	51.4	**44.0 (41.5)**
T2	26.3	66.7	40.0	44.3 (41.6)	26.4	49.1	30.8	35.4 (36.4)	15.4	50.0	35.7	33.7 (34.9)	18.3	-	39.9	29.1 (32.2)
T3	21.1	50.0	18.2	29.8 (32.5)	24.5	49.1	25.0	32.9 (34.7)	18.9	61.7	22.2	34.2 (35.2)	14.8	-	37.6	26.2 (30.2)
T4	16.8	45.0	28.6	30.1 (32.9)	21.7	67.9	43.8	44.5 (41.5)	24.5	66.7	53.8	**48.3 (43.9)**	18.3	-	47.8	**33.1 (34.5)**
T5	18.9	45.0	23.1	29.0 (32.2)	20.8	62.3	32.5	38.5 (38.0)	9.8	45.0	23.1	26.0 (29.7)	21.8	-	39.6	**30.7 (33.4)**
T6	22.1	55.0	27.3	34.8 (35.8)	19.8	30.2	34.8	28.3 (32.0)	4.9	61.7	22.2	29.6 (30.9)	21.8	-	37.6	29.7 (32.8)
T7	15.8	61.7	41.7	39.7 (38.5)	20.8	56.6	28.4	35.3 (36.0)	11.2	66.7	57.1	**45.0 (41.1)**	20.4	-	52.5	**36.5 (36.6)**
T8	20.0	61.7	12.5	31.4 (33.0)	17.9	30.2	23.1	23.7 (29.0)	14.0	66.7	33.3	**38.0 (37.3)**	19.0	-	33.4	26.2 (30.6)
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
C.D.				9.5				9.6				11.7				9.8
SE(m)				3.2				3.2				3.9				3.0
SE(d)				4.5				4.5				5.5				4.2
C.V.				17.5				17.2				20.3				13.8

Table 106b: Integrated Management of CLCuD through its vector management (Nymph reduction % - 7DAS) - Bathinda

	Corrected mortality% (Nymph reduction% over control @ 7DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	19.3	60.5	46.7	42.2 (40.1)	10.5	75.5	50.0	45.3 (41.4)	44.7	74.0	46.7	**55.1 (48.1)**	33.6	-	62.9	**48.2 (43.9)**
T2	18.2	69.8	44.6	44.2 (41.3)	10.6	62.3	48.1	40.3 (38.3)	43.2	54.0	40.0	45.7 (42.5)	13.4	-	55.2	34.3 (34.7)
T3	17.0	46.5	11.9	25.2 (29.2)	11.2	62.3	43.8	39.1 (37.7)	44.7	74.0	46.7	**55.1 (48.1)**	14.2	-	58.3	**36.2 (35.9)**
T4	13.6	37.2	20.9	23.9 (28.8)	8.3	62.3	32.5	34.4 (34.5)	39.4	74.0	63.1	**58.8 (50.3)**	12.7	-	60.1	**36.4 (35.8)**
T5	13.6	37.2	14.8	21.9 (27.3)	15.0	67.9	43.8	42.2 (39.9)	22.0	46.0	26.2	31.4 (33.8)	11.2	-	45.5	28.3 (31.0)
T6	14.8	53.5	24.5	30.9 (33.1)	11.6	56.6	39.4	35.9 (35.8)	28.0	54.0	26.7	36.2 (36.8)	16.4	-	49.0	32.7 (34.1)
T7	21.6	60.5	42.3	41.5 (39.8)	10.4	62.3	38.6	37.1 (36.4)	27.3	74.0	65.7	**55.7 (48.3)**	14.2	-	65.6	**39.9 (38.1)**
T8	19.3	53.5	13.8	28.9 (31.6)	12.3	43.4	15.6	23.8 (28.3)	13.6	54.0	6.7	24.8 (28.0)	17.9	-	58.3	**38.1 (37.4)**
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
C.D.				10.2				11.5				11.1				15.8
SE(m)				3.4				3.8				3.7				4.8
SE(d)				4.8				5.4				5.2				6.8
C.V.				19.4				20.3				17.1				20.9

Table 106c: Integrated Management of CLCuD through its vector management (Whitefly adult reduction % - 5DAS) - Bathinda

	Corrected mortality% (Whitefly adult reduction% over control @ 5DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	23.7	25.6	25.7	25.0 (30.0)	14.3	47.8	34.1	32.1 (33.9)	43.8	10.0	22.5	25.4 (29.4)	36.9	-	22.4	**29.7 (32.8)**
T2	30.1	31.6	28.4	30.1 (33.2)	19.8	33.3	25.4	26.2 (30.6)	41.9	23.0	20.8	28.6 (32.0)	32.7	-	23.2	27.9 (31.8)
T3	24.7	37.6	28.2	30.2 (33.2)	18.7	36.7	29.5	28.3 (31.9)	41.9	60.0	34.7	45.5 (42.4)	25.2	-	46.4	**35.8 (36.5)**
T4	20.4	37.6	34.4	30.8 (33.5)	16.5	22.2	8.6	15.8 (23.0)	43.1	30.0	39.7	37.6 (37.8)	33.2	-	41.4	**37.3 (37.6)**
T5	22.6	29.1	25.5	25.7 (30.4)	13.2	55.6	38.6	35.8 (36.0)	25.0	23.0	20.8	22.9 (28.6)	33.6	-	23.2	28.4 (32.1)
T6	24.7	25.6	27.2	25.9 (30.5)	12.1	55.6	42.0	36.5 (36.3)	28.8	23.0	30.1	27.3 (31.5)	24.3	-	31.5	27.9 (31.8)
T7	19.4	23.1	21.2	21.2 (27.4)	14.3	44.4	33.0	30.6 (33.0)	31.3	60.0	34.7	42.0 (40.3)	27.1	-	46.4	**36.7 (37.1)**
T8	22.6	17.1	13.5	17.7 (24.8)	9.9	33.3	25.4	22.9 (27.9)	28.1	40.0	33.6	33.9 (35.5)	14.5	-	38.1	26.3 (30.2)
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
C.D.				4.6				9.6				11.4				15.1
SE(m)				1.5				3.2				3.8				4.6
SE(d)				2.1				4.5				5.3				6.5
C.V.				9.7				19.6				21.1				21.6

Table 106d: Integrated Management of CLCuD through its vector management (Whitefly adult reduction % - 7DAS) - Bathinda

	Corrected mortality% (Whitefly adult reduction% over control @ 7DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	16.2	42.7	42.9	33.9 (35.1)	8.7	58.9	48.2	38.6 (37.1)	23.5	32.3	41.6	32.4 (34.6)	43.8	-	47.7	**45.7 (42.5)**
T2	15.4	51.3	49.3	38.7 (37.8)	9.2	55.6	50.3	38.3 (37.0)	22.1	35.5	33.6	30.4 (33.3)	27.8	-	42.7	35.2 (36.3)
T3	12.8	48.7	41.2	34.2 (35.0)	10.5	66.7	62.7	46.6 (42.0)	24.0	71.0	53.4	**49.5 (44.5)**	29.6	-	76.8	**53.2 (47.1)**
T4	10.5	59.8	58.3	42.9 (39.8)	7.2	47.8	39.1	31.4 (32.7)	25.3	53.8	60.0	**46.4 (42.7)**	26.6	-	70.9	**48.7 (44.2)**
T5	7.6	40.2	37.4	28.4 (31.0)	12.9	66.7	53.9	44.5 (41.0)	10.3	46.2	44.6	33.7 (34.5)	31.4	-	56.4	43.9 (41.4)
T6	7.4	46.2	46.8	33.5 (33.9)	9.9	70.0	61.3	47.1 (42.2)	13.0	35.5	41.4	30.0 (32.6)	28.4	-	48.9	38.7 (38.3)
T7	8.0	40.2	38.7	29.0 (31.4)	9.7	55.6	46.4	37.2 (36.4)	16.3	78.5	65.0	**53.3 (46.6)**	30.2	-	90.6	**60.4 (52.7)**
T8	9.3	31.6	28.4	23.1 (28.0)	10.2	58.9	54.4	41.2 (38.7)	12.3	64.5	60.5	**45.8 (41.7)**	29.6	-	77.9	**53.7 (47.4)**
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
C.D.				9.0				10.9				12.3				22.1
SE(m)				3.0				3.6				4.1				6.7
SE(d)				4.2				5.1				5.8				9.4
C.V.				17.1				18.2				20.5				24.3

Table 107: Integrated Management of CLCuD through its vector management (CLCuD PDI % & Seed Cotton yield) - Bathinda

	CLCuD PDI %																Seed cotton yield			
	60 DAS				75 DAS				90 DAS				115 DAS				(Q/ha)			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	4.4	3.9	26.7	11.7 (18.2)	11.1	16.7	47.2	25.0 (29.0)	18.3	22.2	56.7	32.4 (34.1)	18.9	25.6	66.7	**37.1 (37.0)**	35.2	18.5	8.5	**20.7**
T2	4.4	7.8	27.8	13.3 (20.0)	11.1	16.7	49.4	25.7 (29.4)	20.6	25.6	57.2	34.5 (35.5)	26.1	27.8	67.2	40.4 (39.2)	27.8	16.1	7.8	**17.2**
T3	1.7	3.9	28.9	11.5 (17.1)	7.8	12.8	51.7	24.1 (27.7)	25.0	27.2	59.4	37.2 (37.3)	28.9	28.3	69.4	42.2 (40.3)	23.4	15.7	7.4	15.5
T4	1.7	9.4	28.3	13.1 (19.2)	6.7	11.7	50.6	23.0 (26.8)	26.1	23.9	60.0	36.7 (36.9)	30.0	27.2	70.0	42.4 (40.5)	24.6	17.1	7.1	**16.3**
T5	3.3	8.9	27.8	13.3 (19.9)	8.3	12.8	56.7	25.9 (28.8)	28.9	32.2	56.1	39.1 (38.5)	34.4	34.4	66.7	45.2 (42.2)	25.5	15.2	6.5	**15.7**
T6	2.8	7.8	28.9	13.2 (19.4)	9.4	13.3	54.4	25.7 (28.9)	20.6	30.6	58.3	36.5 (36.8)	33.9	32.2	68.9	45.0 (42.1)	24.6	15.3	6.2	15.4
T7	2.8	6.1	27.8	12.2 (18.6)	10.0	13.3	50.6	24.6 (28.4)	30.6	29.4	60.0	40.0 (39.0)	33.3	31.7	70.6	45.2 (42.2)	24.0	15.5	6.3	15.3
T8	5.0	7.8	30.0	14.3 (20.8)	14.4	15.0	56.7	28.7 (31.3)	24.4	33.3	61.1	39.6 (38.7)	37.2	36.7	71.1	48.3 (44.1)	25.4	15.0	5.9	15.4
T9	4.4	9.4	31.1	15.0 (21.3)	16.7	14.4	58.9	30.0 (32.2)	29.4	35.0	62.2	42.2 (40.4)	39.4	38.9	73.9	50.7 (45.6)	23.3	14.8	4.7	14.3
C.D.				N/S				N/S				3.2				3.0	6.2	NS	1.8	3.0
SE(m)				1.0				1.1				1.0				1.0				1.0
SE(d)				1.4				1.6				1.5				1.4				1.4
C.V.				9.1				6.5				4.8				4.2	13.8	22.1	15.2	10.6

Table 108a: Integrated Management of CLCuD through its vector management (Nymph reduction % - 5DAS) - Hisar

	Corrected mortality% (Nymph reduction% over control @ 5DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	-	-	41.8	41.8	-	-	27.8	27.8	-	-	46.8	46.8	-	-	35.0	35.0
T2	-	-	35.7	35.7	-	-	20.7	20.7	-	-	35.1	35.1	-	-	25.5	25.5
T3	-	-	38.8	38.8	-	-	17.7	17.7	-	-	37.2	37.2	-	-	21.8	21.8
T4	-	-	41.3	41.3	-	-	27.6	27.6	-	-	43.0	43.0	-	-	26.0	26.0
T5	-	-	53.1	53.1	-	-	33.1	33.1	-	-	36.1	36.1	-	-	40.9	40.9
T6	-	-	49.0	49.0	-	-	30.2	30.2	-	-	27.1	27.1	-	-	33.9	33.9
T7	-	-	42.9	42.9	-	-	26.7	26.7	-	-	33.5	33.5	-	-	26.9	26.9
T8	-	-	43.9	43.9	-	-	28.5	28.5	-	-	20.1	20.1	-	-	29.9	29.9
T9	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0

Table 108b: Integrated Management of CLCuD through its vector management (Nymph reduction % - 7DAS) – Hisar

	Corrected mortality% (Nymph reduction% over control @ 7DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	13.9	38.4	38.1	30.1 (32.8)	10.5	47.1	16.0	24.5 (28.6)	26.3	64.0	34.3	**41.5 (39.9)**	29.4	-	27.7	**28.6 (32.3)**
T2	14.2	32.0	23.8	23.3 (28.6)	10.6	44.1	10.3	21.7 (26.4)	23.5	65.0	27.0	**38.5 (38.0)**	14.8	-	21.5	18.2 (25.1)
T3	12.1	28.9	28.6	23.2 (28.4)	11.2	41.5	7.7	20.1 (25.2)	24.3	63.7	27.7	**38.6 (38.1)**	14.9	-	20.3	17.6 (24.7)
T4	9.9	25.0	33.3	22.7 (27.9)	8.3	43.3	11.9	21.2 (26.0)	26.0	60.7	27.4	**38.0 (37.8)**	17.3	-	22.5	19.9 (26.4)
T5	6.8	28.7	47.6	27.7 (30.4)	15.0	42.2	17.2	24.8 (29.3)	12.7	59.1	27.4	33.1 (34.2)	13.4	-	33.8	**23.6 (28.5)**
T6	12.3	38.7	40.5	30.5 (32.8)	11.6	42.8	19.5	24.6 (29.0)	13.3	61.0	20.6	31.6 (33.2)	13.2	-	24.1	18.7 (25.3)
T7	9.9	31.8	38.1	26.6 (30.2)	10.4	38.5	11.4	20.1 (25.6)	16.1	58.4	24.7	33.1 (34.4)	14.3	-	21.2	17.8 (24.8)
T8	12.3	21.6	33.3	22.4 (27.8)	12.3	40.6	19.5	24.1 (28.8)	10.4	56.9	12.4	26.6 (29.5)	15.8	-	20.8	18.3 (25.3)
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
C.D.				7.9				7.7				9.0				7.3
SE(m)				2.6				2.6				3.0				2.2
SE(d)				3.7				3.6				4.2				3.1
C.V.				17.0				18.2				16.3				13.3

Table 109a: Integrated Management of CLCuD through its vector management (Whitefly adult reduction % - 5DAS) - Hisar

	Corrected mortality% (Whitefly adult reduction% over control @ 5DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	-	-	33.3	33.3	-	-	49.5	49.5	-	-	47.4	47.4	-	-	46.7	46.7
T2	-	-	21.3	21.3	-	-	41.0	41.0	-	-	17.7	17.7	-	-	33.2	33.2
T3	-	-	22.5	22.5	-	-	37.9	37.9	-	-	20.6	20.6	-	-	30.2	30.2
T4	-	-	21.9	21.9	-	-	46.0	46.0	-	-	39.0	39.0	-	-	39.8	39.8
T5	-	-	31.7	31.7	-	-	51.8	51.8	-	-	48.9	48.9	-	-	51.8	51.8
T6	-	-	27.3	27.3	-	-	48.2	48.2	-	-	48.8	48.8	-	-	49.7	49.7
T7	-	-	31.2	31.2	-	-	49.8	49.8	-	-	40.8	40.8	-	-	45.0	45.0
T8	-	-	22.0	22.0	-	-	35.6	35.6	-	-	29.3	29.3	-	-	31.6	31.6
T9	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0

Table 109b: Integrated Management of CLCuD through its vector management (Whitefly adult reduction % - 7DAS) - Hisar

	Corrected mortality% (Whitefly adult reduction% over control @ 7DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	16.2	45.4	29.8	30.5 (33.0)	8.7	57.0	39.4	35.0 (35.0)	23.5	77.4	43.0	**48.0 (43.8)**	30.4	-	40.9	**35.7 (36.6)**
T2	15.4	43.8	22.3	27.2 (30.9)	9.2	48.8	30.3	29.4 (31.8)	22.1	76.7	16.8	38.5 (37.8)	23.4	-	24.7	24.1 (29.4)
T3	12.8	45.9	20.2	26.3 (30.1)	10.5	45.5	27.5	27.8 (31.0)	24.0	76.0	11.5	37.2 (36.6)	22.7	-	20.8	21.8 (27.8)
T4	10.5	35.8	25.1	23.8 (28.6)	7.2	49.9	34.9	30.7 (32.2)	25.3	76.6	39.0	**47.0 (43.3)**	23.9	-	36.6	**30.3 (33.2)**
T5	7.6	31.2	29.8	22.9 (27.7)	12.9	44.0	40.3	32.4 (34.0)	10.3	70.2	27.7	36.1 (35.8)	23.3	-	39.5	31.4 (33.9)
T6	7.4	36.8	22.5	22.2 (27.1)	9.9	51.6	33.1	31.5 (33.1)	13.0	66.8	35.0	38.3 (37.4)	20.9	-	33.9	27.4 (31.4)
T7	8.0	33.7	32.3	24.7 (28.8)	9.7	43.8	33.6	29.0 (31.7)	16.3	72.6	37.0	**42.0 (39.9)**	22.2	-	32.8	**27.5 (31.5)**
T8	9.3	41.5	17.4	22.7 (27.5)	10.2	48.5	21.5	26.7 (30.1)	12.3	65.1	21.8	33.1 (34.0)	14.5	-	21.6	18.1 (25.0)
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
C.D.				7.8				8.9				13.1				6.8
SE(m)				2.6				3.0				4.3				2.0
SE(d)				3.7				4.2				6.1				2.9
C.V.				17.2				17.8				22.0				10.4

Table 109c: Integrated Management of CLCuD through its vector management (CLCuD PDI % & Seed Cotton yield) - Hisar

	CLCuD PDI %																Seed cotton yield			
	60 DAS				75 DAS				90 DAS				115 DAS				(Q/ha)			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	2.4	0.3	3.9	2.2 (7.8)	4.3	0.4	20.0	8.2 (14.0)	6.6	0.2	21.0	9.3 (14.9)	11.3	-	47.6	29.5 (31.6)	24.1	24.0	21.4	**23.2**
T2	3.1	0.3	5.8	3.1 (9.1)	5.6	0.0	19.1	8.2 (13.2)	9.8	0.7	27.4	12.6 (18.2)	15.2	-	47.0	31.1 (33.1)	19.2	23.0	23.0	21.7
T3	2.5	0.3	5.0	2.6 (8.4)	5.4	0.3	18.4	8.0 (14.0)	9.1	0.5	23.4	11.0 (16.8)	13.7	-	46.0	29.9 (32.2)	22.1	22.0	23.5	**22.5**
T4	2.7	0.0	8.3	3.7 (8.7)	5.6	0.0	19.5	8.4 (13.3)	9.4	0.0	23.3	10.9 (15.6)	13.8	-	46.0	29.9 (32.2)	21.1	21.0	21.9	21.3
T5	3.2	0.4	6.3	3.3 (9.5)	5.9	0.0	18.6	8.2 (13.2)	9.7	0.8	20.6	10.4 (16.8)	16.2	-	47.6	31.9 (33.7)	17.5	21.0	22.9	20.5
T6	4.0	0.3	6.6	3.6 (9.9)	6.8	0.0	19.2	8.7 (13.7)	10.3	0.7	22.2	11.1 (17.2)	16.9	-	47.9	32.4 (34.0)	17.3	19.0	20.0	18.8
T7	3.1	0.3	7.2	3.5 (9.6)	5.8	0.0	21.4	9.1 (13.8)	9.8	0.8	29.6	13.4 (18.8)	15.3	-	48.8	32.1 (33.7)	19.8	20.0	20.2	20.0
T8	2.9	0.4	11.5	4.9 (11.1)	5.6	0.0	19.3	8.3 (13.2)	10.7	0.5	28.2	13.1 (18.4)	14.8	-	48.0	31.4 (33.2)	20.2	20.0	21.0	20.4
T9	4.4	0.7	12.2	5.8 (12.4)	7.0	0.6	23.1	10.2 (16.2)	15.2	0.6	30.6	15.5 (20.3)	19.3	-	50.0	34.7 (35.5)	16.1	19.0	18.3	17.8
C.D.				N/A				N/A				2.8				N/A				2.3
SE(m)				1.0				0.7				0.9				0.7				0.7
SE(d)				1.4				1.0				1.3				1.0				1.1
C.V.				17.6				8.9				9.1				3.1				6.2

Table 111a: Integrated Management of CLCuD through its vector management (Nymph reduction % - 5DAS) - Sriganganagar

	Corrected mortality% (Nymph reduction% over control @ 5DAS)																			
	1st Spray				2nd Spray				3rd Spray				4th Spray				5th Spray			
Treatment	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	-	42.2	48.8	45.5 (42.4)	-	44.9	49.8	47.3 (43.5)	-	69.4	47.6	58.5 (50.0)	-	-	49.6	49.6	-	-	46.6 (43.1)	46.6
T2	-	44.4	45.8	45.1 (42.2)	-	49.0	47.5	48.3 (44.0)	-	73.5	46.7	60.1 (51.0)	-	-	45.6	45.6	-	-	43.9 (41.5)	43.9
T3	-	44.4	50.1	47.3 (43.4)	-	46.9	50.4	48.7 (44.2)	-	71.4	48.2	59.8 (50.8)	-	-	50.4	50.4	-	-	47.7 (43.6)	47.7
T4	-	40.0	44.9	42.5 (40.6)	-	44.9	46.6	45.8 (42.5)	-	69.4	46.3	57.8 (49.6)	-	-	44.5	44.5	-	-	44.5 (41.8)	44.5
T5	-	44.4	45.9	45.2 (42.2)	-	49.0	48.7	48.9 (44.3)	-	53.1	46.6	49.8 (44.9)	-	-	47.4	47.4	-	-	44.5 (41.8)	44.5
T6	-	40.0	45.8	42.9 (40.9)	-	44.9	46.4	45.6 (42.5)	-	57.1	46.2	51.7 (45.9)	-	-	45.2	45.2	-	-	43.2 (41.1)	43.2
T7	-	44.4	48.6	46.5 (43.0)	-	49.0	49.3	49.1 (44.5)	-	57.1	47.4	52.3 (46.3)	-	-	50.4	50.4	-	-	46.3 (42.8)	46.3
T8	-	44.4	47.0	45.7 (42.5)	-	46.9	48.8	47.9 (43.8)	-	53.1	47.9	50.5 (45.3)	-	-	49.3	49.3	-	-	44.9 (42.0)	44.9
T9	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0
C.D.				2.2				1.9				9.5				-			8.4	
SE(m)				0.7				0.6				2.9				-			2.4	
SE(d)				1.0				0.8				4.1				-			-	
C.V.				2.5				2.1				9.5				-			8.2	

Table 110b: Integrated Management of CLCuD through its vector management (Nymph reduction % - 7DAS) - Sriganganagar

	Corrected mortality% (Nymph reduction% over control @ 7DAS)																			
	1st Spray				2nd Spray				3rd Spray				4th Spray				5th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	-	51.8	44.8	48.3 (44.0)	-	54.3	44.9	49.6 (44.8)	-	66.6	42.0	**54.3 (47.5)**	-	-	43.1	**43.1**	-	-	40.7 (39.6)	**40.7**
T2	-	47.8	41.6	44.7 (41.9)	-	52.2	42.1	47.2 (43.3)	-	66.3	40.9	**53.6 (47.1)**	-	-	40.0	40.0	-	-	36.7 (37.2)	36.7
T3	-	50.1	46.3	48.2 (44.0)	-	57.2	45.7	51.4 (45.8)	-	69.3	43.7	**56.5 (48.8)**	-	-	45.1	**45.1**	-	-	41.8 (40.2)	**41.8**
T4	-	51.1	41.1	46.1 (42.7)	-	52.5	41.3	46.9 (43.2)	-	66.8	41.5	54.2 (47.4)	-	-	38.2	38.2	-	-	36.5 (36.9)	36.5
T5	-	54.9	42.2	48.5 (44.1)	-	58.9	43.4	51.2 (45.6)	-	56.2	42.0	49.1 (44.5)	-	-	40.6	40.6	-	-	39.2 (38.6)	39.2
T6	-	56.6	41.0	48.8 (44.3)	-	51.8	41.2	46.5 (43.0)	-	57.6	41.0	49.3 (44.6)	-	-	38.8	38.8	-	-	36.9 (37.3)	36.9
T7	-	52.3	44.5	48.4 (44.1)	-	53.6	44.7	49.1 (44.5)	-	56.9	42.2	49.5 (44.7)	-	-	43.2	**43.2**	-	-	41.1 (39.8)	**41.1**
T8	-	58.5	42.8	50.7 (45.4)	-	56.1	43.1	49.6 (44.8)	-	51.4	42.5	46.9 (43.2)	-	-	42.5	**42.5**	-	-	39.5 (38.9)	39.5
T9	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0
C.D.				5.0				4.1				8.6				-			5.8	
SE(m)				1.5				1.2				2.6				-			1.9	
SE(d)				2.2				1.7				3.7				-			-	
C.V.				5.5				4.4				9.0				-			8.8	

Table 112a: Integrated Management of CLCuD through its vector management (Whitefly adult reduction % - 5DAS) - Sriganganagar

	Corrected mortality% (Whitefly adult reduction% over control @ 5DAS)																			
	1st Spray				2nd Spray				3rd Spray				4th Spray				5th Spray			
Treatment	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	55.0	54.0	51.9	53.6 (47.1)	59.8	55.5	54.6	56.7 (48.8)	75.0	71.3	46.7	64.3 (53.6)	74.6	-	58.2	66.4 (54.7)	-	-	56.2 (48.5)	56.2
T2	54.2	54.8	49.7	52.9 (46.6)	62.6	57.8	52.5	57.6 (49.4)	77.7	74.3	45.8	65.9 (54.6)	58.0	-	55.0	56.5 (48.7)	-	-	52.9 (46.7)	52.9
T3	57.3	55.6	51.3	54.8 (47.7)	58.6	56.3	55.3	56.7 (48.9)	76.7	73.3	47.3	65.7 (54.5)	54.1	-	59.5	56.8 (48.9)	-	-	57.3 (49.3)	57.3
T4	56.7	53.2	48.3	52.8 (46.6)	62.2	54.7	51.7	56.2 (48.6)	74.0	71.3	45.5	63.6 (53.1)	52.8	-	54.2	53.5 (47.0)	-	-	51.9 (46.1)	51.9
T5	55.6	55.6	50.8	54.0 (47.3)	60.7	55.5	53.6	56.6 (48.8)	54.0	59.4	45.7	53.0 (46.7)	62.5	-	56.6	59.5 (50.5)	-	-	54.2 (47.4)	54.2
T6	56.7	54.0	49.4	53.4 (46.9)	60.4	56.3	52.5	56.4 (48.7)	56.5	65.3	45.4	55.7 (48.3)	56.6	-	54.8	55.7 (48.3)	-	-	52.9 (46.6)	52.9
T7	55.0	56.5	52.0	54.5 (47.6)	61.9	55.5	54.2	57.2 (49.1)	54.8	63.4	46.6	54.9 (47.8)	55.1	-	58.8	56.9 (49.0)	-	-	56.5 (48.8)	56.5
T8	54.6	55.6	50.6	53.6 (47)	62.8	57.0	53.6	57.8 (49.5)	53.0	57.4	47.0	52.5 (46.4)	49.1	-	58.0	53.5 (47.0)	-	-	55.1 (47.9)	55.1
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0
C.D.				1.4				1.8				7.0				7.3			9.6	
SE(m)				0.5				0.6				2.3				2.2			3.2	
SE(d)				0.7				0.9				3.3				3.1			-	
C.V.				2.0				2.4				8.9				7.1			9.3	

Table 112b: Integrated Management of CLCuD through its vector management (Whitefly adult reduction % - 7DAS) - Sriganganagar

	Corrected mortality% (Whitefly adult reduction% over control @ 7DAS)																			
	1st Spray				2nd Spray				3rd Spray				4th Spray				5th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	53.0	53.3	48.7	51.7 (45.9)	57.8	54.4	51.9	54.7 (47.7)	72.8	70.0	42.2	**61.7 (51.9)**	73.1	-	52.4	**62.8 (52.5)**	-	-	51.3 (45.7)	**51.3**
T2	51.9	53.8	47.8	51.2 (45.7)	61.1	56.1	49.2	55.5 (48.1)	74.6	73.1	41.5	**63.1 (52.8)**	56.3	-	49.9	**53.1 (46.8)**	-	-	47.8 (43.7)	47.8
T3	54.0	53.6	48.3	52.0 (46.1)	56.6	54.7	52.6	54.6 (47.6)	73.9	72.4	44.0	**63.4 (53.0)**	52.6	-	54.1	**53.3 (46.9)**	-	-	52.2 (46.2)	**52.2**
T4	54.8	51.6	46.3	50.9 (45.5)	60.3	53.5	48.5	54.1 (47.3)	71.8	70.7	41.8	**61.4 (51.8)**	51.1	-	48.5	49.8 (44.9)	-	-	46.9 (43.2)	46.9
T5	51.4	53.4	48.3	51.0 (45.6)	58.6	54.3	49.9	54.3 (47.4)	52.4	57.3	42.0	50.6 (45.3)	60.0	-	50.3	55.2 (48.0)	-	-	49.8 (44.8)	49.8
T6	54.0	52.0	47.7	51.2 (45.7)	57.8	54.7	49.2	53.9 (47.2)	53.9	62.7	41.3	52.6 (46.5)	55.1	-	48.8	52.0 (46.1)	-	-	47.1 (43.3)	47.1
T7	53.2	54.4	49.5	52.4 (46.3)	59.8	53.5	51.6	55.0 (47.8)	52.2	60.6	42.5	51.8 (46.0)	53.7	-	52.5	**53.1 (46.8)**	-	-	51.6 (45.9)	**51.6**
T8	52.3	53.6	48.9	51.6 (45.9)	60.5	55.5	50.9	55.6 (48.2)	51.2	54.4	42.5	49.4 (44.6)	48.0	-	51.9	49.9 (45.0)	-	-	49.4 (44.6)	49.4
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0
C.D.				1.4				2.0				7.1				7.3			8.5	
SE(m)				0.5				0.7				2.3				2.2			2.8	
SE(d)				0.7				0.9				3.3				3.1			-	
C.V.				2.0				2.7				9.3				7.4			9.1	

Table 113: Integrated Management of CLCuD through its vector management (CLCuD PDI % & Seed Cotton yield) – Sriganganagar

	CLCuD PDI %																Seed cotton yield			
	60 DAS				75 DAS				90 DAS				115 DAS				(Q/ha)			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	16.1	6.8	24.3	15.7 (22.8)	18.8	12.7	27.9	19.8 (26.1)	27.2	15.6	34.2	25.7 (30.2)	31.1	17.5	41.3	30.0 (32.9)	29.6	34.6	18.7	**27.6**
T2	17.3	4.8	25.5	15.9 (22.5)	18.1	12.2	27.2	19.2 (25.7)	27.6	16.6	34.6	26.3 (30.6)	30.7	20.2	41.7	30.9 (33.5)	30.1	33.1	17.7	**27.0**
T3	16.7	4.4	26.6	15.9 (22.4)	18.8	13.1	28.8	20.2 (26.4)	29.4	18.3	35.3	27.7 (31.5)	32.5	23.1	42.1	32.6 (34.6)	29.6	33.5	17.6	26.9
T4	16.9	6.4	26.2	16.5 (23.2)	17.1	13.9	28.9	20.0 (26.3)	30.0	19.6	35.7	28.4 (32.0)	32.4	21.2	43.7	32.4 (34.5)	30.3	32.0	18.0	26.8
T5	17.1	6.6	22.9	15.5 (22.6)	18.7	11.9	24.7	18.4 (25.2)	29.2	19.8	32.1	27.0 (31.2)	33.0	20.6	40.8	31.5 (33.9)	29.2	31.2	18.9	26.4
T6	17.4	8.7	25.9	17.3 (24.1)	19.6	15.2	29.0	21.3 (27.3)	29.9	22.0	35.8	29.2 (32.6)	32.3	22.6	42.2	32.4 (34.5)	28.9	34.9	17.9	**27.2**
T7	17.2	6.8	26.6	16.9 (23.5)	19.2	14.6	29.7	21.2 (27.1)	30.3	21.7	35.5	29.2 (32.6)	32.0	21.9	43.4	32.4 (34.5)	28.9	33.8	17.7	26.8
T8	16.3	5.7	25.6	15.9 (22.7)	17.2	12.9	27.3	19.1 (25.7)	29.8	17.5	33.6	27.0 (31.1)	31.8	20.7	41.9	31.5 (33.9)	27.4	31.4	18.4	25.7
T9	16.9	7.8	24.2	16.3 (23.3)	18.8	12.1	27.4	19.4 (25.9)	31.2	18.3	35.5	28.3 (31.9)	35.7	21.4	43.6	33.6 (35.2)	27.2	32.1	16.6	25.3
C.D.				N/A				1.1				1.5				1.2	2.4	2.7	3.2	N/S
SE(m)				0.6				0.4				0.5				0.4				0.6
SE(d)				0.9				0.5				0.7				0.6				0.8
C.V.				4.7				2.5				2.8				2.1				3.7

Table 114a: Integrated Management of CLCuD through its vector management (Nymph reduction % - 5DAS) - Faridkot

	Corrected mortality% (Nymph reduction% over control @ 5DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	15.6	13.1	31.8	20.2 (26.3)	18.7	23.0	31.1	24.3 (29.4)	24.0	26.0	22.7	24.2 (29.5)	23.0	30.0	55.7	36.2 (36.7)
T2	15.6	15.6	28.3	19.8 (26.2)	21.1	12.3	46.5	26.6 (30.3)	23.1	28.2	31.4	27.6 (31.6)	18.3	10.7	30.3	19.8 (25.9)
T3	12.8	6.3	23.5	14.2 (21.5)	19.0	13.9	22.0	18.3 (25.2)	18.3	29.8	29.2	25.8 (30.4)	12.1	14.0	25.9	17.3 (24.3)
T4	16.7	9.4	25.4	17.1 (24.1)	16.9	14.4	30.5	20.6 (26.7)	18.6	31.3	26.2	25.4 (30.1)	9.9	8.0	21.3	13.1 (20.7)
T5	13.3	9.4	24.8	15.8 (23.0)	18.1	11.8	32.8	20.9 (26.7)	11.1	16.8	31.3	19.7 (25.9)	12.7	10.7	24.5	16.0 (23.2)
T6	15.0	10.0	24.7	16.6 (23.7)	20.2	12.3	40.9	24.5 (29.0)	14.4	13.7	29.8	19.3 (25.7)	13.4	2.7	24.1	13.4 (20.1)
T7	10.6	6.9	24.7	14.0 (21.3)	20.5	12.3	35.8	22.9 (28.1)	10.5	17.6	22.1	16.7 (23.9)	9.9	10.0	22.7	14.2 (21.7)
T8	13.3	10.6	29.9	18.0 (24.5)	14.2	11.2	33.9	19.8 (25.8)	10.8	12.2	26.9	16.6 (23.6)	12.1	10.0	12.0	11.4 (19.7)
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C.D.				4.5				6.8				6.0				7.0
SE(m)				1.5				2.2				2.0				2.3
SE(d)				2.1				3.2				2.8				3.3
C.V.				12.0				15.8				14.0				18.7

Table 114b: Integrated Management of CLCuD through its vector management (Nymph reduction % - 7DAS) - Faridkot

	Corrected mortality% (Nymph reduction% over control @ 7DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	9.1	9.5	27.7	15.4 (22.4)	9.2	11.7	18.0	13.0 (20.9)	23.8	22.7	33.1	**26.5 (30.9)**	23.1	24.3	60.5	**36.0 (36.4)**
T2	8.3	9.9	21.7	13.3 (20.9)	11.8	9.3	11.1	10.7 (19.1)	22.9	23.4	40.1	**28.8 (32.3)**	14.9	11.0	36.6	20.8 (26.4)
T3	9.7	8.8	34.2	17.6 (23.7)	9.9	8.5	17.7	12.0 (20.0)	20.7	24.3	33.3	26.1 (30.6)	13.8	11.7	39.4	21.6 (26.9)
T4	8.0	10.5	21.3	13.3 (20.9)	8.9	8.7	10.7	9.4 (17.9)	21.9	22.4	37.1	**27.1 (31.2)**	13.1	12.1	47.1	**24.1 (28.3)**
T5	8.9	8.9	29.2	15.7 (22.5)	10.7	9.7	16.0	12.1 (20.3)	13.2	12.9	48.8	25.0 (28.9)	12.7	13.9	34.9	20.5 (26.3)
T6	10.0	9.1	25.4	14.8 (22.1)	12.2	11.2	18.5	14.0 (21.8)	12.2	11.5	39.5	21.1 (26.4)	14.0	10.2	36.6	20.3 (25.9)
T7	8.9	9.0	35.1	17.7 (23.7)	10.8	8.2	15.5	11.5 (19.7)	11.8	11.6	39.6	21.0 (26.3)	12.7	11.6	44.2	**22.8 (27.5)**
T8	8.6	8.9	28.0	15.2 (22.1)	8.7	9.0	17.8	11.8 (19.8)	10.6	12.2	20.1	14.3 (22.0)	11.7	11.1	16.5	13.1 (21.1)
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C.D.				5.8				3.2				7.6				8.1
SE(m)				1.9				1.0				2.5				2.7
SE(d)				2.7				1.5				3.6				3.8
C.V.				16.7				10.2				17.2				19.0

Table 115a: Integrated Management of CLCuD through its vector management (Whitefly adult reduction % - 5DAS) - Faridkot

	Corrected mortality% (Whitefly adult reduction% over control @ 5DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	8.6	34.2	35.5	26.1 (29.8)	31.9	43.2	32.1	35.7 (36.6)	59.0	63.6	64.5	62.4 (52.1)	63.2	68.9	29.5	53.9 (47.2)
T2	3.7	30.0	33.9	22.5 (26.6)	34.5	40.7	38.2	37.8 (37.9)	63.1	66.7	70.4	66.7 (54.8)	34.2	42.2	32.7	36.4 (37.0)
T3	2.5	33.3	46.7	27.5 (29.1)	30.0	35.8	25.2	30.3 (33.4)	57.6	63.6	69.2	63.5 (52.8)	35.3	40.0	38.8	38.0 (38.1)
T4	9.9	30.8	29.8	23.5 (28.4)	30.9	35.8	21.8	29.5 (32.8)	61.4	63.6	67.1	64.0 (53.1)	33.1	44.4	36.3	37.9 (38.0)
T5	6.2	32.5	37.6	25.4 (29.0)	30.6	38.3	30.5	33.1 (35.1)	28.5	37.9	51.2	39.2 (38.6)	34.9	37.8	29.7	34.1 (35.7)
T6	2.5	38.3	33.7	24.8 (27.6)	33.6	32.1	30.1	31.9 (34.4)	32.2	36.4	47.8	38.8 (38.5)	38.6	35.6	30.8	35.0 (36.2)
T7	1.2	41.7	43.6	28.8 (29.3)	33.9	34.6	34.9	34.4 (35.9)	34.6	37.9	45.4	39.3 (38.8)	33.1	35.6	29.5	32.7 (34.9)
T8	0.0	33.3	47.9	27.1 (26.3)	30.6	40.7	19.5	30.3 (33.1)	32.9	39.4	37.5	36.6 (37.2)	30.9	37.8	18.5	29.1 (32.4)
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C.D.				12.2				4.4				3.7				7.3
SE(m)				4.0				1.5				1.2				2.4
SE(d)				5.7				2.1				1.7				3.4
C.V.				27.8				8.2				5.3				12.6

Table 115b: Integrated Management of CLCuD through its vector management (Whitefly adult reduction % - 7DAS) - Faridkot

	Corrected mortality% (Whitefly adult reduction% over control @ 7DAS)															
	1st Spray				2nd Spray				3rd Spray				4th Spray			
Treatment	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**	**2020-21**	**2021-22**	**2022-23**	**Pooled**
T1	9.6	30.5	42.9	27.7 (30.8)	33.7	30.0	33.6	32.4 (34.7)	62.0	60.0	49.3	**57.1 (49.1)**	69.7	66.0	43.1	**59.6 (50.6)**
T2	5.8	28.8	39.6	24.7 (28.5)	36.8	32.0	31.8	33.5 (35.4)	67.6	62.0	67.0	**65.5 (54.0)**	46.1	38.0	28.6	37.6 (37.7)
T3	5.8	29.9	35.0	23.6 (27.8)	37.1	30.0	37.6	34.9 (36.2)	66.0	63.0	41.0	56.7 (48.9)	43.4	36.0	23.5	34.3 (35.7)
T4	9.6	25.2	39.7	24.8 (29.1)	34.0	34.0	38.8	35.6 (36.6)	67.0	62.0	46.2	**58.4 (49.9)**	46.8	34.0	26.6	35.8 (36.6)
T5	7.7	29.1	28.7	21.8 (27.0)	29.8	34.0	30.0	31.3 (34.0)	47.7	35.0	32.5	38.4 (38.2)	48.1	35.0	36.6	**39.9 (39.1)**
T6	3.8	30.1	34.0	22.6 (26.7)	33.1	28.0	34.6	31.9 (34.4)	46.1	33.0	30.4	36.5 (37.1)	40.1	34.0	41.0	**38.4 (38.2)**
T7	3.8	32.5	45.7	27.3 (29.5)	35.6	29.0	26.1	30.2 (33.3)	42.4	37.0	34.1	37.8 (37.9)	49.5	37.0	48.5	**45.0 (42.1)**
T8	3.8	28.3	23.3	18.5 (24.1)	36.5	30.0	51.5	39.3 (38.7)	41.4	39.0	27.7	36.0 (36.8)	42.1	37.0	37.2	38.8 (38.5)
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C.D.				8.6				4.6				5.3				6.5
SE(m)				2.8				1.5				1.8				2.2
SE(d)				4.0				2.2				2.5				3.0
C.V.				19.8				8.4				7.8				10.5

Table 116: Integrated Management of CLCuD through its vector management (CLCuD PDI % & Seed Cotton yield) - Faridkot

	CLCuD PDI %																Seed cotton yield			
	60 DAS				75 DAS				90 DAS				115 DAS				(Q/ha)			
Treatment	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	0.3	6.3	15.8	7.5 (13.7)	7.8	5.8	20.8	11.5 (19.1)	20.4	7.9	25.8	18.0 (24.6)	24.1	27.5	38.3	30.0 (33.1)	32.3	33.1	5.0	23.5
T2	0.7	5.0	16.7	7.5 (13.9)	8.2	6.7	23.3	12.7 (20.2)	21.0	7.1	28.3	18.8 (24.9)	23.2	27.9	41.7	30.9 (33.6)	32.2	33.2	4.8	23.4
T3	0.6	5.8	15.0	7.1 (13.7)	7.7	8.3	21.7	12.6 (20.2)	21.8	10.0	27.5	19.8 (26.0)	24.3	28.8	40.8	31.3 (33.9)	33.6	33.0	4.2	23.6
T4	0.8	4.6	17.5	7.6 (14.1)	8.8	6.3	22.5	12.5 (20.0)	21.2	8.3	29.2	19.6 (25.6)	25.1	26.7	45.0	32.3 (34.4)	33.7	33.6	4.4	23.9
T5	0.6	5.8	19.2	8.5 (14.8)	9.2	7.1	24.2	13.5 (20.9)	22.0	9.2	27.5	19.6 (25.7)	28.2	28.8	47.5	34.8 (36.0)	31.5	31.4	4.2	22.4
T6	0.4	3.8	18.3	7.5 (13.4)	9.0	4.6	25.0	12.9 (19.9)	22.7	7.5	30.0	20.1 (25.8)	27.0	30.8	47.5	35.1 (36.2)	29.6	29.9	4.0	21.2
T7	0.8	4.2	16.7	7.2 (13.7)	9.3	5.4	23.3	12.7 (20.0)	20.9	7.9	26.7	18.5 (24.9)	27.8	32.5	43.3	34.5 (35.9)	30.1	29.6	4.8	21.5
T8	0.4	5.8	19.2	8.5 (14.5)	9.6	7.5	25.8	14.3 (21.5)	22.9	9.6	30.8	21.1 (26.8)	28.3	29.6	40.8	32.9 (34.9)	28.6	30.5	4.0	21.0
T9	0.8	5.0	20.8	8.9 (15.1)	10.0	6.3	29.2	15.2 (21.9)	23.8	10.8	34.2	22.9 (28.0)	33.4	36.3	51.7	40.5 (39.4)	27.9	27.7	2.6	19.4
C.D.				N/A				N/A				1.4				1.9	6.9	1.1	83.7	1.8
SE(m)				0.7				0.7				0.5				0.6				0.6
SE(d)				1.0				1.0				0.7				0.9				0.8
C.V.				8.3				5.9				3.1				3.1	1.2	4.9	11.4	4.6

Table 117a: Integrated Management of CLCuD through its vector management (Nymph reduction % over control @ 7DAS)

Treatment	Nymph reduction % over control @ 7DAS											
	Bathinda		Hisar		Sriganganagar		Faridkot		Sirsa		Pooled	
	3rd Spray	4th spray	3rd Spray	4th spray	3rd Spray	4th spray	3rd Spray	4th spray	3rd Spray	4th spray	3rd Spray	4th spray
T1	55.1	48.2	41.5	28.6	54.3	43.1	26.5	36.0	62.9	68.5	**48.1**	**44.9**
T2	45.7	34.3	38.5	18.2	53.6	40.0	28.8	20.8	60.1	65.0	**45.3**	35.7
T3	55.1	36.2	38.6	17.6	56.5	45.1	26.1	21.6	57.6	59.5	**46.8**	**36.0**
T4	58.8	36.4	38.0	19.9	54.2	38.2	27.1	24.1	57.0	55.7	**47.0**	34.9
T5	31.4	28.3	33.1	23.6	49.1	40.6	25.0	20.5	61.3	66.7	40.0	**35.9**
T6	36.2	32.7	31.6	18.7	49.3	38.8	21.1	20.3	55.4	61.0	38.7	34.3
T7	55.7	39.9	33.1	17.8	49.5	43.2	21.0	22.8	47.2	57.0	41.3	**36.1**
T8	24.8	38.1	26.6	18.3	46.9	42.5	14.3	13.1	40.1	47.5	30.5	31.9
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 117b: Integrated Management of CLCuD through its vector management (Whitefly adult reduction % over control @ 7DAS)

Treatment	Whitefly adult reduction % over control @ 7DAS											
	Bathinda		Hisar		Sriganganagar		Faridkot		Sirsa		Pooled	
	3rd Spray	4th spray	3rd Spray	4th spray	3rd Spray	4th spray	3rd Spray	4th spray	3rd Spray	4th spray	3rd Spray	4th spray
T1	32.4	45.7	48.0	35.7	61.7	62.8	57.1	59.6	63.4	34.3	**52.5**	**47.6**
T2	30.4	35.2	38.5	24.1	63.1	53.1	65.5	37.6	62.0	44.1	51.9	38.8
T3	49.5	53.2	37.2	21.8	63.4	53.3	56.7	34.3	61.1	40.6	**53.6**	**40.6**
T4	46.4	48.7	47.0	30.3	61.4	49.8	58.4	35.8	60.3	39.2	**54.7**	**40.8**
T5	33.7	43.9	36.1	31.4	50.6	55.2	38.4	39.9	43.7	39.6	40.5	**42.0**
T6	30.0	38.7	38.3	27.4	52.6	52.0	36.5	38.4	45.4	38.5	40.6	39.0
T7	53.3	60.4	42.0	27.5	51.8	53.1	37.8	45.0	42.8	41.6	45.5	**45.5**
T8	45.8	53.7	33.1	18.1	49.4	49.9	36.0	38.8	38.7	38.5	40.6	39.8
T9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 118: Integrated Management of CLCuD through its vector management (CLCuD PDI % and Seed Cotton Yield in Q/ha)

Treatment	CLCuD PDI % at 115-120 DAS						SCY (Q/ha)									
	Bathinda	Hisar	Sri Ganganagar	Faridkot	Sirsa	Pooled	Bathinda	Inc %	Hisar	Inc %	Sri Ganganagar	Inc %	Faridkot	Inc %	Sirsa	Inc %
T1	37.1	29.5	30.0	30.0	22.1	**29.7**	20.7	6.4	23.2	5.4	27.6	2.3	23.5	4.1	23.1	3.8
T2	40.4	31.1	30.9	30.9	25.1	**31.7**	17.2	2.9	21.7	3.9	27.0	1.7	23.4	4.0	21.3	2.0
T3	42.2	29.9	32.6	31.3	24.0	**32.0**	15.5	1.2	22.5	4.7	26.9	1.6	23.6	4.2	20.8	1.5
T4	42.4	29.9	32.4	32.3	23.0	**32.0**	16.3	2.0	21.3	3.5	26.8	1.5	23.9	4.5	21.5	2.2
T5	45.2	31.9	31.5	34.8	24.5	33.6	15.7	1.4	20.5	2.7	26.4	1.1	22.4	3.0	21.7	2.4
T6	45.0	32.4	32.4	35.1	24.3	33.8	15.4	1.1	18.8	1.0	27.2	1.9	21.2	1.8	23.6	4.3
T7	45.2	32.1	32.4	34.5	24.6	33.8	15.3	1.0	20.0	2.2	26.8	1.5	21.5	2.1	22.4	3.1
T8	48.3	31.4	31.5	32.9	25.6	33.9	15.4	1.1	20.4	2.6	25.7	0.4	21.0	1.6	19.5	0.2
T9	50.7	34.7	33.6	40.5	37.5	39.4	14.3	0	17.8	0	25.3	0	19.4	0	19.3	0

Table 118b. Statement showing Economics of various treatments in management of CLCuD through its vector management of cotton (Pooled)

Modules	Yield range (Q-ha)	Pooled SCY (Q/ha)	Yield increase over control Q/ha	Additional income (Rs) by the treatments Col 1)	Cost of treatment (Pesticides, labor charge etc(Rs/ha)	Net realization	ICBR on Net
1		**2**	**3**	**4**	**5**	**6 (4-5)**	**7 (4/5)**
Exiting IPM	20.7- 27.6	23.6	4.4	37400	7700.0	29700	3.9
New IPM 1	17.2 -27.0	22.1	2.9	24650	7250.0	17400	2.4
New IPM 2	15.5 - 26.9	21.9	2.7	22950	7230.0	15720	2.2
New IPM 3	16.3 – 26.8	21.9	2.7	22950	7230.0	15720	2.2
New Biomodule 1	15.7 – 26.4	21.3	2.1	17850	5950.0	11900	2.0
New Biomodule 2	15.4 – 27.2	21.2	2.0	17000	5940.0	11060	1.9
New Biomodule 3	15.3 – 26.8	21.2	2.0	17000	5940.0	11060	1.9
Existing Biomodule 1	15.4 – 25.7	20.4	1.2	10200	6450.0	3750	0.6
Control	14.3 – 25.3	19.2	-	-	-	-	-

Cost of Treatments

S.No	Treatment	Approximate Cost (Rs)
1	Neem oil	570/L
2	Flonicamid	7600/Kg
3	Diafenthiurone	2600Kg
4	Spiromecifen	1200/L
5	EPF formulations	300/L
6	L leacanii commercial formulation	595/L
7	Labor charge for one spray/ha	500.0
8	Picking charge per Q seed cotton	100.0
9	Approx Price of seed cotton	8500.0

Path 3 (j): Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations (Concluded 3 years)

Table 119: List of treatments for Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations

Treatments	Details
T_1	Kresoxim methyl 44.3% SC @ 1 ml/litre of water
T_2	Propiconazole 25% EC @ 1 ml/litre of water
T_3	Propineb 70% WP @ 2.5 g/litre of water
T_4	Fluxapyroxad 167 g/litre + Pyraclostrobin 333 g/litre SC @ 0.6 g/litre of water
T_5	Metiram 55% + Pyraclostrobin 5% WG @ 2 g/litre of water
T_6	Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1 ml/ litre of water
T_7	Copper sulphate 47.15% + Mancozeb 30% WDG @ 5 g/ litre of water
T_8	Captan 70 % + Hexaconazole 5 % WP @ 1.5 g/ litre of water
T_9	Copper oxychloride 50 % WP @ 2.5 g litre of water
T_{10}	Flonicamid 80 g/acre (60 & 90 days)/ Diafenthiuron/ Dinotefuran (110 – 120 days)
T_{11}	Fluvalinate (for bugs)
T_{12}	Control (Water spray)

Table 120: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their combinations (Bathinda)

Treatments	Fungal Foliar Leaf Spot															
	DI (100 DAS)**(BS)				PDI (15 DAS)				Reduction over control (%)				SCY (Q/ha)			
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	53.3	86.7	83.3	74.4	3.0	5.5	5.1	4.5	66.7	63.3	63.1	64.4	23.8	19.1	8.8	**17.2**
T2	70.0	80.0	76.6	75.5	7.5	10.2	10.0	9.2	16.7	32.2	28.5	25.8	20.5	16.2	5.6	14.1
T3	46.7	76.7	80.0	67.8	5.0	7.5	10.6	7.7	44.4	50.0	48.8	47.7	21.5	16.7	5.2	**14.5**
T4	50.0	86.7	83.3	73.3	8.5	11.3	8.0	9.3	5.5	24.4	42.8	24.2	19.4	15.6	6.7	13.9
T5	66.7	80.0	80.0	75.6	6.5	9.0	8.6	8.0	27.8	40.0	38.1	35.3	21.4	16.3	6.1	**14.6**
T6	46.7	76.7	76.6	66.7	3.5	6.0	5.8	5.1	61.1	60.0	58.3	59.8	21.9	17.1	8.5	**15.8**
T7	-	80.0	80.0	80.0	-	8.3	7.0	7.7	-	44.4	50.0	47.2	-	16.5	6.9	11.7
T8	-	86.7	83.3	85.0	-	7.0	7.1	7.1	-	53.3	52.3	52.8	-	16.8	6.7	11.8
T9	-	90.0	86.6	88.3	-	10.3	8.1	9.2	-	31.1	47.6	39.4	-	15.9	7.3	11.6
T10	-	73.3	73.3	73.3	-	11.5	11.5	11.5	-	23.3	29.7	26.5	-	15.5	5.2	10.4
T11	-	93.3	90.0	91.7	-	14.5	10.0	12.3	-	3.3	28.5	15.9	-	14.6	4.7	9.7
T12	73.3	96.7	96.6	88.9	9.0	15.0	14.0	12.7	--	--	--	-	18.9	14.4	3.9	12.4

Table 121a: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their combinations (Hisar)

Treatments	Boll rot (% Incidence)											
	I Spray				II Spray				III Spray			
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	9.3	12.0	2.6	8.0	12.0	14.0	5.1	10.4	14.1	18.0	7.0	13.0
T2	9.1	12.5	2.7	8.1	11.4	14.4	5.5	10.4	13.0	18.0	7.2	12.7
T3	8.9	10.0	1.8	6.9	10.6	11.5	4.2	8.8	12.0	13.0	5.3	10.1
T4	6.4	7.0	1.5	5.0	8.1	8.1	3.4	6.5	10.8	9.0	4.0	7.9
T5	7.9	7.0	1.6	5.5	9.0	8.0	3.8	6.9	11.9	10.1	4.4	8.8
T6	9.2	8.1	1.8	6.4	11.9	10.0	4.0	8.6	13.9	13.0	5.0	10.6
T7	-	10.4	2.0	6.2	-	13.3	4.8	9.1	-	15.0	6.2	10.6
T8	-	11.1	2.4	6.8	-	14.0	5.0	9.5	-	16.5	6.5	11.5
T9	-	10.2	1.8	6.0	-	11.0	4.5	7.8	-	12.0	6.0	9.0
T10	-	13.0	2.7	7.9	-	15.4	5.9	10.7	-	18.1	7.7	12.9
T11	-	13.2	2.8	8.0	-	15.2	6.0	10.6	-	20.0	7.9	14.0
T12	10.4	14.2	3.4	9.3	15.0	17.0	6.5	12.8	20.4	25.6	8.5	18.2

Table 121b: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their combinations (Hisar)

Treatments	Boll rot (Reduction % over control)															
	I Spray				II Spray				III Spray				SCY (Q/ha)			
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	10.2	15.6	24.8	16.9	20.0	17.7	21.5	19.7	30.9	29.7	17.9	26.2	23.0	21.0	6.1	16.7
T2	12.3	11.8	20.4	14.8	23.5	15.3	15.9	18.2	36.1	29.7	15.9	27.2	24.0	21.0	5.9	17.0
T3	14.4	29.2	47.8	30.5	29.3	32.4	35.4	32.4	40.9	49.2	37.9	42.7	24.0	23.0	6.6	**17.9**
T4	38.4	50.6	54.9	48.0	46.0	52.6	47.7	48.8	47.1	64.8	53.1	55.0	27.0	25.0	7.5	**19.8**
T5	23.2	50.6	52.2	42.0	40.0	52.9	42.0	45.0	41.6	60.7	48.4	50.2	27.0	25.0	7.3	**19.8**
T6	11.5	42.6	48.4	34.2	20.1	41.2	38.0	33.1	31.5	49.3	41.4	40.7	24.0	23.0	6.7	**17.9**
T7	-	26.8	41.3	34.1	-	22.0	26.6	24.3	-	41.4	27.7	34.6	-	22.0	6.3	14.2
T8	-	21.4	30.1	25.8	-	17.7	23.1	20.4	-	35.6	23.8	29.7	-	21.0	6.2	13.6
T9	-	28.0	46.9	37.5	-	35.3	30.3	32.8	-	53.3	30.0	41.7	-	24.0	6.4	15.2
T10	-	8.3	21.2	14.8	-	9.2	9.7	9.5	-	29.2	10.1	19.7	-	21.0	5.8	13.4
T11	-	7.1	18.6	12.9	-	10.8	7.7	9.3	-	22.0	7.7	14.9	-	20.0	5.6	12.8
T12	-	-	-	-	-	-	-	-	-	-	-	-	21.0	20.0	5.2	15.4

Table 122: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their combinations (Surat)

Treatment	Bacterial leaf blight (PDI)				Reduction over control (%)				Boll rot (PDI)				Reduction over control (%)				Seed cotton yield (Q/ha)			
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	30.2	31.3	34.2	31.9	23.5	24.8	36.3	28.2	20.8	19.3	18.0	19.4	30.2	31.4	32.9	31.5	21.7	21.5	19.5	20.9
T2	33.3	34.7	37.7	35.2	15.7	16.8	29.8	20.8	25.5	22.7	21.3	23.2	14.5	19.5	20.5	18.2	19.5	19.3	17.3	18.7
T3	31.5	32.8	35.8	33.4	20.3	21.2	33.2	24.9	24.0	20.8	19.5	21.4	19.6	26.0	27.3	24.3	20.4	20.5	18.4	19.8
T4	24.2	21.2	25.2	23.5	38.7	49.2	53.1	47.0	13.8	14.7	13.7	14.1	53.6	47.9	49.1	50.2	26.8	26.0	24.1	**25.6**
T5	25.7	25.3	28.8	26.6	34.9	39.2	46.3	40.1	16.1	16.3	14.7	15.7	45.8	42.0	45.3	44.4	24.3	24.2	22.3	**23.6**
T6	27.7	28.8	32.2	29.6	29.9	30.8	40.1	33.6	17.3	18.0	16.5	17.3	41.9	36.1	38.5	38.8	23.1	22.9	20.9	22.3
T7	-	37.7	40.3	39.0	-	9.6	24.8	17.2	-	24.2	22.7	23.5	-	14.2	15.5	14.9	-	17.5	15.4	16.4
T8	-	35.0	38.5	36.8	-	16.0	28.3	22.2	-	23.7	22.3	23.0	-	16.0	16.8	16.4	-	18.1	16.1	17.1
T9	-	19.8	23.5	21.7	-	52.4	56.2	54.3	-	13.3	12.8	13.1	-	52.7	52.2	52.5	-	26.4	24.8	**25.6**
T10	-	38.2	41.5	39.9	-	8.4	22.7	15.6	-	24.7	23.3	24.0	-	12.4	13.0	12.7	-	17.1	15.2	16.2
T11	-	39.7	43.0	41.4	-	4.8	19.9	12.4	-	26.2	24.8	25.5	-	7.1	7.5	7.3	-	16.8	15.1	15.9
T12	39.5	41.7	53.7	45.0	-	-	-	-	29.8	28.2	26.8	28.3	-	-	-	-	18.1	16.4	15.0	**16.5**

Table 123: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their combinations (Nanded)

T. No	ALS (PDI)				Red. over control %				Grey mildew (PDI)				Red. over control %				No. of bugs/plant				Seed cotton Yield (Q/ha)			
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	-	4.1	4.5	4.3	-	49.5	46.0	47.8	-	4.5	7.2	5.8	-	66.5	69.9	68.2	-	0.9	1.7	1.3	-	11.5	11.7	**11.6**
T2	-	4.8	4.8	4.8	-	40.7	42.0	41.4	-	7.4	12.0	9.7	-	45.1	49.7	47.4	-	0.8	1.5	1.2	-	10.2	10.8	10.5
T3	-	4.3	4.7	4.5	-	45.9	44.0	45.0	-	6.6	10.2	8.4	-	51.2	57.3	54.3	-	0.9	1.7	1.3	-	10.7	11.3	**11.0**
T4	-	2.1	2.7	2.4	-	73.8	68.0	70.9	-	2.7	4.8	3.8	-	79.8	79.7	79.8	-	0.9	1.8	1.4	-	13.2	13.0	**13.1**
T5	-	3.5	3.3	3.4	-	55.9	60.0	58.0	-	6.3	9.7	8.0	-	53.2	59.4	56.3	-	0.8	1.6	1.2	-	10.9	10.7	10.8
T6	-	3.6	3.7	3.6	-	55.0	56.0	55.5	-	6.4	10.2	8.3	-	52.3	57.3	54.8	-	0.9	1.7	1.3	-	10.7	11.0	10.9
T7	-	5.5	5.5	5.5	-	31.3	34.0	32.7	-	8.9	15.3	12.1	-	34.4	35.7	35.1	-	0.9	1.7	1.3	-	9.6	9.3	9.5
T8	-	5.6	5.3	5.5	-	30.2	36.0	33.1	-	8.6	14.7	11.6	-	36.0	38.5	37.3	-	1.0	1.7	1.4	-	10.0	8.8	9.4
T9	-	5.6	5.7	5.6	-	29.8	32.0	30.9	-	9.0	15.8	12.4	-	33.1	33.6	33.4	-	0.9	1.6	1.3	-	8.7	9.0	8.9
T10	-	7.3	7.5	7.4	-	9.1	10.0	9.6	-	11.4	19.7	15.5	-	15.9	17.5	16.7	-	0.2	0.7	0.5	-	7.3	7.8	7.6
T11	-	7.3	7.7	7.5	-	8.5	8.0	8.3	-	11.4	20.0	15.7	-	15.6	16.1	15.9	-	0.3	1.0	0.7	-	7.2	7.7	7.5
T12	-	8.0	8.3	8.2	-	-	-	-	-	13.5	22.8	18.2	-	-	-	-	-	1.0	1.8	1.4	-	7.0	7.3	7.2

***No incidence of Boll rot noticed**

Table 124a: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their combinations (Nagpur)

Treatment	Boll rot (% Incidence)								Corynespora leaf spot (PDI)							
	I st Spray				II spray				I st Spray				IInd spray			
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	46.6	16.7	22.2	28.5	71.7	23.3	26.7	40.6	21.6	4.0	6.0	10.5	21.6	21.0	12.0	18.2
T2	60.0	20.0	20.0	33.3	73.3	20.0	20.0	37.8	28.9	1.7	7.3	12.6	36.6	15.0	9.7	20.4
T3	50.0	23.3	20.0	31.1	68.3	36.7	13.4	39.5	31.0	4.0	7.0	14.0	40.0	17.0	15.0	24.0
T4	53.3	20.0	24.4	32.6	70.0	20.0	13.4	34.5	23.3	1.0	3.3	9.2	26.7	13.0	7.7	15.8
T5	36.7	20.0	17.8	24.8	63.3	23.3	16.7	34.4	28.3	0.0	3.7	10.7	33.3	16.0	12.3	20.5
T6	53.3	13.3	11.1	25.9	73.3	23.3	20.0	38.9	17.2	1.0	8.0	8.7	23.0	17.2	9.3	16.5
T7	-	6.7	13.3	10.0	-	13.3	13.4	13.4	-	1.7	7.3	4.5	-	23.0	21.7	22.4
T8	-	13.3	13.3	13.3	-	16.7	16.7	16.7	-	4.4	7.7	6.1	-	14.0	11.3	**12.7**
T9	-	3.3	11.1	7.2	-	6.7	10.0	8.4	-	4.4	4.7	4.6	-	15.0	12.3	**13.7**
T10	-	26.7	26.7	26.7	-	30.0	30.0	30.0	-	3.3	7.3	5.3	-	13.0	15.7	**14.4**
T11	-	33.3	24.4	28.9	-	36.7	30.0	33.4	-	2.2	6.0	4.1	-	33.9	18.3	26.1
T12	63.3	36.7	28.9	43.0	81.6	40.0	36.7	52.8	33.9	13.0	8.7	18.5	41.6	46.0	27.3	38.3
C.D.				N/A				N/A				N/A				9.57
SE(m)				7.68				9.73				1.47				3.04
SE(d)				10.87				13.76				2.08				4.30
C.V.				51.09				56.64				42.37				24.73

Table 124b: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their combinations (Nagpur)

Treatment	Grey mildew (PDI)											
	I st Spray				IInd spray				Yield (Q/ha)			
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	5.0	11.1	0.3	5.5	0.8	6.0	4.3	3.7	17.5	15.9	17.7	17.0
T2	14.2	13.9	2.3	10.1	6.7	8.3	5.3	6.8	21.3	15.3	16.3	**17.6**
T3	11.7	8.3	1.0	7.0	3.3	11.1	15.7	10.0	19.4	15.8	18.5	**17.9**
T4	10.7	13.4	2.0	8.7	3.3	8.3	4.3	5.3	25.7	16.6	17.2	**19.8**
T5	5.8	11.1	1.0	6.0	2.5	11.1	13.7	9.1	17.8	17.2	16.2	17.1
T6	11.7	13.9	7.7	11.1	3.3	13.4	12.3	9.7	19.1	14.7	17.5	17.1
T7	-	16.7	1.0	8.9	-	24.0	19.3	21.7	-	15.2	17.5	16.4
T8	-	11.1	0.3	5.7	-	26.3	15.7	21.0	-	15.1	15.1	15.1
T9	-	13.4	1.0	7.2	-	39.7	22.0	30.9	-	16.5	17.7	17.1
T10	-	17.0	7.3	12.2	-	50.0	28.7	39.4	-	17.9	14.8	16.4
T11	-	20.3	8.7	14.5	-	48.6	31.3	40.0	-	15.2	15.8	15.5
T12	22.5	20.5	5.7	16.2	25.0	52.0	38.0	38.3	9.0	12.0	14.4	11.8
C.D.				4.19				13.47				N/A
SE(m)				1.33				4.28				0.86
SE(d)				1.88				6.05				1.216
C.V.				21.59				28.49				7.562

Table 125a: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their combinations (Lam, Guntur)

Treatment	Corynespora leaf spot (PDI)																Grey mildew (PDI)							
	Before Spray				1st Spray				2nd Spray				3rd Spray				1st Spray				2nd Spray			
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	4.0	4.9	4.7	4.5	14.7	7.0	12.2	11.3	11.6	11.2	7.5	10.1	2.3	15.3	-	8.8	7.0	8.3	9.8	8.4	-	2.2	7.2	4.7
T2	3.5	4.0	4.5	4.0	13.2	6.7	13.4	11.1	9.2	10.3	8.3	9.3	1.1	13.8	-	7.4	4.6	6.3	10.2	7.0	-	2.0	7.6	4.8
T3	5.0	4.7	3.8	4.5	15.3	5.3	13.3	11.3	9.4	9.8	7.9	9.0	1.9	11.9	-	6.9	1.8	4.2	10.6	5.5	-	1.1	7.6	4.3
T4	4.8	2.9	3.8	3.8	14.9	7.2	15.5	12.5	10.8	11.3	8.5	10.2	1.4	11.8	-	6.6	5.2	6.9	11.3	7.8	-	2.6	7.3	5.0
T5	4.3	4.1	4.7	4.4	14.5	7.5	14.9	12.3	10.9	10.8	8.3	10.0	1.4	12.9	-	7.2	7.4	4.8	8.6	6.9	-	2.5	7.3	4.9
T6	4.3	3.6	4.5	4.1	14.6	5.8	10.8	10.4	11.3	10.3	8.3	10.0	1.3	13.6	-	7.5	4.5	1.8	7.5	4.6	-	1.4	7.2	4.3
T7	-	4.0	4.5	4.3	-	6.3	13.9	10.1	-	11.9	8.6	10.2	-	15.5	-	15.5	-	10.7	9.9	10.3	-	0.8	7.5	4.2
T8	-	4.2	3.0	3.6	-	6.6	13.4	10.0	-	11.3	8.4	9.9	-	10.5	-	10.5	-	6.2	10.8	8.5	-	1.5	6.7	4.1
T9	-	3.3	4.3	3.8	-	7.4	12.3	9.9	-	11.3	8.4	9.9	-	15.3	-	15.3	-	8.7	8.8	8.7	-	5.2	7.3	6.2
T10	-	4.4	4.3	4.4	-	8.3	22.3	15.3	-	19.4	19.3	19.3	-	27.2	-	27.2	-	13.3	16.6	14.9	-	7.7	11.5	9.6
T11	-	3.5	3.5	3.5	-	8.4	22.2	15.3	-	18.8	20.1	19.4	-	24.4	-	24.4	-	14.1	16.8	15.5	-	9.7	11.5	10.6
T12	5.0	3.6	3.7	4.1	20.7	15.3	29.3	21.8	26.8	24.2	25.2	25.4	22.9	36.6	-	29.8	17.3	17.8	21.1	18.7	-	13.5	16.5	15.0
CD @5%	NS	NS	NS		2.2	2.3	3.1		2.3	1.7	1.3		1.6	3.7			2.1	2.8	2.6			1.3	1.4	
CV%	16.8	19.6	15.4		8.2	17.5	11.3		10.2	7.6	6.9		19.0	12.6			16.9	18.9	13.1			18.6	**9.6**	

Table 125b: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their combinations (Lam, Guntur)

Treatment	Corynespora leaf spot (% Reduction over control)												Grey mildew (% Reduction over control)							
	1st Spray				2nd Spray				3rd Spray				1st Spray				2nd Spray			
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	29.0	54.3	58.5	47.3	56.8	53.8	70.2	60.3	89.8	58.1	-	74.0	59.4	53.1	53.7	55.4	-	83.9	56.6	70.3
T2	36.3	56.5	54.2	49.0	65.8	57.3	66.9	63.3	95.3	63.6	-	79.5	73.5	64.8	51.8	63.4	-	85.2	54.1	69.7
T3	26.2	65.8	54.6	48.9	64.9	59.7	65.5	63.4	91.6	67.4	-	79.5	89.9	76.5	49.8	72.1	-	92.0	54.1	73.1
T4	27.8	53.2	47.2	42.7	59.6	53.1	66.2	59.6	93.8	67.7	-	80.8	70.0	61.0	46.3	59.1	-	80.9	55.6	68.3
T5	29.9	51.1	49.1	43.4	59.3	55.2	66.9	60.5	93.8	64.9	-	79.4	56.9	72.8	59.3	63.0	-	81.5	55.6	68.6
T6	29.5	62.5	63.4	51.8	58.0	57.3	67.2	60.8	94.2	62.9	-	78.6	73.9	89.7	64.4	76.0	-	89.5	56.6	73.1
T7	-	59.2	52.5	55.9	-	50.7	65.9	58.3	-	57.6	-	57.6	-	39.9	52.9	46.4	-	94.4	54.6	74.5
T8	-	57.1	54.2	55.7	-	53.5	66.6	60.1	-	71.3	-	71.3	-	62.2	49.0	55.6	-	88.9	59.6	74.3
T9	-	51.6	58.0	54.8	-	53.5	66.6	60.1	-	58.1	-	58.1	-	51.2	58.5	54.9	-	61.7	56.1	58.9
T10	-	45.7	24.1	34.9	-	27.9	23.5	25.7	-	39.4	-	39.4	-	24.9	21.4	23.2	-	43.2	30.3	36.8
T11	-	45.8	24.4	35.1	-	33.1	20.2	26.7	-	46.9	-	46.9	-	20.7	20.2	20.5	-	32.1	30.3	31.2
T12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 125c: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their combinations (Lam, Guntur)

Treatment	Rust (PDI & Reduction%)																Boll rot %				Yield (Q/ha)			
	1st Spray (PDI)				% Control				2nd Spray (PDI)				% Control											
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	9.8	8.5	13.7	10.7	73.6	41.2	55.3	56.7	-	18.7	9.0	13.9	-	39.4	62.5	51.0	-	0.8	0.8	0.8	26.8	10.9	19.3	**19.0**
T2	9.8	8.2	15.4	11.1	73.8	43.7	49.6	55.7	-	17.3	8.8	13.1	-	44.0	63.2	53.6	-	1.7	0.7	1.2	26.5	11.0	19.1	**18.9**
T3	11.8	7.1	14.3	11.1	68.2	51.2	53.4	57.6	-	16.8	8.7	12.7	-	45.6	63.9	54.8	-	4.0	0.9	2.5	26.4	11.5	18.0	**18.6**
T4	9.4	7.6	15.3	10.8	74.7	47.7	49.9	57.4	-	8.8	10.6	9.7	-	71.4	55.9	63.7	-	1.6	0.5	1.1	24.9	10.0	16.0	**17.0**
T5	10.9	7.3	15.7	11.3	70.6	50.0	48.8	56.5	-	18.3	10.6	14.4	-	40.7	55.9	48.3	-	2.2	0.7	1.5	23.8	10.0	15.0	16.3
T6	9.3	6.3	11.9	9.2	74.9	56.3	61.0	64.1	-	15.3	10.7	13.0	-	50.7	55.5	53.1	-	1.9	0.8	1.4	26.5	10.1	14.3	**17.0**
T7	-	9.4	13.7	11.5	-	35.0	55.3	45.2	-	19.8	10.8	15.3	-	35.9	54.9	45.4	-	2.4	0.8	1.6	-	9.4	16.2	12.8
T8	-	7.7	12.8	10.3	-	47.1	58.0	52.6	-	15.6	10.1	12.8	-	49.6	58.0	53.8	-	1.6	0.7	1.2	-	10.5	14.7	12.6
T9	-	9.0	13.9	11.5	-	37.9	54.5	46.2	-	19.6	9.9	14.8	-	36.7	58.7	47.7	-	2.3	0.7	1.5	-	10.2	14.8	12.5
T10	-	12.8	27.5	20.2	-	12.1	10.1	11.1	-	26.8	16.6	21.7	-	13.5	30.9	22.2	-	3.4	1.1	2.3	-	9.9	10.9	10.4
T11	-	11.8	28.3	20.0	-	19.0	7.5	13.3	-	25.0	16.6	20.8	-	19.2	30.9	25.1	-	3.5	1.1	2.3	-	9.7	10.2	10.0
T12	37.2	14.5	30.6	27.4	-	-	-	-	-	30.9	24.0	27.5	-	-	-	-	-	4.4	1.8	3.1	19.5	8.0	7.1	11.5
CD @5%	3.7	2.1	3.3							3.6	2.1											1.7	2.7	
CV%	15.1	13.7	11.0							11.0	10.1											9.6	11.0	

Table 126a: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their combinations (Dharwad)

Treatment	Alternaria blight								Grey mildew		Rust							
	PDI				% Control				PDI	% Control	PDI				% Control			
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2020-21	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	28.3	28.2	23.6	26.7	18.1	24.0	27.9	23.3	16.8	14.9	-	32.2	16.4	24.3	-	16.3	33.9	25.1
T2	26.5	26.2	22.4	25.0	23.4	29.4	31.6	28.1	16.7	15.6	-	31.1	15.6	23.4	-	19.3	37.1	28.2
T3	27.1	27.8	24.6	26.5	21.5	25.2	24.8	23.8	15.6	43.5	-	29.1	17.7	23.4	-	24.4	28.7	26.6
T4	18.3	20.4	17.1	18.6	47.1	45.1	47.8	46.7	9.8	50.6	-	24.1	11.4	17.8	-	32.8	53.9	**43.4**
T5	20.9	22.9	19.2	21.0	39.7	38.3	41.3	39.8	11.2	43.2	-	25.7	13.1	19.4	-	28.4	47.2	**37.8**
T6	21.3	23.0	21.6	22.0	38.2	38.0	34.0	36.7	12.3	37.5	-	26.8	14.9	20.9	-	25.1	40.0	**32.6**
T7	-	32.1	26.2	29.2	-	13.5	20.0	16.8	-	-	-	32.8	19.0	25.9	-	8.5	23.4	16.0
T8	-	33.8	26.9	30.4	-	8.8	17.8	13.3	-	-	-	32.3	19.2	25.8	-	16.2	22.5	19.4
T9	-	30.7	25.6	28.2	-	17.3	21.8	19.6	-	-	-	33.0	18.0	25.5	-	14.3	27.3	20.8
T10	-	35.0	27.0	31.0	-	5.6	17.4	11.5	-	-	-	36.9	20.8	28.9	-	4.1	16.0	10.1
T11	-	34.9	28.8	31.9	-	5.8	12.1	8.9	-	-	-	36.3	21.2	28.8	-	5.8	14.5	10.2
T12	34.6	37.1	32.7	34.8	-	-	-	-	19.8	-	-	38.5	24.8	31.7	-	-	-	-
CD at 5%	0.8	2.6	0.6						1.0			3.4	0.7					
S.E.(m)±	0.2	0.9	0.2						0.4			1.2	0.2					
CV%		4.7	1.1						3.6			5.9	1.7					

Table 126b: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their combinations (Dharwad)

Treatment	Boll rot (PDI & % Reduction over control)								Seed cotton yield (Qtls/ha)			
	PDI				% Reduction over control							
	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled	2020-21	2021-22	2022-23	Pooled
T1	13.4	17.8	10.8	14.0	20.3	23.8	42.4	28.8	8.1	15.5	17.5	13.7
T2	14.7	18.3	10.0	14.3	13.0	21.8	46.4	27.1	10.7	14.1	16.8	13.9
T3	13.2	17.2	11.2	13.9	21.6	26.5	39.9	29.3	9.4	16.6	16.0	14.0
T4	7.7	13.3	7.2	9.4	54.1	43.0	61.7	52.9	15.3	18.6	20.5	**18.1**
T5	9.1	14.0	8.5	10.5	45.9	40.0	54.7	46.9	15.0	19.7	19.2	**18.0**
T6	10.7	15.5	9.9	12.0	36.5	33.7	47.0	39.1	12.2	17.4	18.6	16.1
T7	-	19.1	13.8	16.5	-	18.0	26.7	22.4	-	14.9	14.6	14.8
T8	-	18.8	12.3	15.6	-	19.7	34.3	27.0	-	13.8	14.0	13.9
T9	-	19.0	11.9	15.5	-	18.6	36.4	27.5	-	14.8	15.8	**15.3**
T10	-	21.7	14.5	18.1	-	7.2	22.5	14.9	-	11.1	13.8	12.5
T11	-	21.2	15.8	18.5	-	9.3	18.3	13.8	-	10.8	13.0	11.9
T12	16.9	23.4	18.7	19.7	-	-	-	-	6.6	9.0	11.0	8.9
CD at 5%	0.7	3.1	0.7						0.3	3.1	2.3	
S.E.(m)±	0.3	1.1	0.2						0.2	1.0	0.8	
CV%	3.2	7.3	2.0						2.8	12.1	8.5	

Agron. V: Technology for organic cotton production

Table 127: Intensity of diseases under organic cotton production (G.Cot-38) at Junagarh

S.N.	Treatment's detail	PDI ALS *	PDI BLB #
T_1	Absolute control (No organic & Inorganic)	(36.0) 36.9	1.9 (3.6)
T_2	Control (STCR)	(35.9) 36.9	1.9 (3.6)
T_3	RD of Nutrient through organic based on P - equivalent basis. (No P recommended)	(34.7) 36.1	1.7 (2.7)
T_4	Seed treatment and soil application of rec. bio fertilisers and foliar application of PPFM @1 % at flowering and boll development. (Azotobacter, PSB, KSB 40-50 ml/10lit and PPFM 100ml/10 lit.)	(31.7) 34.2	1.8 (3.2)
T_5	Neem cake 250 kg/ha. (0.945 kg/plot)	(32.7) 34.9	1.6 (2.4)
T_6	Raising of Sunhemp between rows incorporated before flowering.	(36.3) 37.1	1.7 (2.9)
T_7	Intercropping with black gram crop residue has to be incorporated after harvesting insitu condition.	(32.5) 34.8	1.6 (2.6)
T_8	T_4+T_5	(34.2) 35.8	1.8 (3.1)
T_9	T_4+T_6	(35.1) 36.4	1.7 (2.8)
T_{10}	T_4+T_5+T_6	(32.0) 34.5	1.7 (2.8)
T_{11}	T_4+ T_5 + T_7	(33.7) 35.5	1.6 (2.6)
	S.Em.±	0.2	0.7
	C.V. %	13.2	3.4
	C.D.	NS	NS

Square root transformation, * Arcsine transformation

Table 128: Intensity of diseases under organic cotton production (G. Cot. 20) at Surat

Sr. No.	Treatments	Bacterial leaf blight		Corynespora leaf spot	
		PDI	DR	PDI	DR
T_1	Absolute control (No organic & Inorganic)	58.2	MS	0.0	DF
T_2	Control (STCR)	36.2	MR	0.0	DF
T_3	RD of Nutrient through organic based on P - equivalent basis. (No P recommended)	46.7	MR	0.0	DF
T_4	Seed treatment and soil application of rec. bio fertilisers and foliar application of PPFM @1 % at flowering and boll development. (Azotobacter, PSB, KSB 40-50 ml/10lit and PPFM 100ml/10 lit.)	41.2	MR	0.0	DF
T_5	Neem cake 250 kg/ha. (0.945 kg/plot)	28.5	MR	0.0	DF
T_6	Raising of Sunhemp between rows incorporated before flowering.	40.5	MR	0.0	DF
T_7	Intercropping with black gram crop residue has to be incorporated after harvesting insitu condition.	56.7	MS	0.0	DF
T_8	T_4+T_5	37.2	MR	0.0	DF
T_9	T_4+T_6	25.5	MR	0.0	DF
T_{10}	T_4+T_5+T_6	33.5	MR	0.0	DF
T_{11}	T_4+ T_5 + T_7	46.2	MR	0.0	DF

Agron. Standardization of geometry for Bt varieties

Table: 129. Statement showing the intensity of Corynespora leaf spot diseases *Kharif-2022* Junagarh

Treat. No.	Treatment Detail	CoLS PDI #
T_1	Sole Bt cotton at spacing **120 X 45 cm**	(11.5) 3.4
T_2	Paired row planting of Bt cotton with two rows of intercrop Sesamum (A)	(15.2) 3.9
T_3	Paired row planting of Bt cotton with two rows of intercrop Soybean (B)	(24.9) 5.0
T_4	Paired row planting of Bt cotton with two rows of intercrop Groundnut (C)	(16.3) 4.0
T_5	Paired row planting of Bt cotton with one row (A) + one row (B)	(22.9) 4.8
T_6	Paired row planting of Bt cotton with one row (B) + one row (C)	(20.3) 4.5
T_7	Paired row planting of Bt cotton with one row (C) + one row (A)	(18.9) 4.4
T_8	Farmers practice Cotton + Sesamum (1:1) (150 X 30 cm) ATM	(13.4) 3.7
T_9	Recommended intercropping**. Cotton + Sesamum (1:1) (120 X 45 cm)**	(13.3) 3.6
T_{10}	Paired row planting of Bt cotton	(13.4) 3.7
	S.Em.±	0.2
	C.V. %	7.9
	C.D.	0.6

Square root transformation

*****

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(AICRP – on Cotton)

COTTON TECHNOLOGICAL REPORT

(2022-23)

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Global Cotton Scenario

Cotton plays a vital role as an agricultural & industrial commodity and supports livelihood of over 100 million farm families' world over. Cotton, accounts for about 25% of the total fibre consumption (Figure 1). Raw material [Lint] worth $ 50 billion is produced annually. Global area under cotton cultivation is relatively stable. The cotton scenario in the country has undergone a substantial transformation with improvement in the output levels and productivity with the introduction of the *Bt* cotton in 2002-03. India has sustained the position of the leading cotton producer in the world with production of about 5.31 million tons which is 21% of estimated world cotton production of 25.44 million tons in 2021- 22.

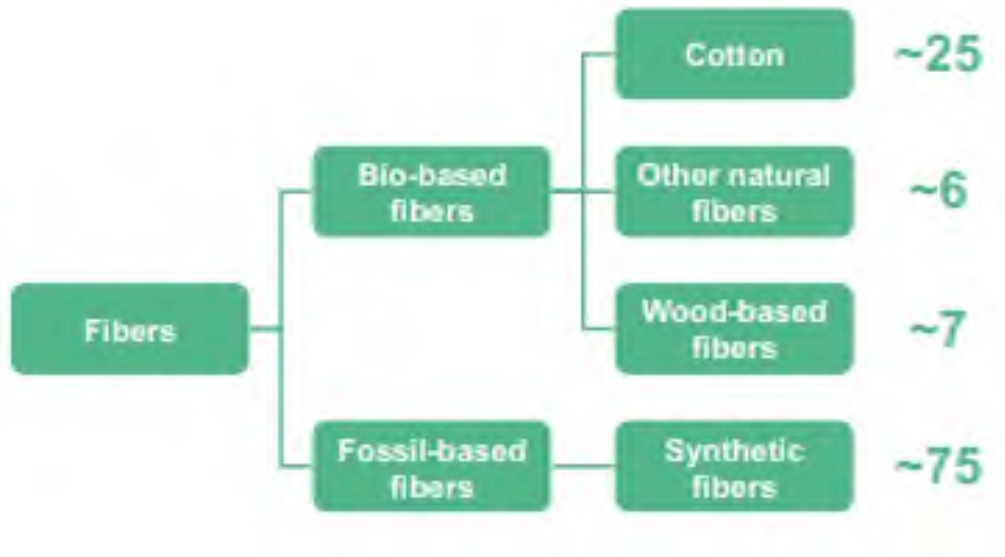


Figure 1: Global production of different fibres (*Source: Annual Report 2022 Lenzing Group***)**

About 6 million farmers are engaged in the cultivation of cotton in India and the majority of the cotton is produced under rain-fed conditions. The Indian Textile Industry consumes a diverse range of fibres and yarns and the ratio of use of cotton to non-cotton fibres in India is around 60:40, whereas it is 30:70 in the rest of the World. India is the flag bearer for cotton in its global battle to retain and improve its share. The per capita availability of cotton cloth for the year 2021-22 is estimated at 25.78 square meter.

World Cotton Production

million 480 lb. bales	2021/22	2022/23 Feb	2022/23 Mar
China	26.8	28.5	29.5
India	24.4	25.5	24.5
United States	17.5	14.7	14.7
Brazil	11.7	13.3	13.3
Australia	5.8	5.0	5.5
Rest of World	29.7	27.4	27.6
World	115.9	114.4	115.1

World Cotton Mill-Use

million 480 lb. bales	2021/22	2022/23 Feb	2022/23 Mar
China	33.8	36.0	36.0
India	25.0	22.5	22.5
Pakistan	10.7	8.8	8.6
Bangladesh	8.5	8.2	8.1
Turkey	8.7	8.0	7.7
Rest of World	29.6	27.2	27.2
World	116.3	110.7	110.1

Figure 2: Current Global production and consumption of cotton (*Source: Monthly Economic Letter, March 2023 Cotton Incorporated***)**

India's Cotton Trade

The total cotton supply for October 2022-February 2023 is estimated at 192.73 lakh bales, which consists of the arrivals of 154.84 lakh bales, imports of 6 lakh bales and the opening stock estimated by the CAI at 31.89 lakh bales at the beginning of the season.

Particulars	**2021-22(P)***		**2022-23(P)***	
	(In lakh bales of 170 kg. Each)	(in Thousand Tons)	(In lakh bales of 170 kg. Each)	(in Thousand Tons)
SUPPLY				
Opening Stock	71.84	1221.28	45.25	769.25
Crop	311.17	5289.89	337.23	5732.91
Import	21.13	359.21	10.00	170.00
TOTAL SUPPLY	**404.14**	**6870.38**	**392.48**	**6672.16**
DEMAND				

Mill Consumption	279.57	4752.69	275.00	4675.00
S.S.I Consumption	21.07	358.19	20.00	340.00
Non Textile Consumption	16.00	272.00	16.00	272.00
Export	42.25	718.25	35.00	595.00
TOTAL DEMAND	**358.89**	**6101.13**	**346.00**	**5882.00**
Closing Stock.	**45.25**	**769.25**	**46.48**	**790.16**

Cotton fibre quality challenges in India

- Contamination with impurities in few instances
- Quality based trading
- Quality tagging of bales
- Traceability
- Competition with cottons grown in other countries
- Competition with synthetic fibres
- Imbalance in supply and demand of different staple length cotton

Fibre Quality Analysis of ICAR-AICRP Cotton samples

The Indian Council of Agricultural Research (ICAR) launched the All India Coordinated Cotton Improvement Project (AICCIP) in the year 1967 with its Headquarters at Coimbatore (Tamil Nadu). Since then the cotton has moved a great deal from varieties to genetically modified cotton cultivars. Presently the future of genetically modified cotton is being discussed widely in the country along with the change in the weather pattern. Therefore, the importance of the project has received a thrust in terms of multi-disciplinary and multi-centre approaches with the active involvement of State Agricultural Universities across cotton growing states for the development of better varieties suiting to different agro climatic conditions. Currently, the AICCIP Project, now All India Co-ordinated Research Project on Cotton (ICAR-AICRP on Cotton) is in operation with its headquarters at Coimbatore and spread over 21 participating centres involving 16 State Agricultural Universities. The ICAR-Central Institute for Research on Cotton Technology (ICAR-CIRCOT), Mumbai and its Regional units at Nagpur, Coimbatore, Sirsa, Guntur, Dharwad and Surat are closely associated with ICAR-AICRP on Cotton in assessing the fibre quality parameters of cotton cultures under trial. It is heartening to note that vide letter no. F.No. A.Engg.17(13)/2014-AE dated 30.08.2016 from SMD, a new discipline, **Quality Research**, has been added in AICRP-on Cotton and ICAR-CIRCOT has been included as Principal Investigator. This letter was issued with approval of DDG (CS).

Since the quality plays an important role in varietal improvement research and it takes several years to evolve a variety endowed with good yield and desired fibre quality parameters. Starting with a few seeds initially obtained either from Germ Plasm collection or from a new cross, the cotton breeder has to select good plants during several successive generations until a strain which gives consistent results is evolved, year after year, as regards yield, quality and other characteristics.

The successful development of a new variety involves close collaboration of scientists from various disciplines, *viz.* the cotton breeder, agronomist, physiologist, pathologist, entomologist and technologist. The work of developing new varieties can be speeded up if an integrated approach covering all these aspects is made. The multi-location evaluation of the new varieties for various characteristics in each cotton growing zone is necessarily to be carried out on the promising varieties.

India has become the world's largest producer and exporter of cotton. Indian cotton also typically trades at a discount up to the extent of 7 %, in the international market, compared to cotton from other countries due to practices followed in market yards and other subsequent processes. Opportunities may exist to improve the income of cotton producers in India and of global cotton consumers by improving the communication of consumer's quality needs to the farm level researchers.

The quality of the cotton fibre is dependent on the pedigree or genetic composition of the variety as well as on the conditions under which the plant is grown. Although fibre quality per se cannot be improved during processing however improper handling or processing can adversely affect the quality.

ICAR-CIRCOT undertakes the fibre and yarn quality assessment of ICAR-AICRP on Cotton samples and presented in the Annual Technological Report. Quality parameter data was generated on the cotton samples received from the cotton breeders throughout the country from breeders pertaining to the ICAR-AICRP on Cotton Zonal Trials (North Zone, Central Zone and South Zone). Out of the zonal trials, 227 cotton samples belong to North zone, 271 cotton samples belong to Central zone and 101 belong to South zone.Under Agronomy trial 51 samples were received for spinning performance along with fibre quality assessment. The quality parameters of all cotton fiber samples were measured by using the High Volume Instrument operated in the HVI Mode. The data was analysed and reported.

ICAR-AICRP on Cotton is mandated to give new thrust and direction in terms of multidisciplinary and multi-centre approaches with the active involvement of State Agricultural Universities. It is pertinent to mention about the collaborative efforts of AICRP on Cotton in evaluating the suitability of private sector Bt Cotton hybrids (the first commercial transgenic crop approved for cultivation by GEAC) for major cotton growing states in the country from the year 2002 onwards. ICAR submitted its recommendation to Genetic Engineering Appraisal Committee suggesting that Bt cotton hybrid events has to be tested as per norms of AICRP system before releasing for commercial cultivation. Out of the 17 parameters to be evaluated ICAR-CIRCOT has been designated to analyse Upper Half Mean Length (mm) under HVI Mode, Uniformity index under HVI Mode, Micronaire under HVI Mode, Tenacity under HVI Mode. ICAR-CIRCOT with its huge expertise in fibre quality analysis has been doing this analysis for the past two years successfully.

HVI and ICC Mode Comparison

Since last season onwards the testing of all the lint samples under the AICRP-on Cotton is being carried out in HVI mode of testing. This has brought the fibre attributes data at par with international method of testing. While most institutions in India use either International Calibration Cotton (ICC) or HVI tenacity, many foreign cottons, especially those from the US and Australia, are labeled with only HVI tenacity values which are much higher. Cotton exporters in India are also familiar with HVI mode of testing as they have to submit HVI mode values to get their produce sold in international markets. In international markets, the transaction occur mainly using HVI mode fibre properties. The comparisons with foreign cottons have led to the misnomer that Indian cottons are weaker compared to their foreign counterparts in a given category.

In order to get acquainted with the different parameters obtained in HVI mode following explanation is given. The comparison between ICC and HVI mode parameters are also explained.

Fibre length: The 2.5 per cent span length (ICC mode) is the distance up to which 2.5 per cent of the fibres caught in the sample holding comb are found to extend. On the other hand, Upper Half Mean Length (UHML), obtained in HVI mode, is the average length by number of the longer half (50 per cent) of the fibres distributed by weight. Though different by definition, the two length measures are nearly equal. Hence, there is no difficulty in switching over from the old set of parameters to the new.

Fibre length variation: The length variability index in the ICC mode is the uniformity ratio of span length at 50 per cent and 2.5 per cent density levels.

UR % = (L50 / L2.5) × 100

The UR per cent for all varieties of cotton lies in the 40-54 range.

The uniformity index (UI) determined in the HVI mode is the ratio of the mean length and the UHML:

UI = (Mean length/UHML) × 100

As mean length is very close to, though smaller than, UHML, the ratio is much larger than the UR per cent. Generally, the UI per cent is in the 70-98 range, the theoretical limit being 100 when the fibres are all of constant length.

Tenacity: The fibre tenacity in the ICC mode is available at the Stelo level. These are adjusted to agree with the tenacity obtained with conventional mechanical machines known as the Stelometer. In the HVI mode, the tenacity given by the machine is much higher than the measures obtained in the ICC mode. The HVI tenacity is about 25-30 per cent higher than the tenacity obtained in the ICC mode.

A relationship between ICC & HVI Modes of testing is given below in the form of a regression equation is given. ***It is cautioned that one should not use the equations/thumb rule as an alternate to actual testing.***

ICC Mode	HVI mode	Conversion (ICAR-CIRCOT)	Thumb rule
2.5% Span Length (SL)	Upper Half Mean Length (UHML)	UHML=0.98 x 2.5 SL+0.1827	**2.5% SL is equal to UHML**
Uniformity Ratio (UR)	Uniformity Index (UI)	UI% = -0.1841xUR% + 91.17	**UI is 1.8 times UR**
Tenacity (g/tex) T(ICC)	Tenacity (g/tex) T(HVI)	T(HVI) = 1.0395 x T(ICC) + 4.967	**T (HVI) is 1.25 times of T (ICC)**
Note: Other fibre properties like micronaire, elongation and short fibre index remain the same in both the modes of HVI testing			

The Quality Norms in HVI mode of testing

Over the past 55 years, USTER® STATISTICS has earned legendary status throughout textiles – and its value is more significant than ever in the globalized trading environment today and in the future. Therefore, it is pertinent to take into the account the Uster statistics while formulating the norms for the AICRP- on cotton system. In order to get the realistic scenario, the statistical analysis was carried out on samples of cotton fibre received during the season 2015-16 from all over the country under AICRP-on cotton. These samples were tested on HVI mode on different makes of HVI systems following relevant standard procedures. As per prevailing system the UHML was categorized into 9 groups. The UHML below 24 mm was not considered since fibres with this attribute mostly utilized either by Open end spinning Industry or other purposes such as absorbent cottons. The Uster statistics 2013 values for different parameters were taken as base, since these data are based on the cottons from different part of world. An attempt was made to find out the position of samples received under AICRP-on cotton with respect to world average. Uster statistics gives the value of the fibre attributes

for 5 %, 25 %, 50 %, 75 % and 95 % percentiles. These percentiles may be labelled as Excellent, Good, Average, Fair and poor respectively. The case may be reversed in case of micronaire values. The percentages of samples under these labels were determined by calculating the frequencies of samples in these categories. After statistical analysis of the fibre attributes data norms are proposed for HVI mode of testing. The analysis of data will be carried out for the current season and norms will be finalized.

Highest Spinnability Count Index

The commercial value of a cotton variety is related to its spinning performance, which, in turn, is dependent on the yarn count that can be spun from the given cotton and the yarn quality obtained for that count. The quality of any yarn spun from cotton depends on its fibre quality, particularly length, strength, fineness, uniformity ratio, short fibre content and breaking elongation. The prediction of yarn quality and spinnability of a particular cotton is necessary for a better product design. Presently, the test for yarn quality is done by processing a small quantity of a cotton sample to a particular count and ascertaining the quality of yarn so produced. As Initial Evaluation Trials are having very small sample size, it is not possible to spin the cotton by mechanical processing to decide its spinning potential.

An integrated index called highest standard cotton (HSC) was developed by ICAR-CIRCOT long back and it was mainly for used comparing cottons after actual spinning of cottons into 2 to 3 counts. HSC is the finest count of yarn that can be spun economically with a standard optimum twist and has a certain standard lea CSP. The counts that are spun higher than HSC will have less CSP and counts that are spun lower than HSC will have more CSP than the standard. Thus, the HSC of cotton is a single integrated index, which provides an easy way for comparing the quality of cottons. This is a time consuming as well as labour and machine intensive process apart from requiring minimum sample size of 6.0 kg. To overcome these problems, ICAR-CIRCOT has developed regression equations. HSC being an integrated index reflecting the spinnability of cotton is more suitable index to compare cottons than FQI.

Abbreviations

Abbreviation	Description
Mic	Micronaire (micrograms/inch)
Str	Bundle tenacity in grams/tex
E%	Bundle elongation in %
HSC	Highest Standard Count Index
Mean HSC	Mean of HSC of different locations of particular entry
Count1	Under spun count in English count (Ne)
CSP1	Corrected count strength product of under spun count
Count2	Over spun count in English count (Ne)
CSP2	Corrected count strength product of over spun count
UHML	Upper Half Mean length in mm (HVI mode)
Tenacity	Bundle tenacity in grams/tex (HVI mode)
UI	Uniformity Index (HVI mode)

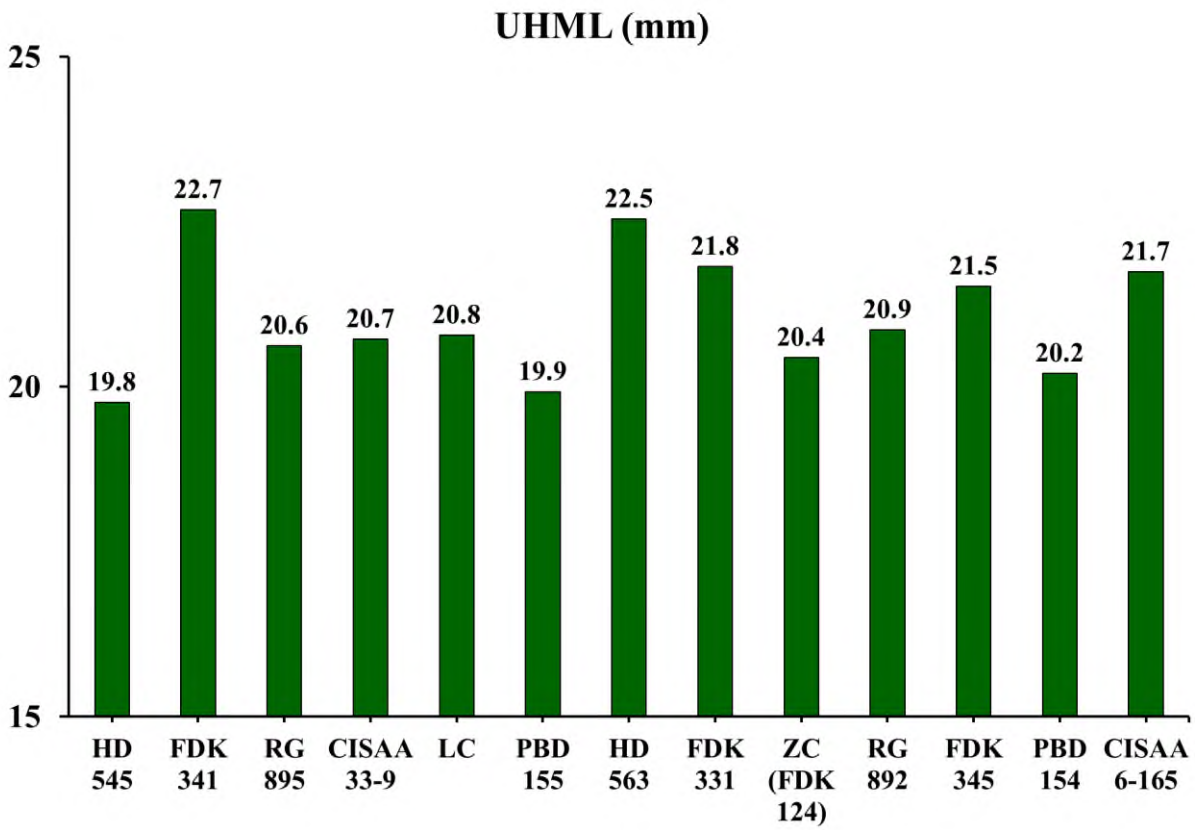
Research highlights

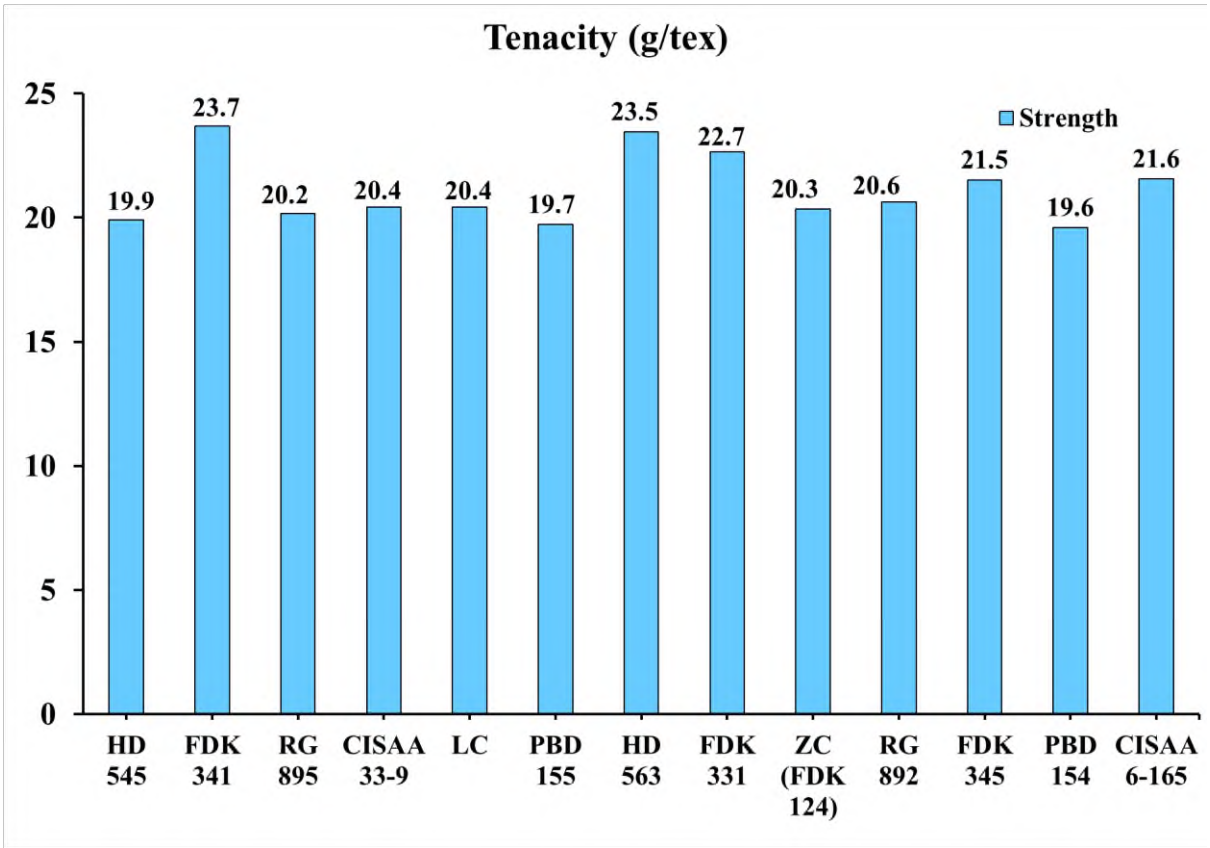
NORTH ZONE

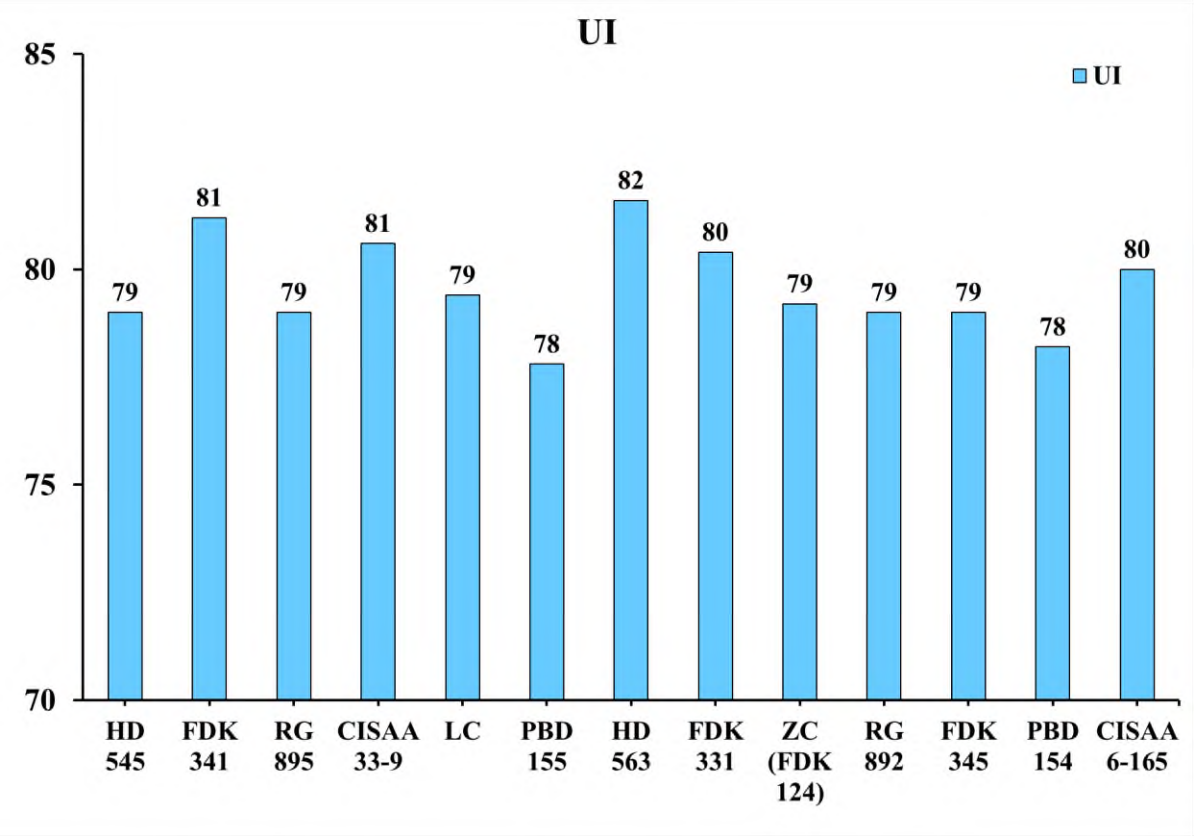
Br.22 a/b Initial Evaluation Trial - *G.arboreum*

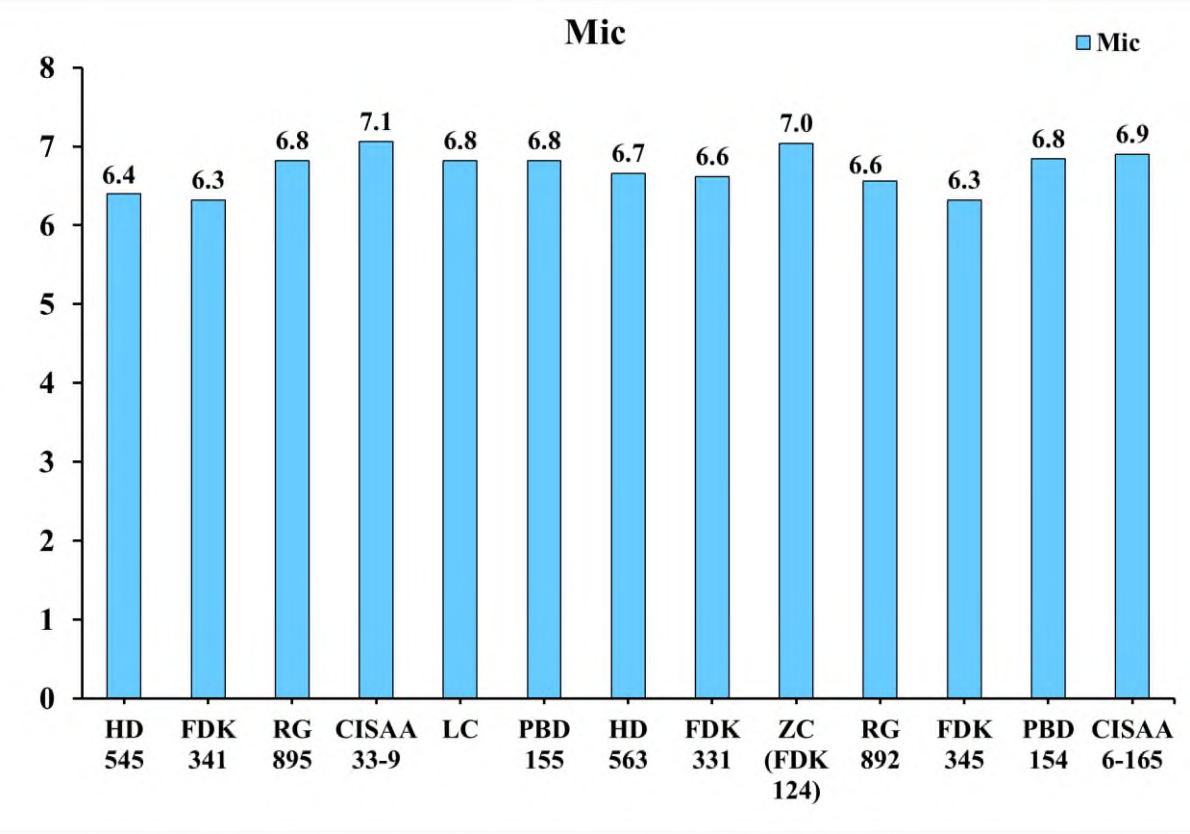
Observations

- Under this trial samples were received in the UHML ranges of 20-23 mm.
- The samples were having UI in the range of 79-80 which are found to be good.
- The tenacity of the samples was at par with fibre length.
- The micronaire values of most the samples were very high in the range of 6.5-7.
- These kind of samples can find application only for surgical cotton or denim industry




Tenacity (g/tex)
Strength
25
20
15
10
5
0
19.9
23.7
20.2
20.4
20.4
19.7
23.5
22.7
20.3
20.6
21.5
19.6
21.6
HD 545
FDK 341
RG 895
CISAA 33-9
LC
PBD 155
HD 563
FDK 331
ZC (FDK 124)
RG 892
FDK 345
PBD 154
CISAA 6-165


UI
UI
85
80
75
70
79
81
79
81
79
78
82
80
79
79
79
78
80
HD 545
FDK 341
RG 895
CISAA 33-9
LC
PBD 155
HD 563
FDK 331
ZC (FDK 124)
RG 892
FDK 345
PBD 154
CISAA 6-165



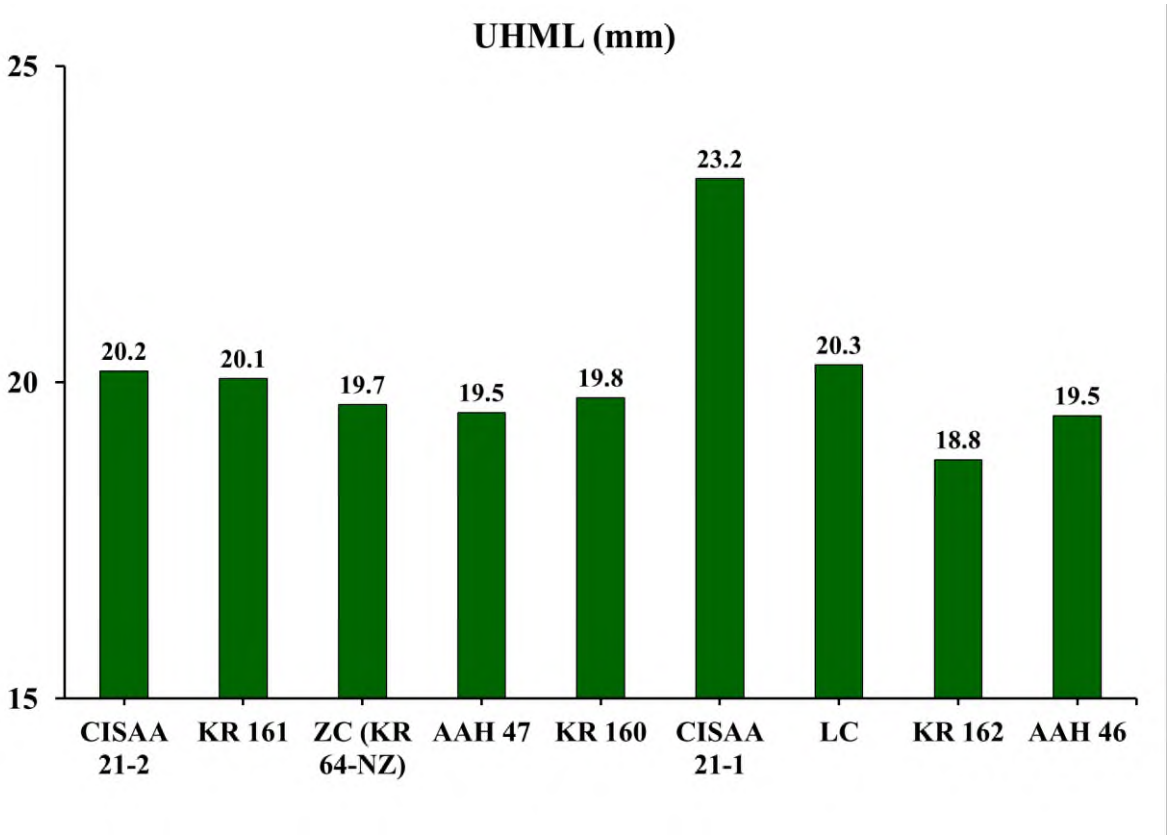
Recommendations

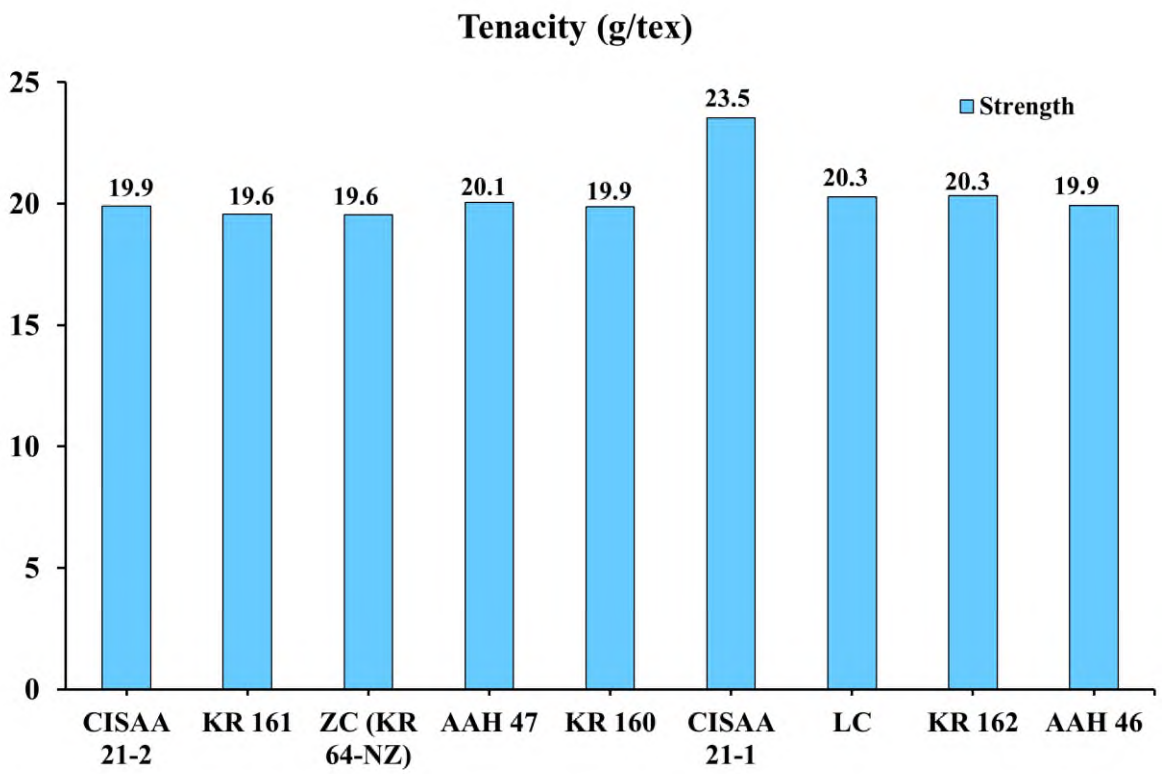
Entry FDK 341 (*UHML 23.7 mm, Tenacity 23.7 gpt, UI 81 and Micronaire 6.3*) has performed well. Other performing entry is HD 563 (*UHML 22.5 mm, Tenacity 23.5 gpt, UI 82 and Micronaire 6.7*)

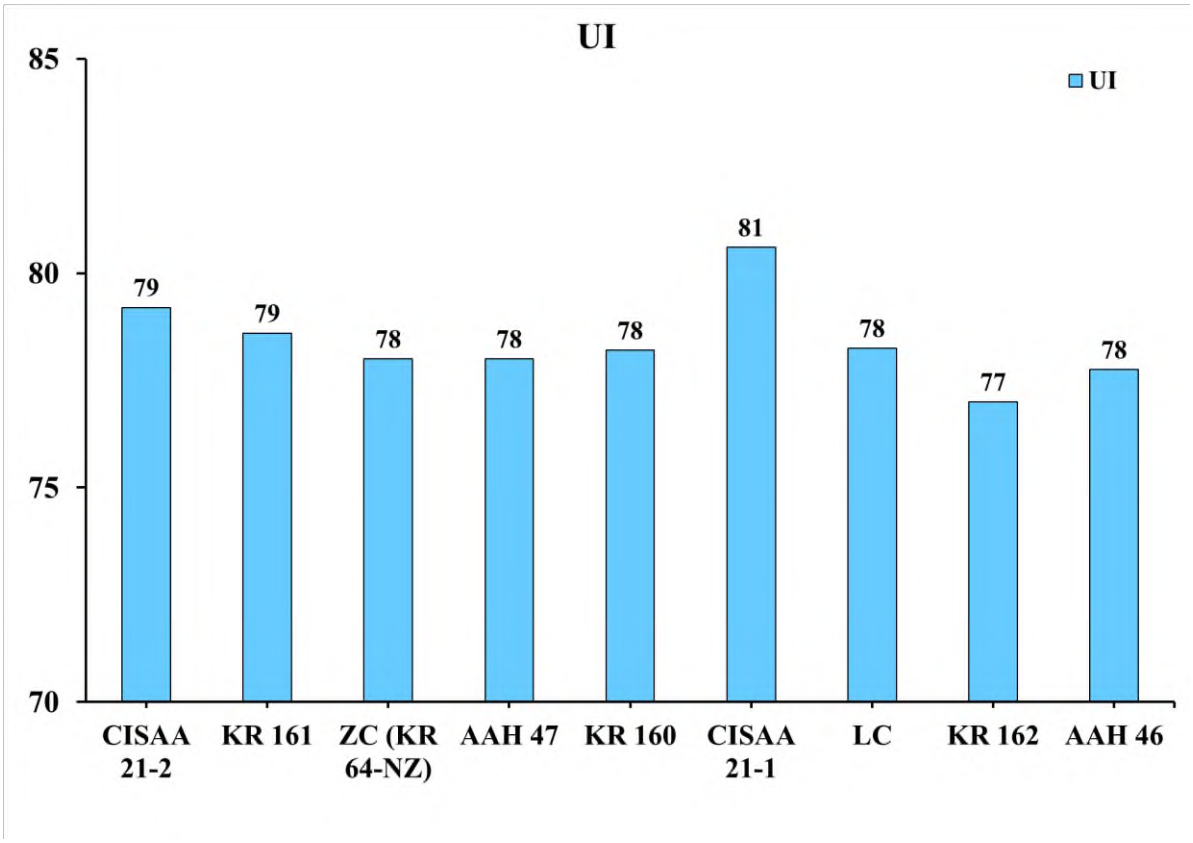
Br25 a/b Preliminary Hybrid Trial - Desi Hybrid

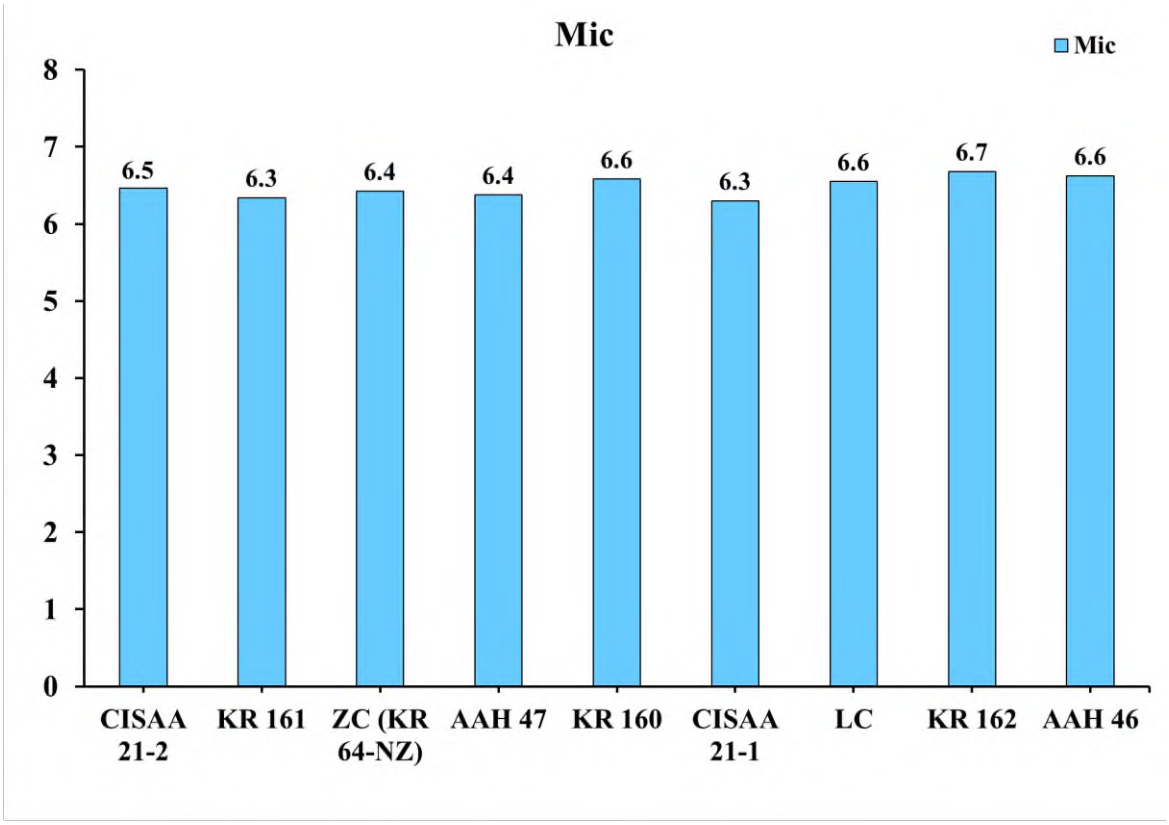
Observations

- Majority of the samples have UHML in the range of around 20 mm except CISAA 21-1.
- The tenacity of the samples was equal to fibre length.
- The samples were having UI below the minimum requirement.
- The micronaire values of most the samples were higher than maximum required micronaire.


UHML (mm)
25
20
15
20.2
20.1
19.7
19.5
19.8
23.2
20.3
18.8
19.5
CISAA 21-2
KR 161
ZC (KR 64-NZ)
AAH 47
KR 160
CISAA 21-1
LC
KR 162
AAH 46


Tenacity (g/tex)
Strength
25
20
15
10
5
0
19.9
19.6
19.6
20.1
19.9
23.5
20.3
20.3
19.9
CISAA 21-2
KR 161
ZC (KR 64-NZ)
AAH 47
KR 160
CISAA 21-1
LC
KR 162
AAH 46





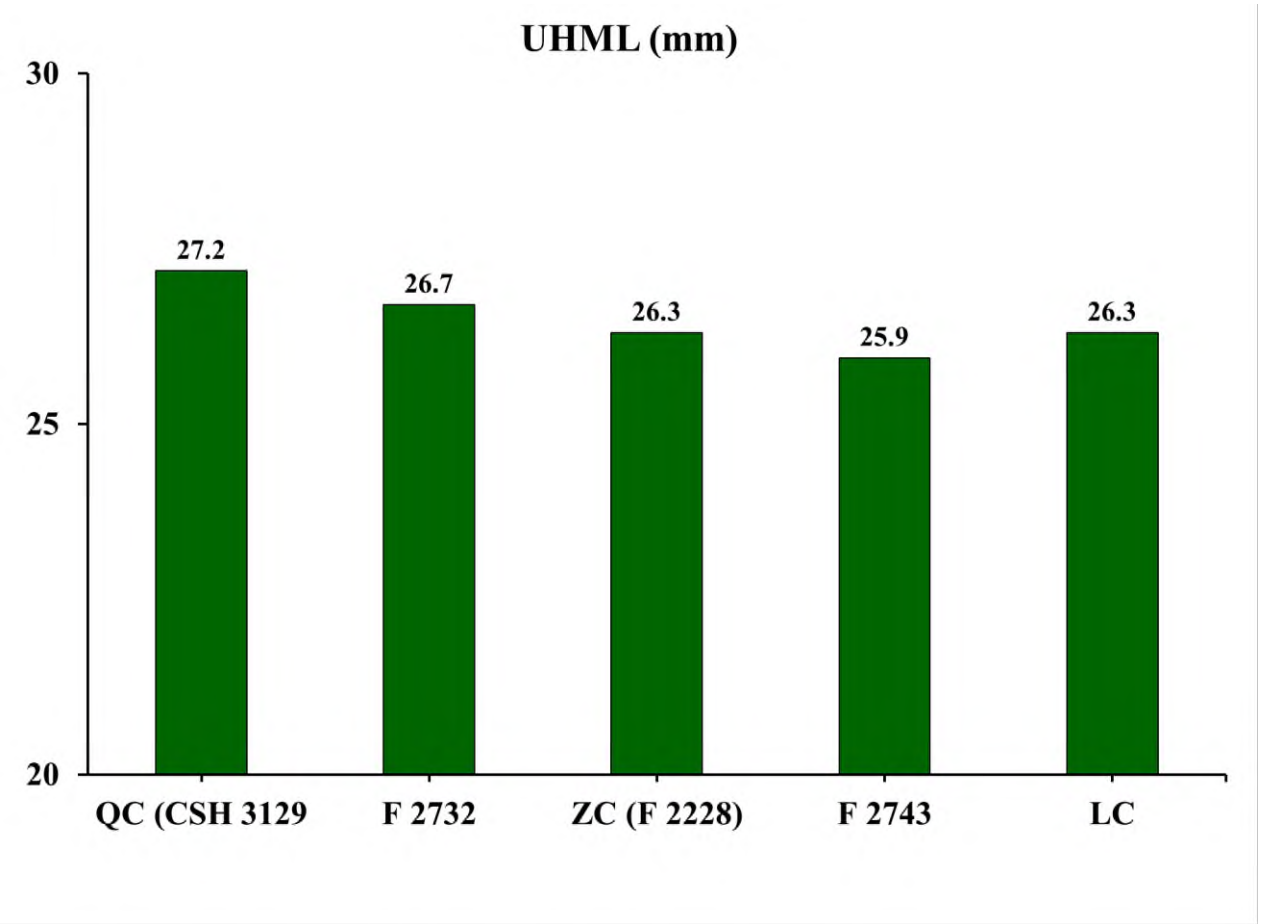
Recommendations

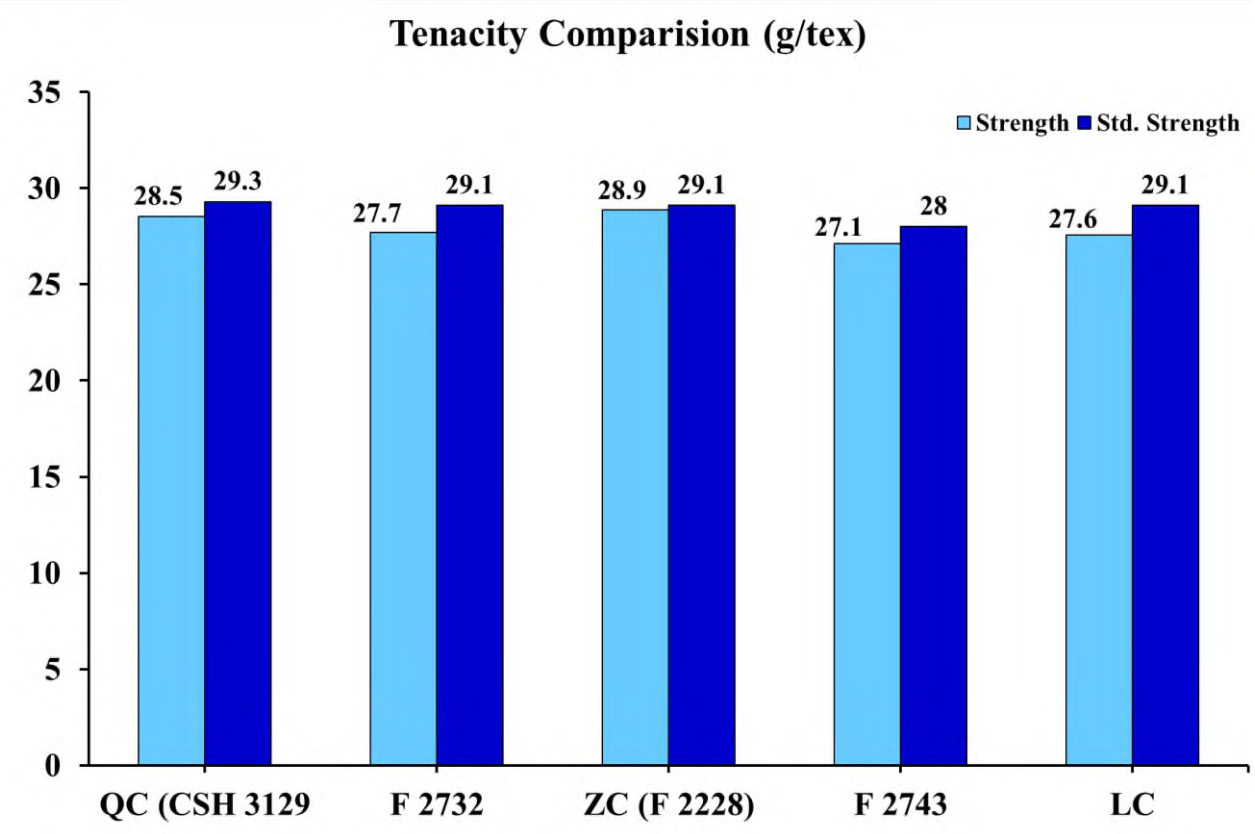
Entry CISAA 21-1 (*UHML 23.2 mm, Tenacity 23.5 gpt, UI 81 and Micronaire 6.*3) has performed well

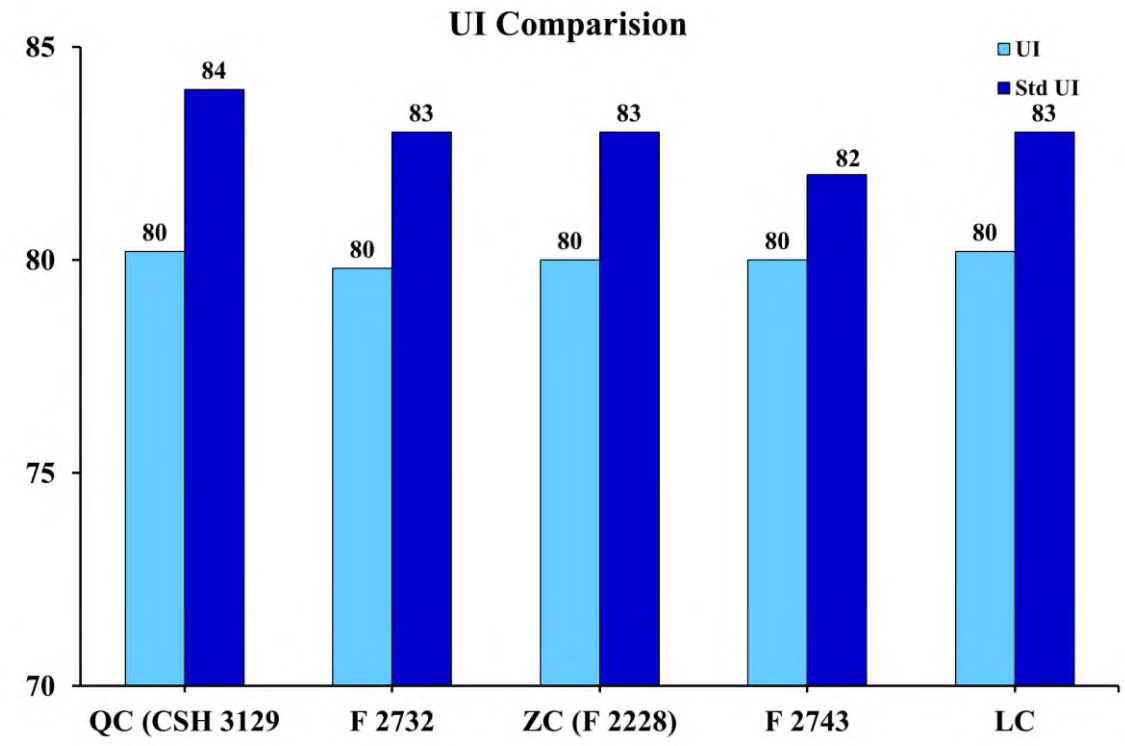
Br04 a - Coordinated Variety Trial of *G.hirsutum*

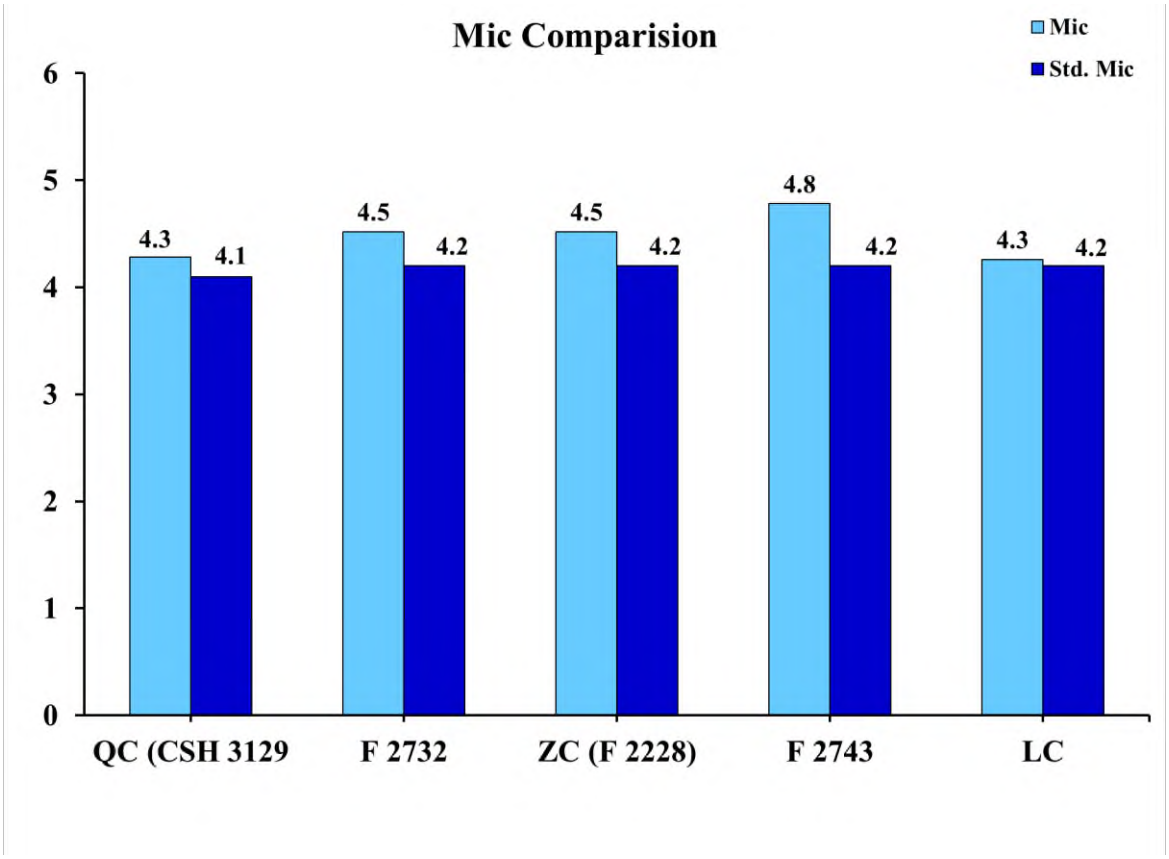
Observations

- Samples were having UHML from 26 mm to 27 mm.
- The tenacity of the samples was lower than the minimum requirement as shown in graph.
- The UI of the samples across the UHML ranges were lower than the minimum requirement.
- The micronaire values were higher than the minimum required.




Tenacity Comparision (g/tex)
Strength
Std. Strength
35
30
25
20
15
10
5
0
28.5
29.3
27.7
29.1
28.9
29.1
27.1
28
27.6
29.1
QC (CSH 3129
F 2732
ZC (F 2228)
F 2743
LC


UI Comparision
UI
Std UI
85
80
75
70
80
84
80
83
80
83
80
82
80
83
QC (CSH 3129
F 2732
ZC (F 2228)
F 2743
LC



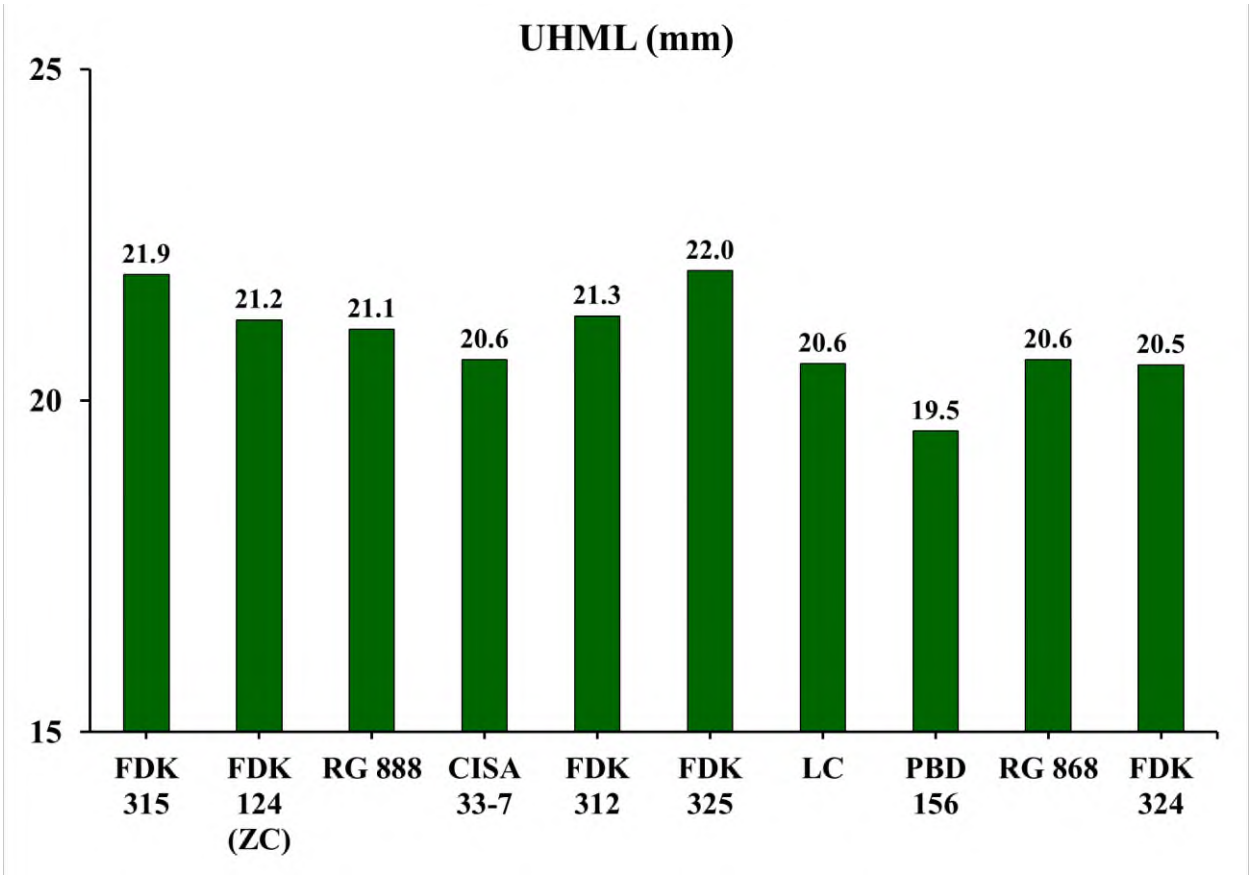
Recommendations

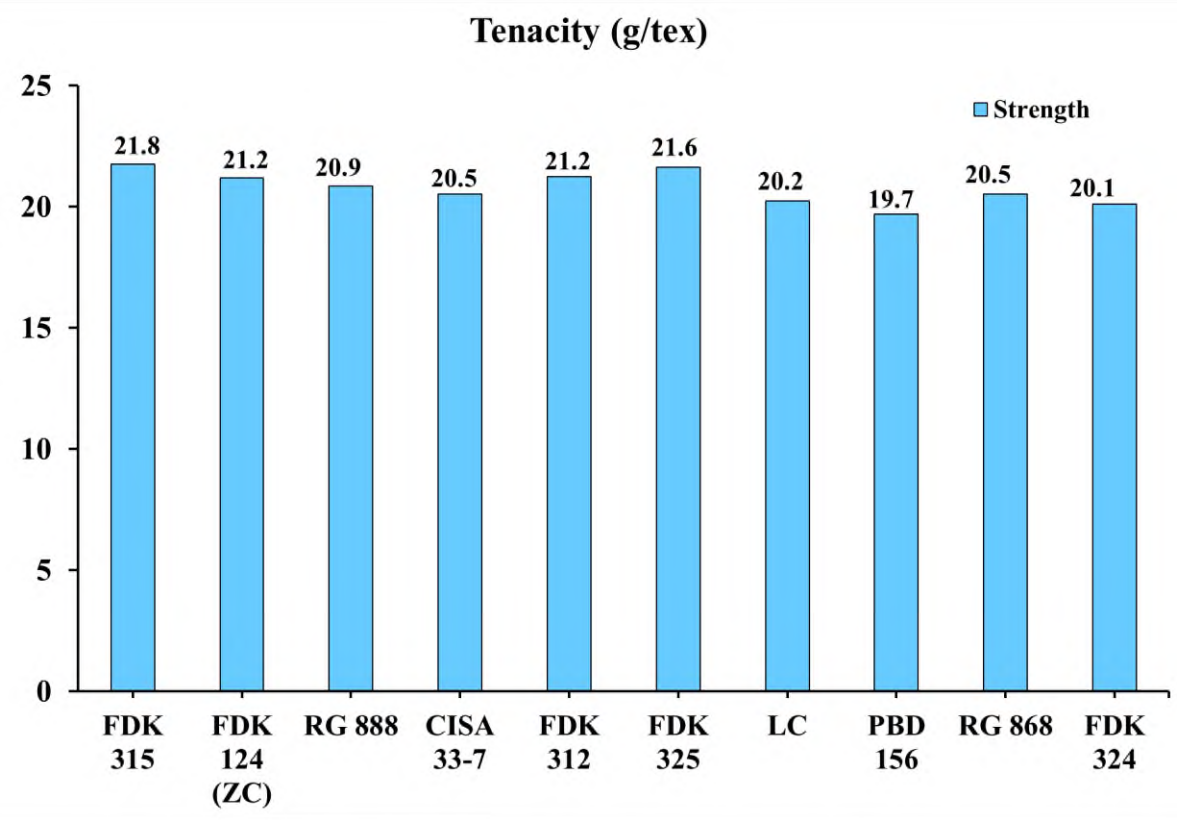
No entry has performed better than local check.

Br24 a - Coordinated Variety Trial of *G.arboreum*

Observations

- Under this trial samples were received in the UHML range of 20-22 mm.
- The samples were having UI in the range of 78.
- The tenacity of the samples was at par with fibre length.
- The micronaire values of most the samples were very high in the range of 6.5-7.
- These kind of samples can find application only for surgical cotton or denim industry


UHML (mm)
25
20
15
21.9
21.2
21.1
20.6
21.3
22.0
20.6
19.5
20.6
20.5
FDK 315
FDK 124 (ZC)
RG 888
CISA 33-7
FDK 312
FDK 325
LC
PBD 156
RG 868
FDK 324


Tenacity (g/tex)
Strength
25
20
15
10
5
0
21.8
21.2
20.9
20.5
21.2
21.6
20.2
19.7
20.5
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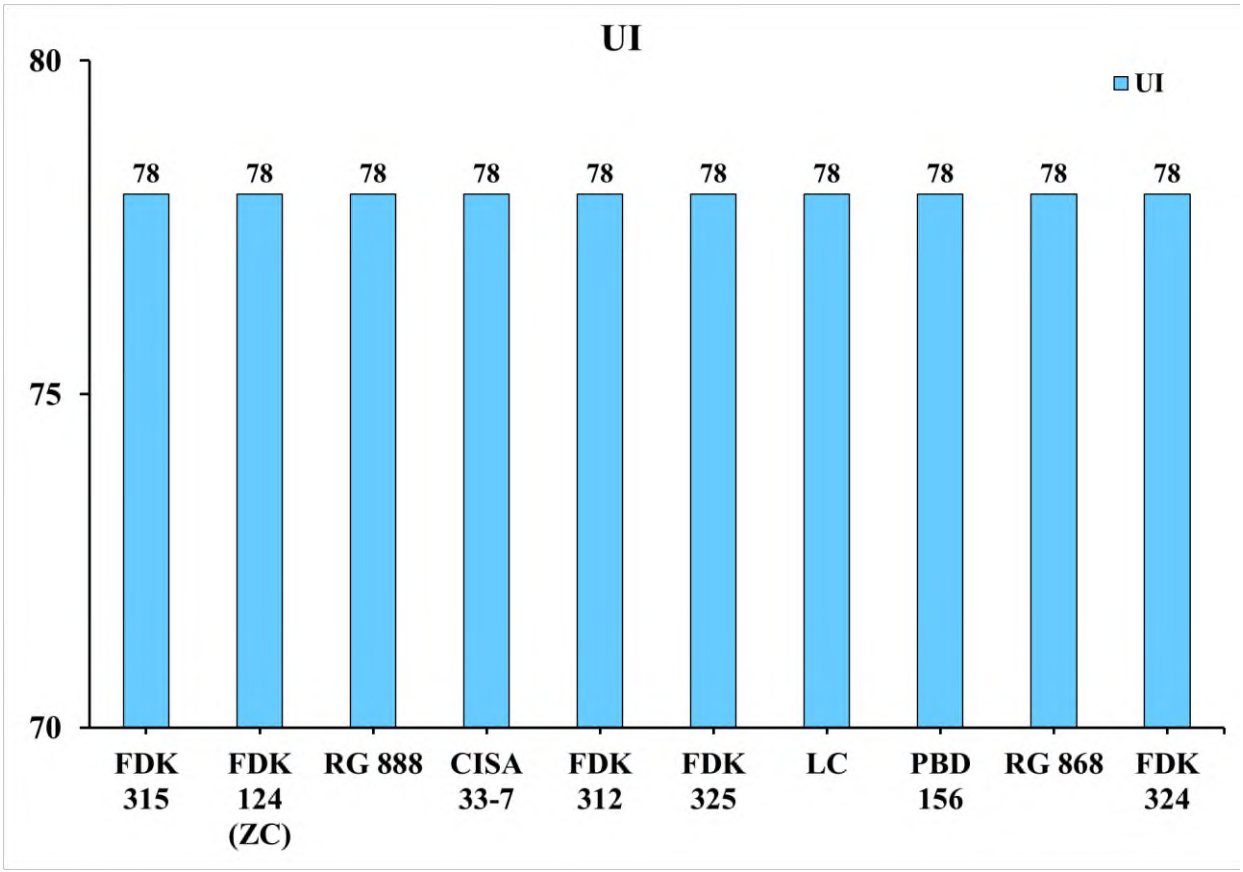
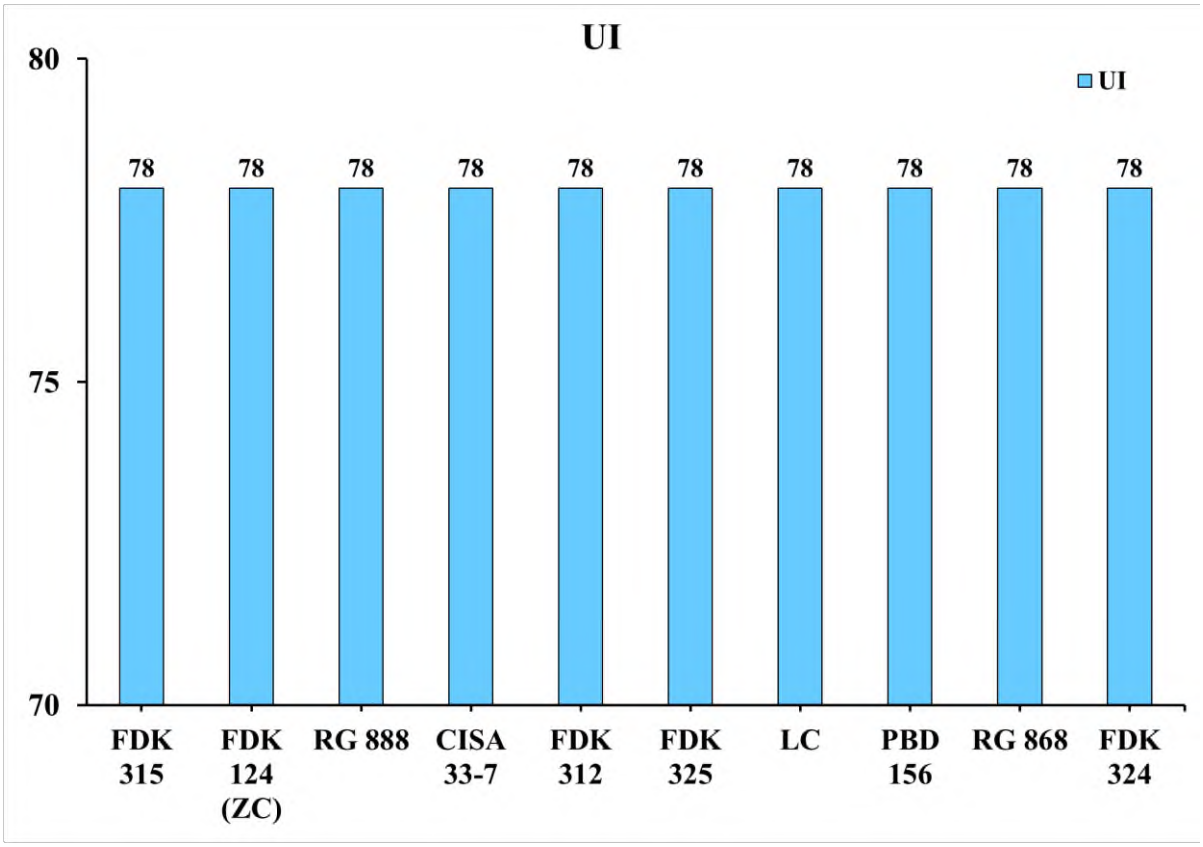
RG 888
CISA 33-7
FDK 312
FDK 325
LC
PBD 156
RG 868
FDK 324


UI
UI
80
75
70
78
78
78
78
78
78
78
78
78
78
FDK 315
FDK 124 (ZC)
RG 888
CISA 33-7
FDK 312
FDK 325
LC
PBD 156
RG 868
FDK 324


UI
UI
80
75
70
78
78
78
78
78
78
78
78
78
78
FDK 315
FDK 124 (ZC)
RG 888
CISA 33-7
FDK 312
FDK 325
LC
PBD 156
RG 868
FDK 324

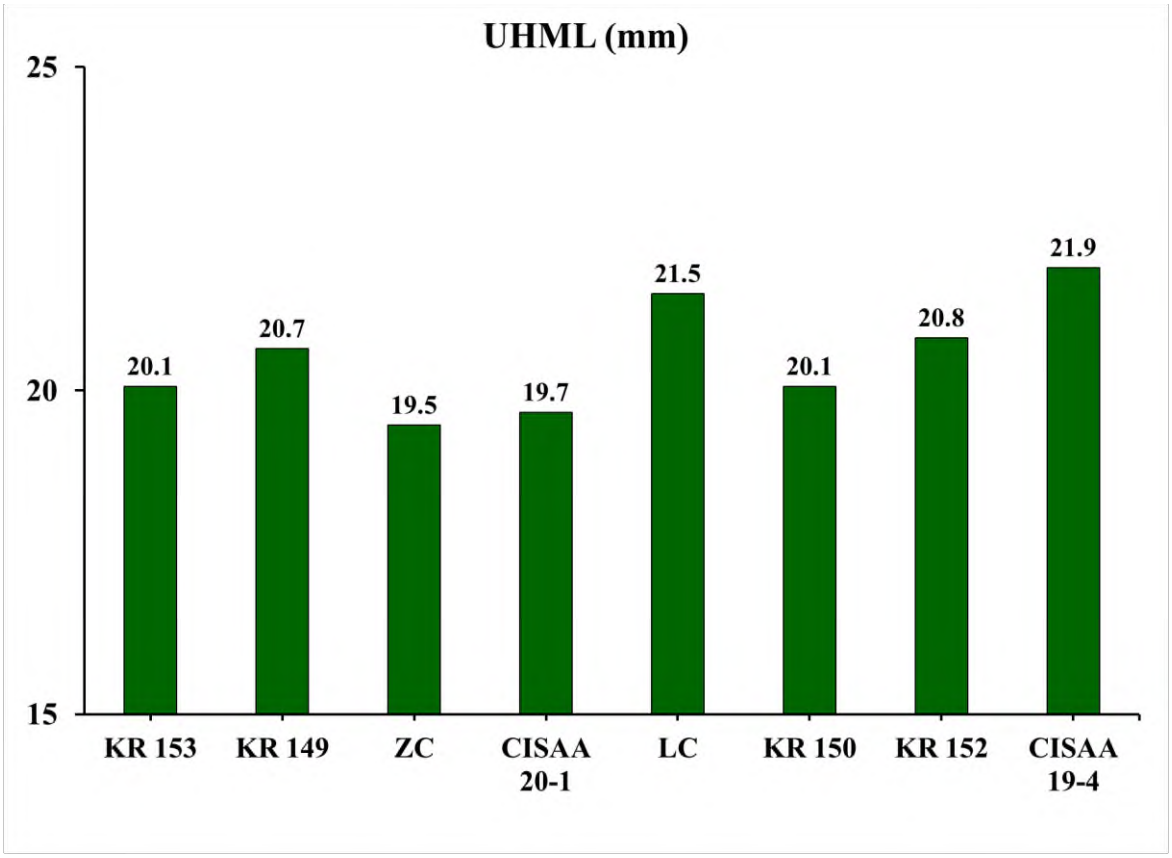
Recommendations

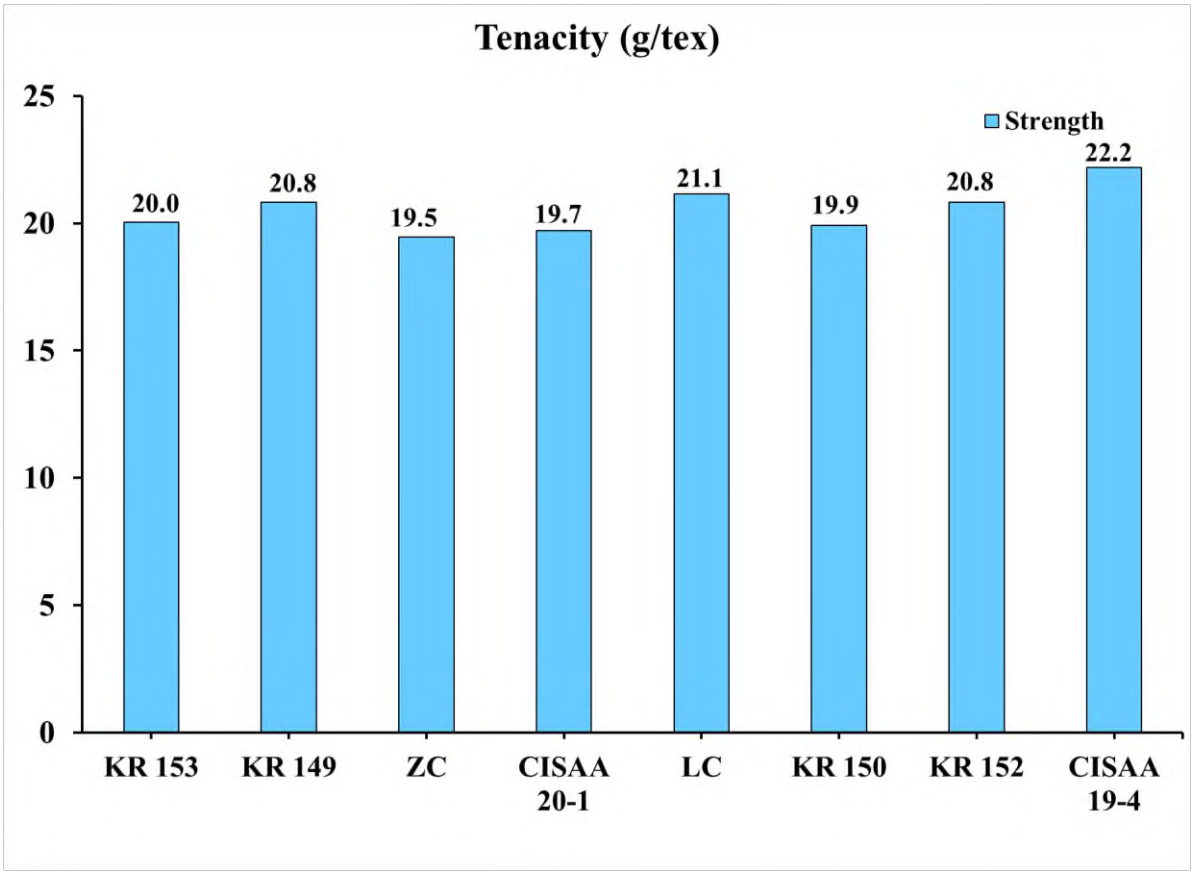
Entry FDK 325 (*UHML 22.0 mm, Tenacity 21.6 gpt, UI 78 and Micronaire 6.*3) has performed well. Other performing entry is FDK 315 (*UHML 21.9 mm, Tenacity 21.8 gpt, UI 78 and Micronaire 6.*1)

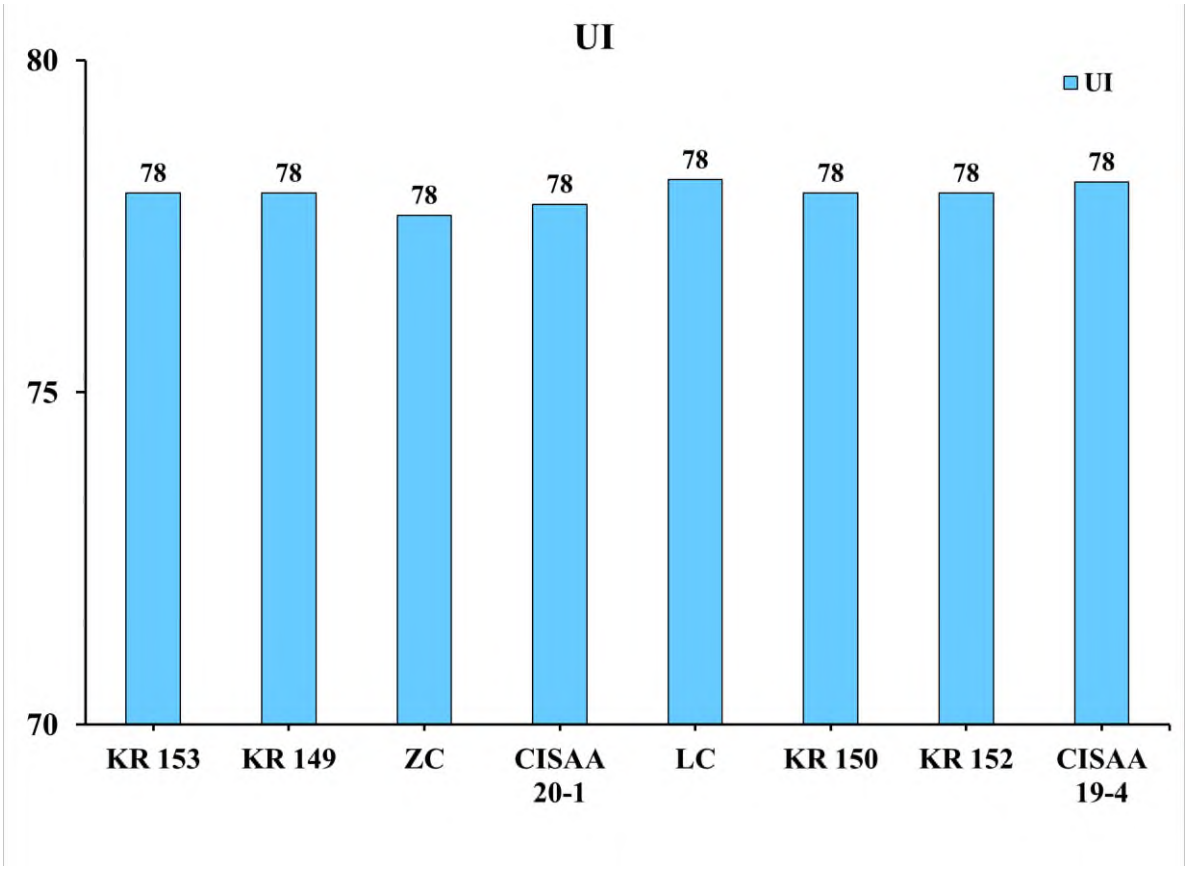
Br25 a - Coordinated Desi Hybrid Trial

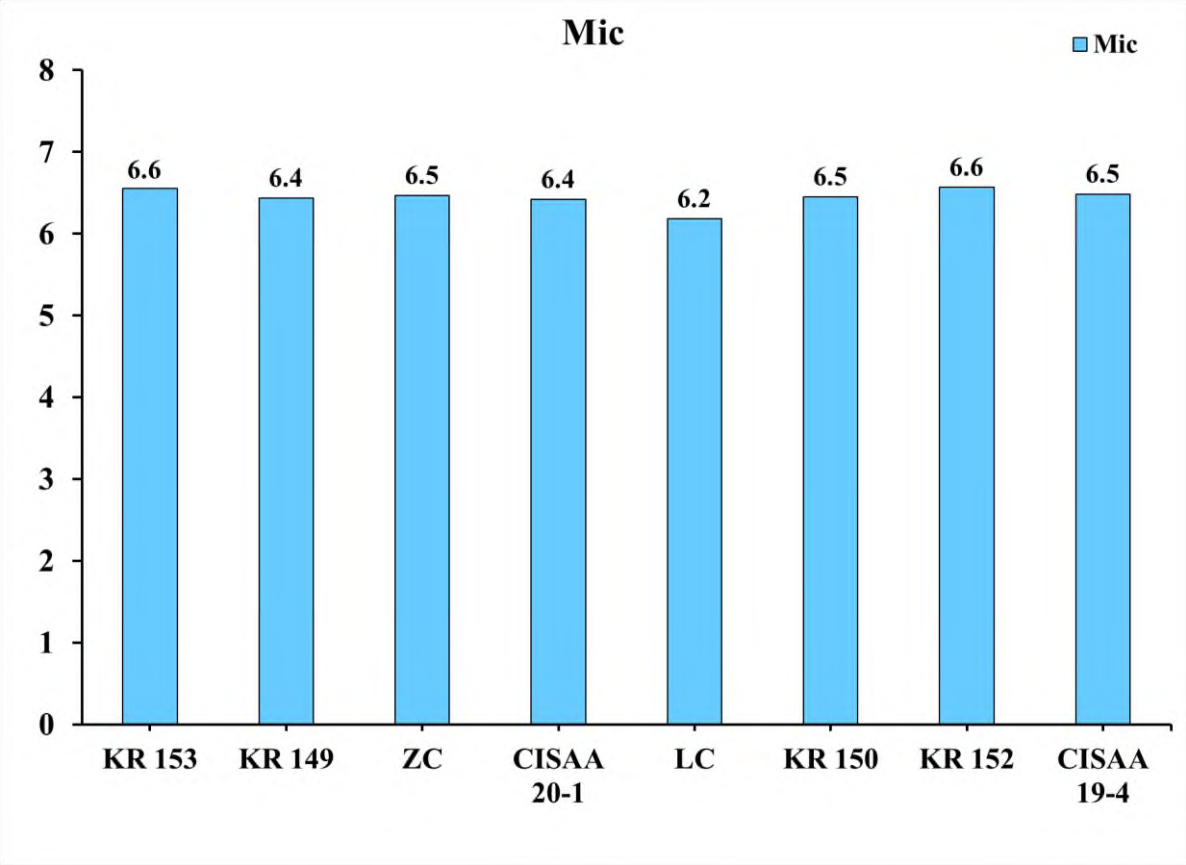
Observations

- Under this trial samples were received in the UHML range of 20-22 mm.
- The samples were having UI in the range of 78.
- The tenacity of the samples was at par with fibre length.
- The micronaire values of most the samples were very high in the range of 6.4-6.6.
- These kind of samples can find application only for surgical cotton or denim industry




Tenacity (g/tex)
Strength
25
20
15
10
5
0
20.0
20.8
19.5
19.7
21.1
19.9
20.8
22.2
KR 153
KR 149
ZC
CISAA 20-1
LC
KR 150
KR 152
CISAA 19-4


UI
UI
80
75
70
78
78
78
78
78
78
78
78
KR 153
KR 149
ZC
CISAA 20-1
LC
KR 150
KR 152
CISAA 19-4



Recommendations

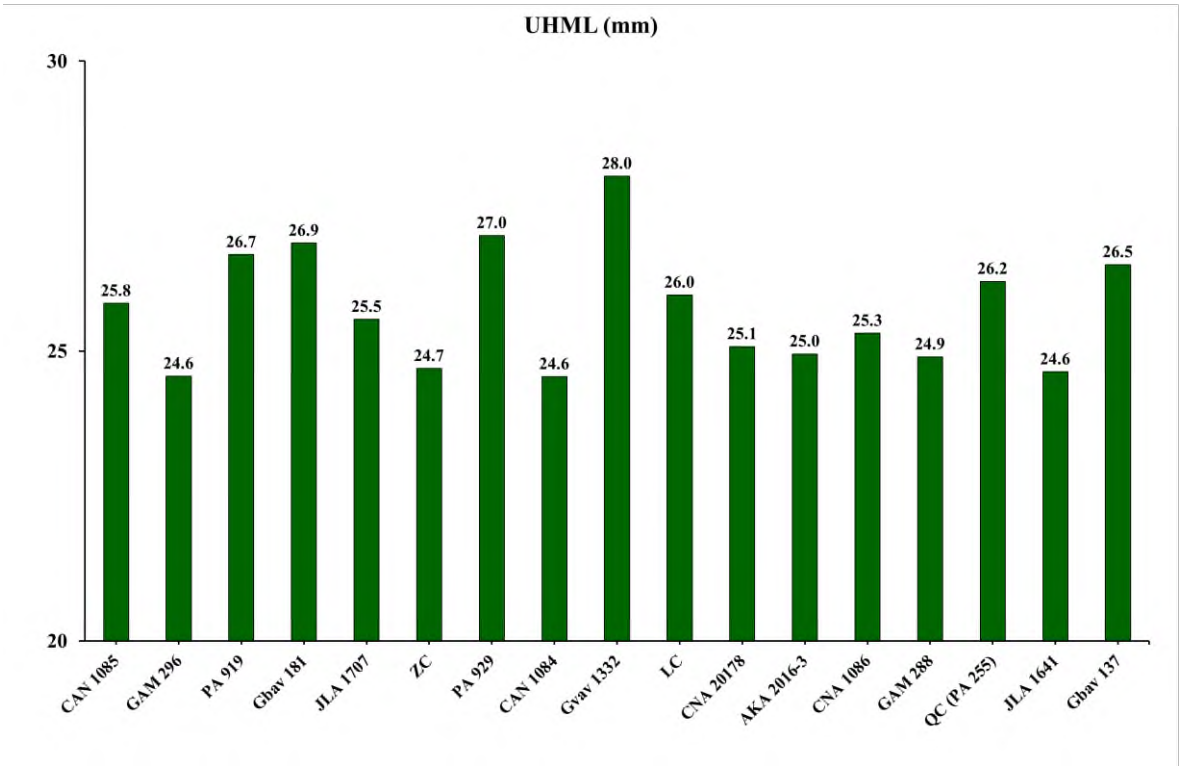
Entry CISAA-94 (*UHML 21.9 mm, Tenacity 22.2 gpt, UI 78 and Micronaire 6.5*) has performed well

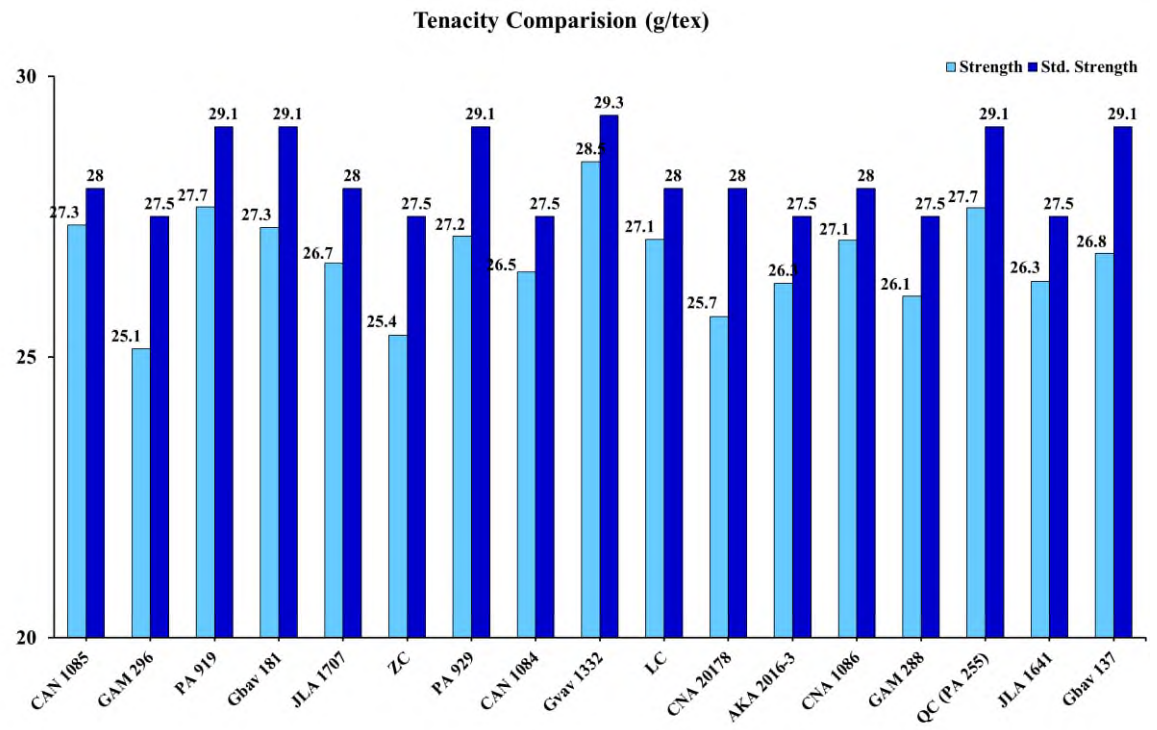
CENTRAL ZONE

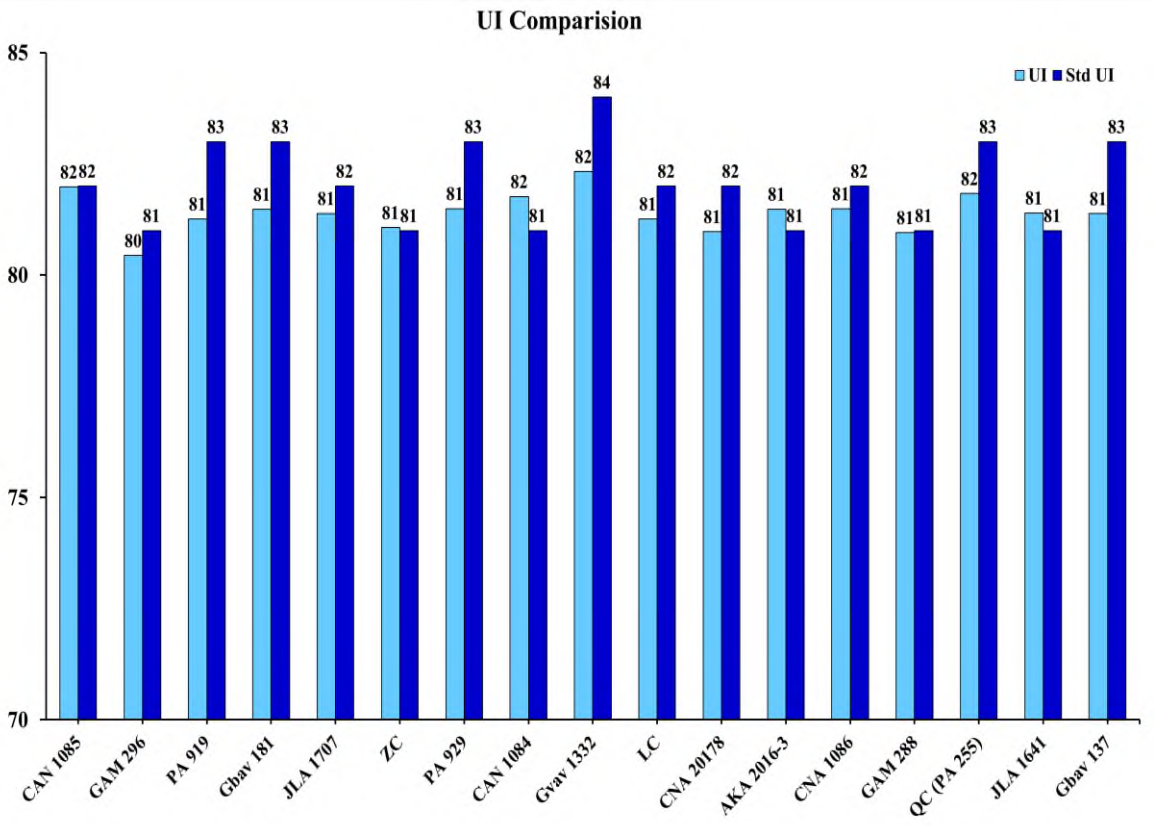
Br 22 b IET-*G.arboreum*

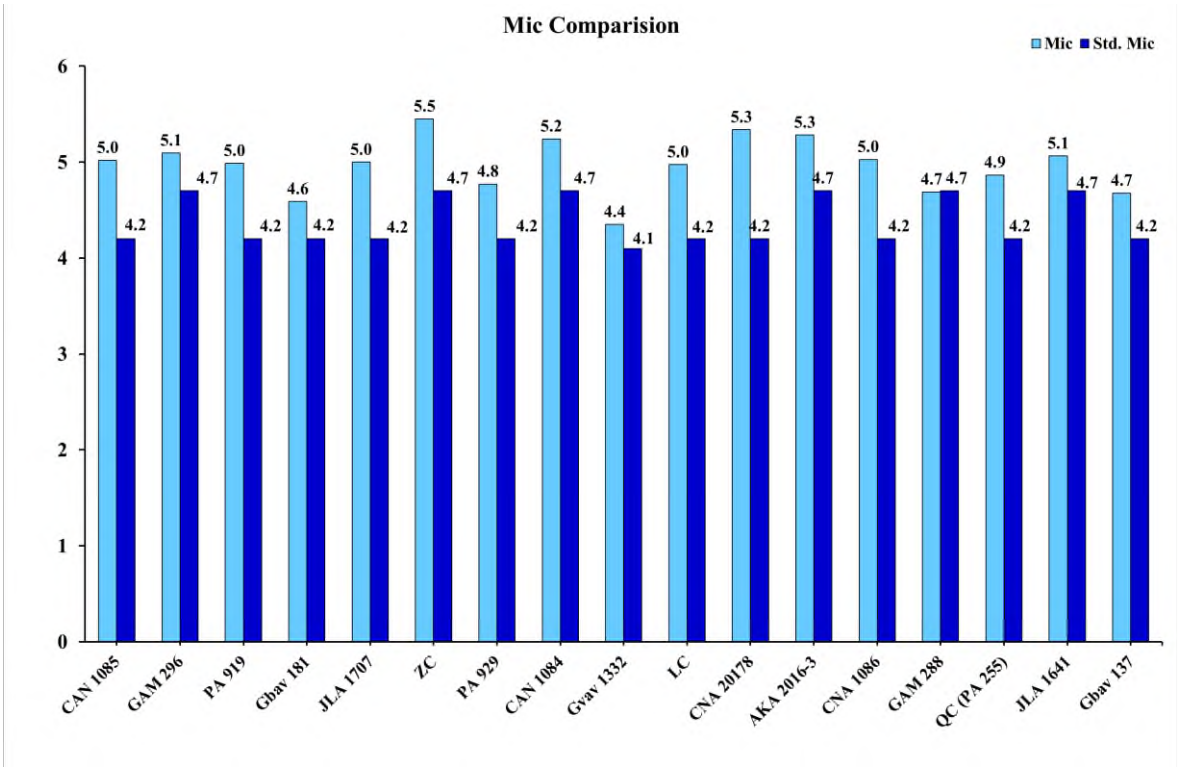
Observations

- Under this trial samples were received in the UHML range of 24-28 mm.
- The samples were having UI in the range of 82 which is very good.
- The tenacity of the samples was lower than the minimum requirement.
- The micronaire values of most the samples were very high in the range of 5-5.6




Tenacity Comparision (g/tex)
Strength
Std. Strength
30
25
20
27.3
28
25.1
27.5
27.7
29.1
27.3
29.1
26.7
28
25.4
27.5
27.2
29.1
26.5
27.5
28.5
29.3
27.1
28
25.7
28
26.1
27.5
27.1
28
26.1
27.5
27.7
29.1
26.3
27.5
26.8
29.1
CAN 1085
GAM 296
PA 919
Gbav 181
JLA 1707
ZC
PA 929
CAN 1084
Gvav 1332
LC
CNA 20178
AKA 2016-3
CNA 1086
GAM 288
QC (PA 255)
JLA 1641
Gbav 137


UI Comparision
UI
Std UI
85
80
75
70
82 82
80 81
81 83
81 83
81 82
81 81
81 83
82 81
82 84
81 82
81 82
81 81
81 82
81 81
82 83
81 81
81 83
CAN 1085
GAM 296
PA 919
Gbav 181
JLA 1707
ZC
PA 929
CAN 1084
Gvav 1332
LC
CNA 20178
AKA 2016-3
CNA 1086
GAM 288
QC (PA 255)
JLA 1641
Gbav 137



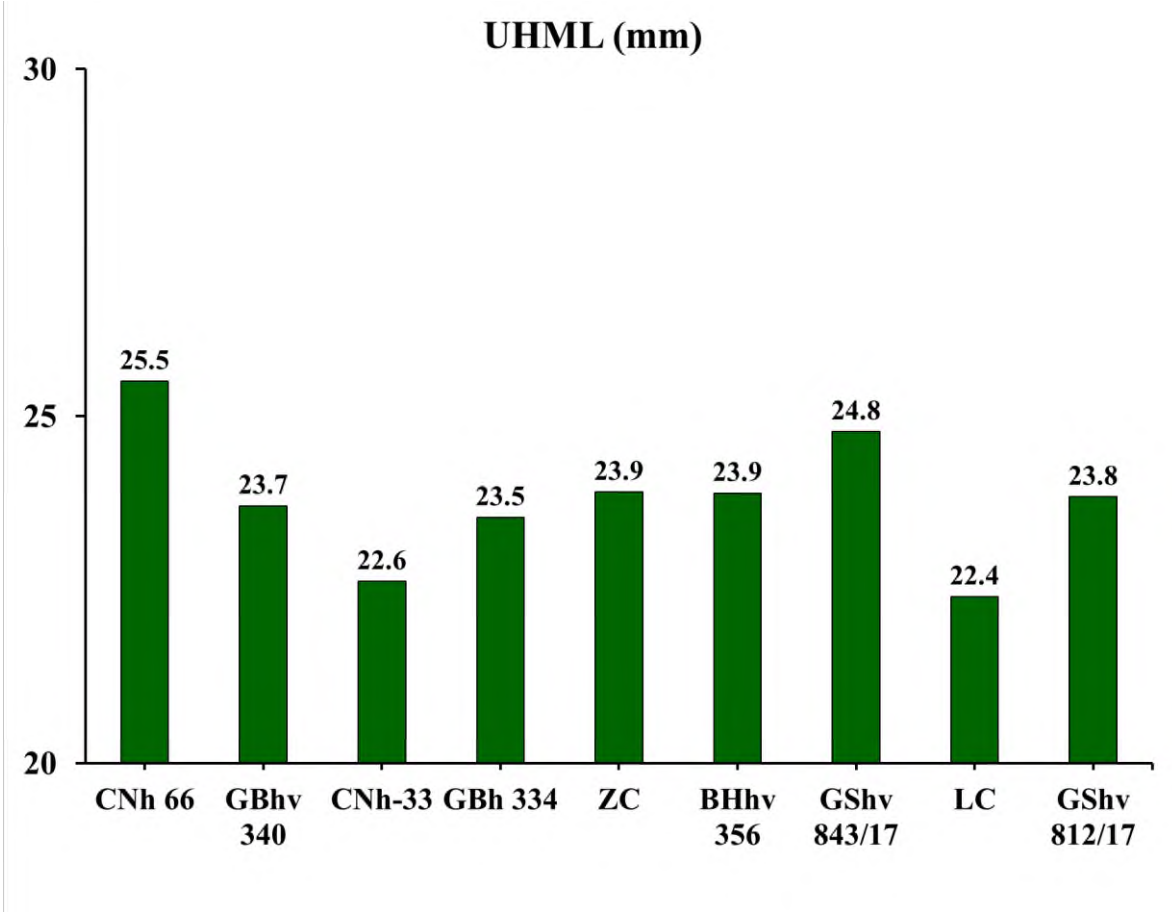
Recommendations

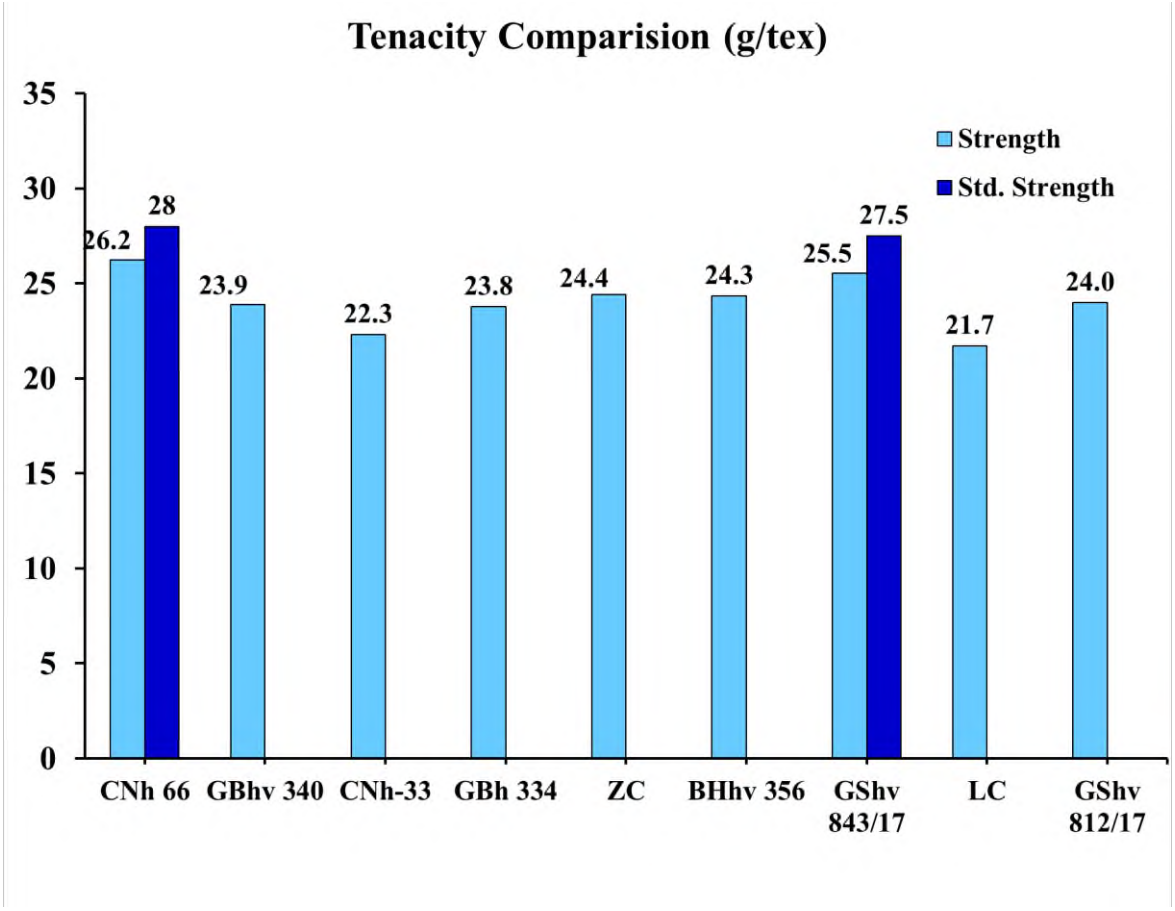
Entry GVav 1332 (*UHML 28.0 mm, Tenacity 28.5 gpt, UI 82 and Micronaire 4.4*) has performed well

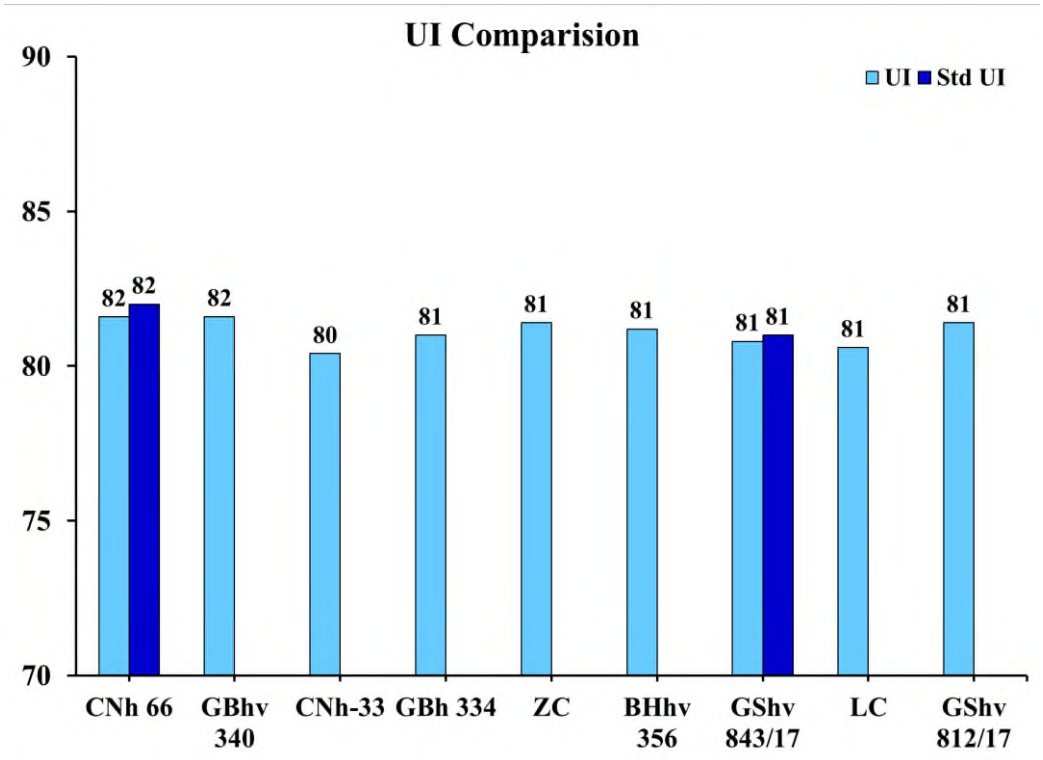
Br.32b IET. of *G. herbaceum*

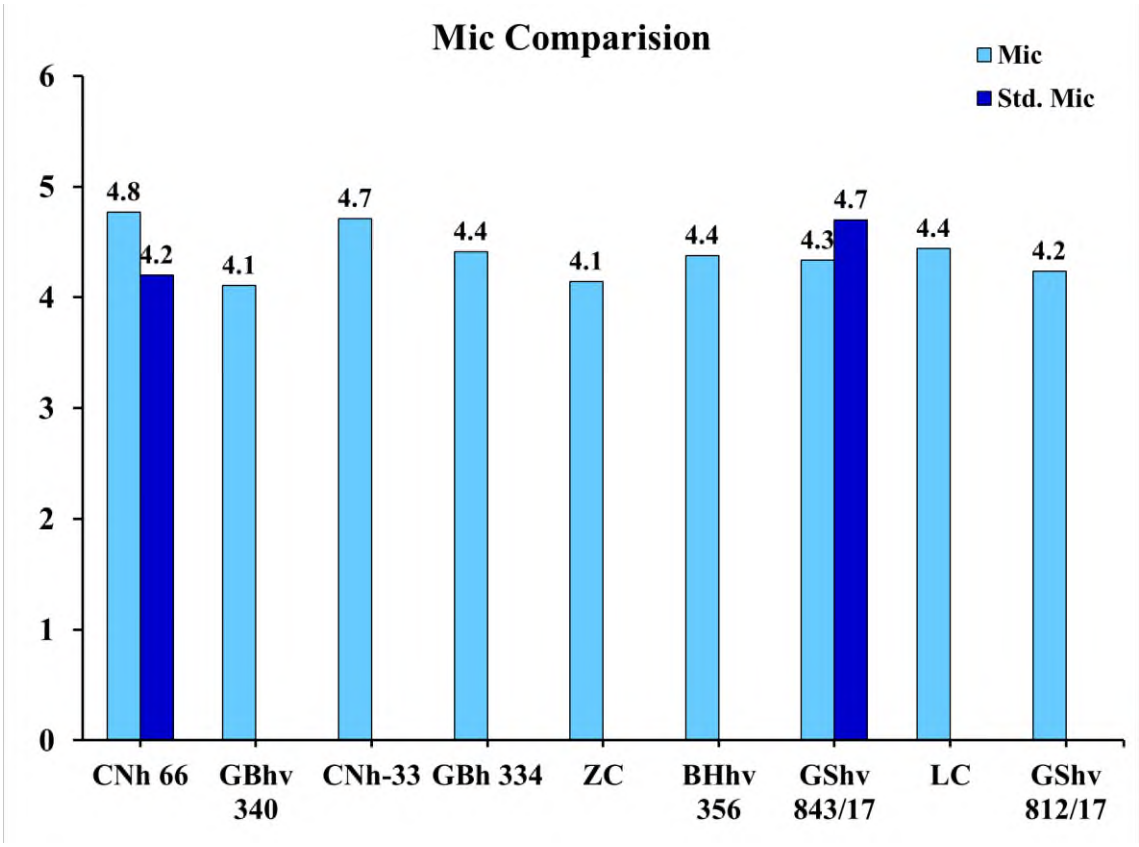
Observations

- Under this trial samples were received in the UHML range of 22.5-25.5 mm.
- The samples were having UI in the range of 81.
- The tenacity of the two entries was at par with minimum requirement.
- The micronaire values of most the samples in the range of 4.2.


UHML (mm)
30
25
20
25.5
23.7
22.6
23.5
23.9
23.9
24.8
22.4
23.8
CNh 66
GBhv 340
CNh-33
GBh 334
ZC
BHhv 356
GShv 843/17
LC
GShv 812/17


Tenacity Comparision (g/tex)
35
30
25
20
15
10
5
0
Strength
Std. Strength
26.2
28
23.9
22.3
23.8
24.4
24.3
25.5
27.5
21.7
24.0
CNh 66
GBhv 340
CNh-33
GBh 334
ZC
BHhv 356
GShv 843/17
LC
GShv 812/17





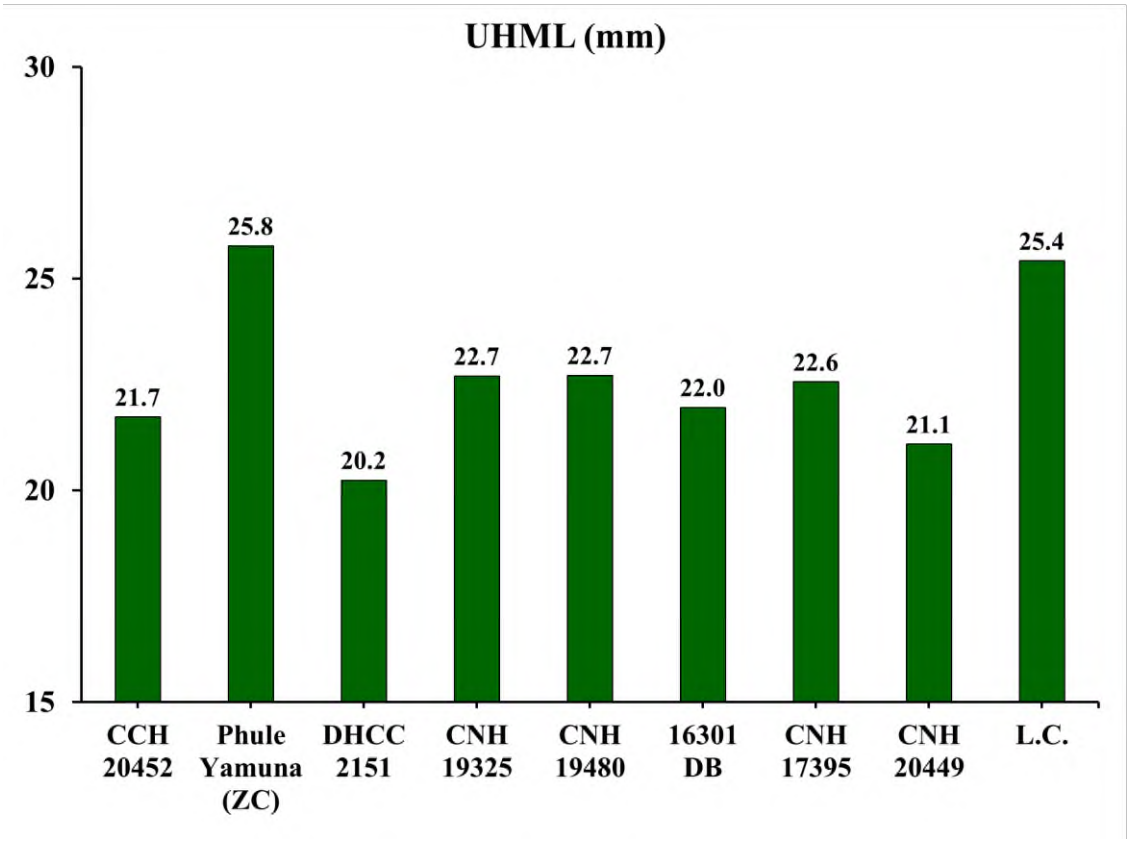
Recommendations

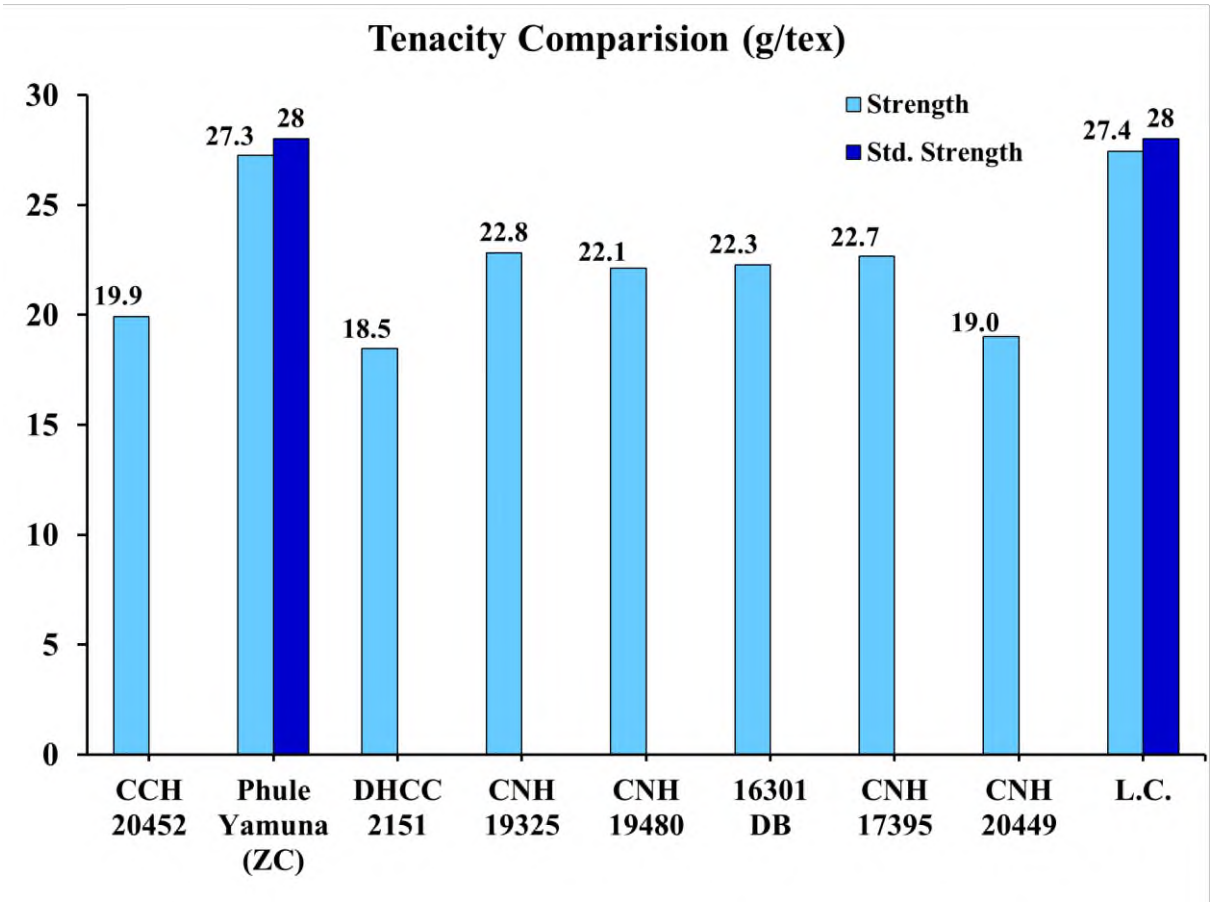
Entry CNh 66 (UHML 25.5 mm, Tenacity 26.2 gpt, UI 82 and Micronaire 4.8) has performed well. The other performing entry is GShv 843/17 (UHML 24.8 mm, Tenacity 25.5 gpt, UI 81 and Micronaire 4.3)

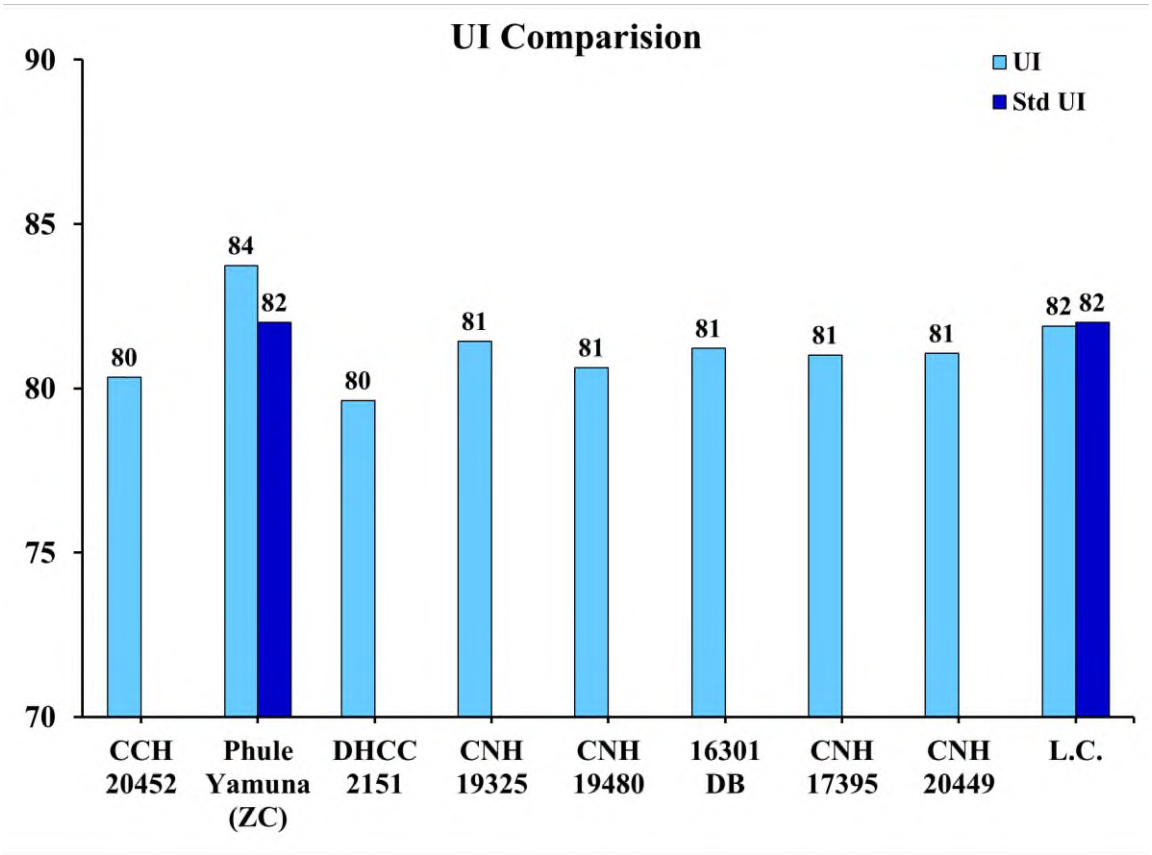
Br-03 a/b - PVT Coloured Cotton (*Hirsutum*)– Irrigated

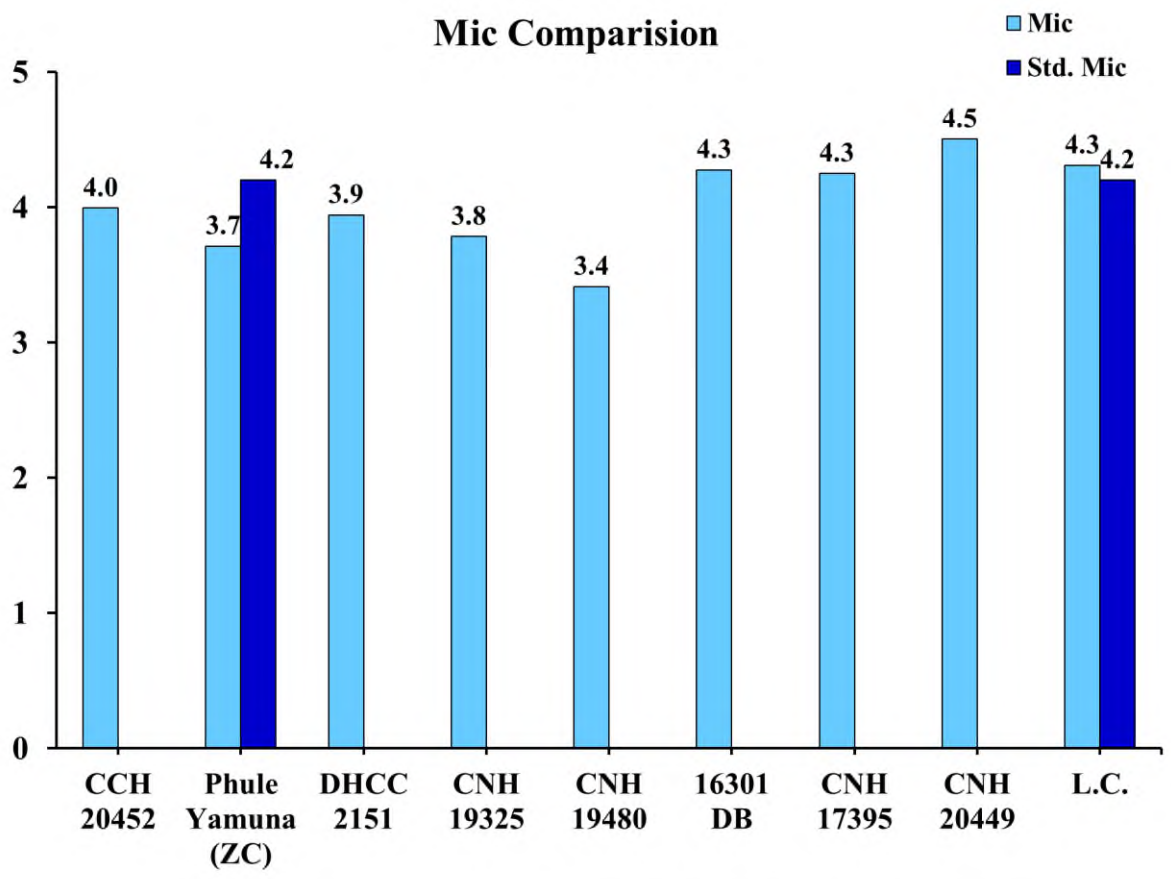
Observations

- Under this trial samples were received in the UHML range of 21-23 mm lesser than LC and ZC.
- The samples were having UI in the range of 81.
- The micronaire values of most the samples were within the limit




Tenacity Comparision (g/tex)
Strength
Std. Strength
30
25
20
15
10
5
0
19.9
27.3
28
18.5
22.8
22.1
22.3
22.7
19.0
27.4
28
CCH 20452
Phule Yamuna (ZC)
DHCC 2151
CNH 19325
CNH 19480
16301 DB
CNH 17395
CNH 20449
L.C.


UI Comparision
UI
Std UI
90
85
80
75
70
80
84
82
80
81
81
81
81
81
82
82
CCH 20452
Phule Yamuna (ZC)
DHCC 2151
CNH 19325
CNH 19480
16301 DB
CNH 17395
CNH 20449
L.C.



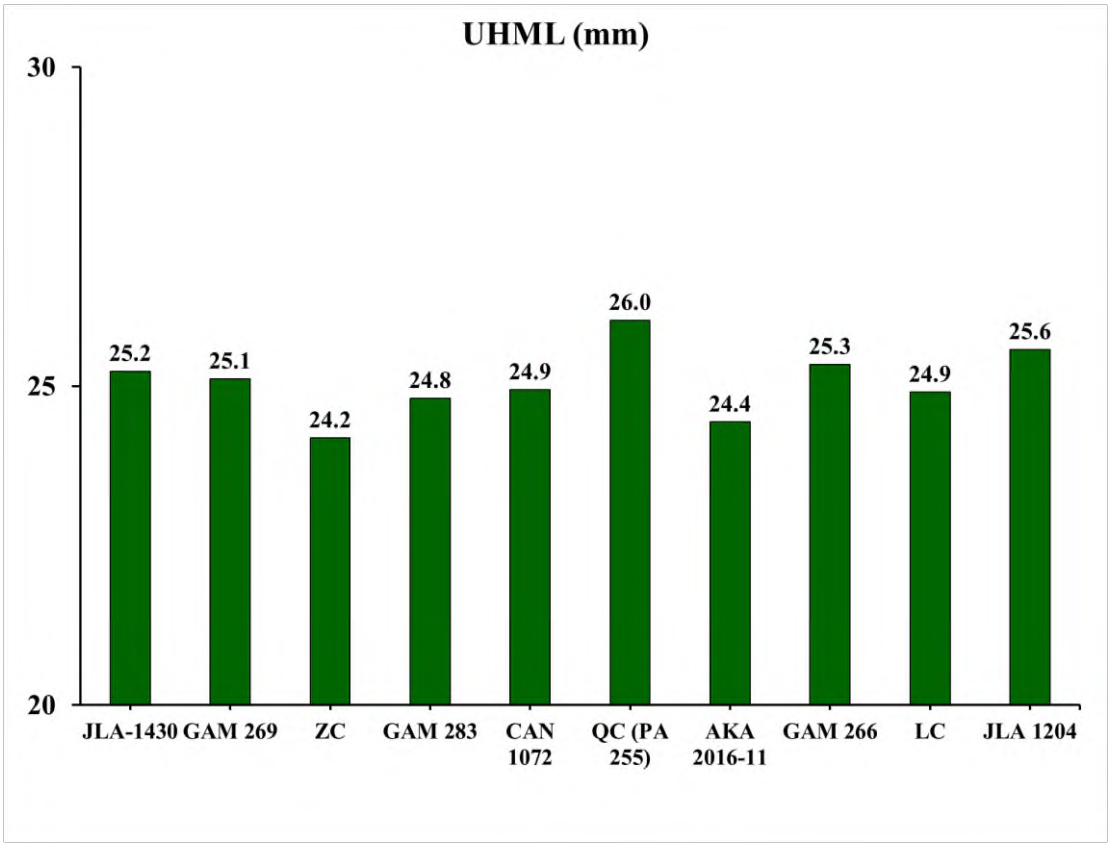
Recommendations

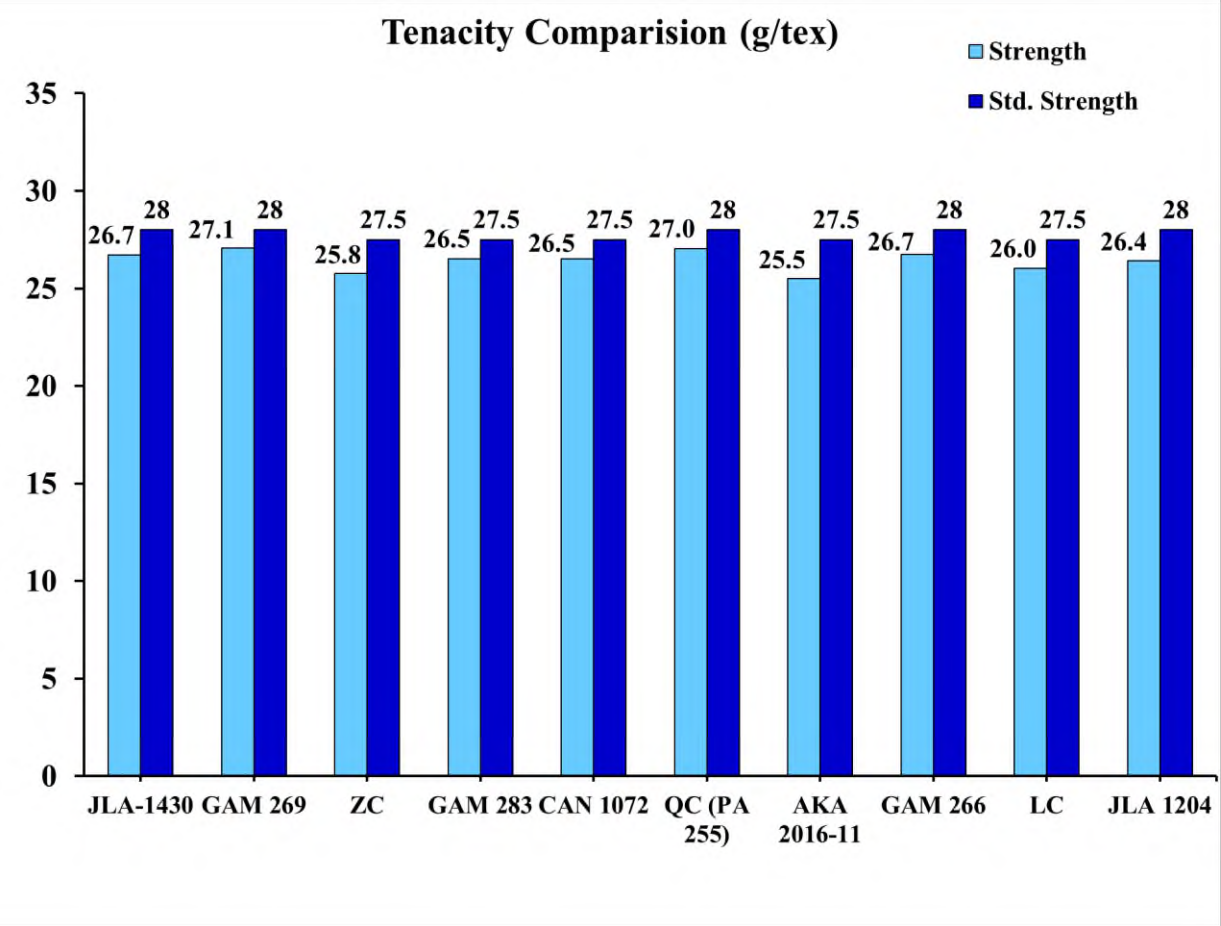
No entry has performed well

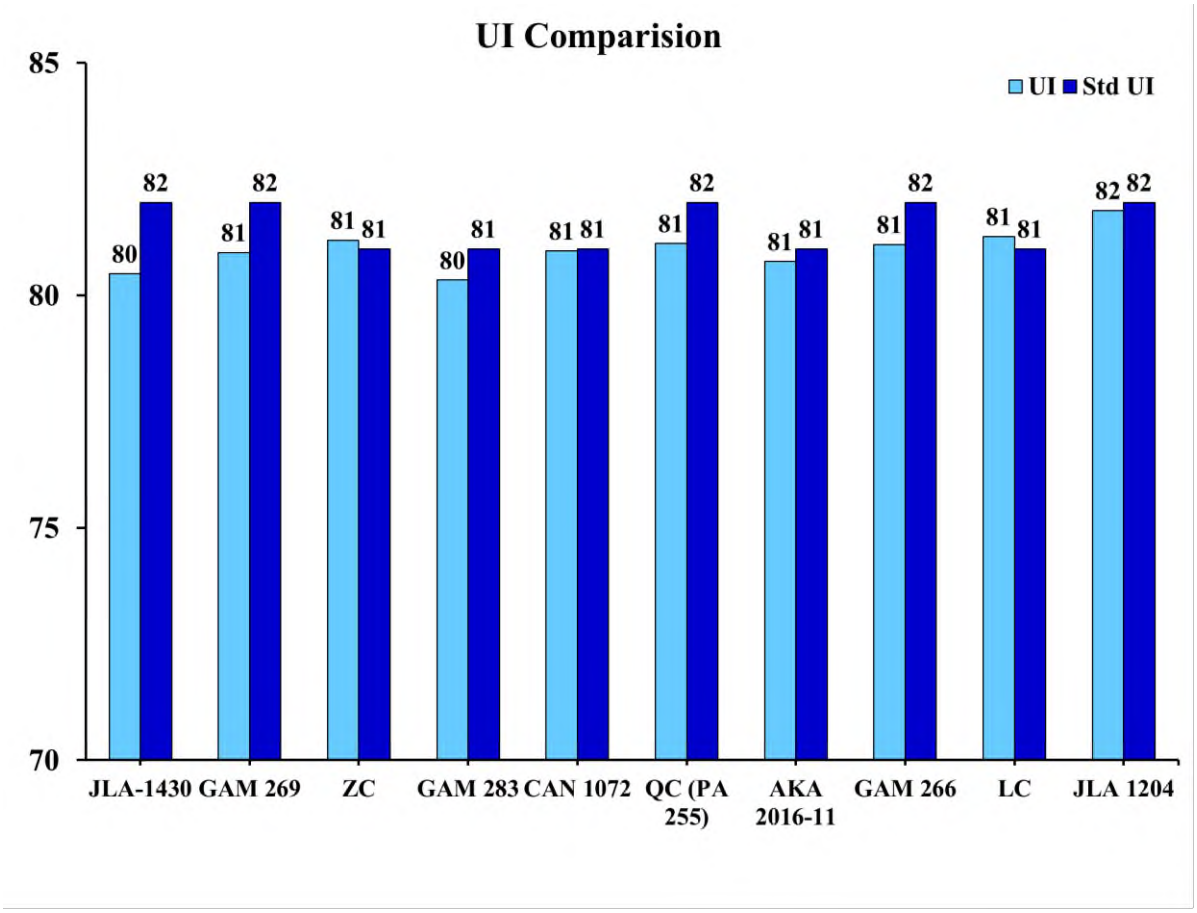
Br-24 b CVT - *G.arboreum*

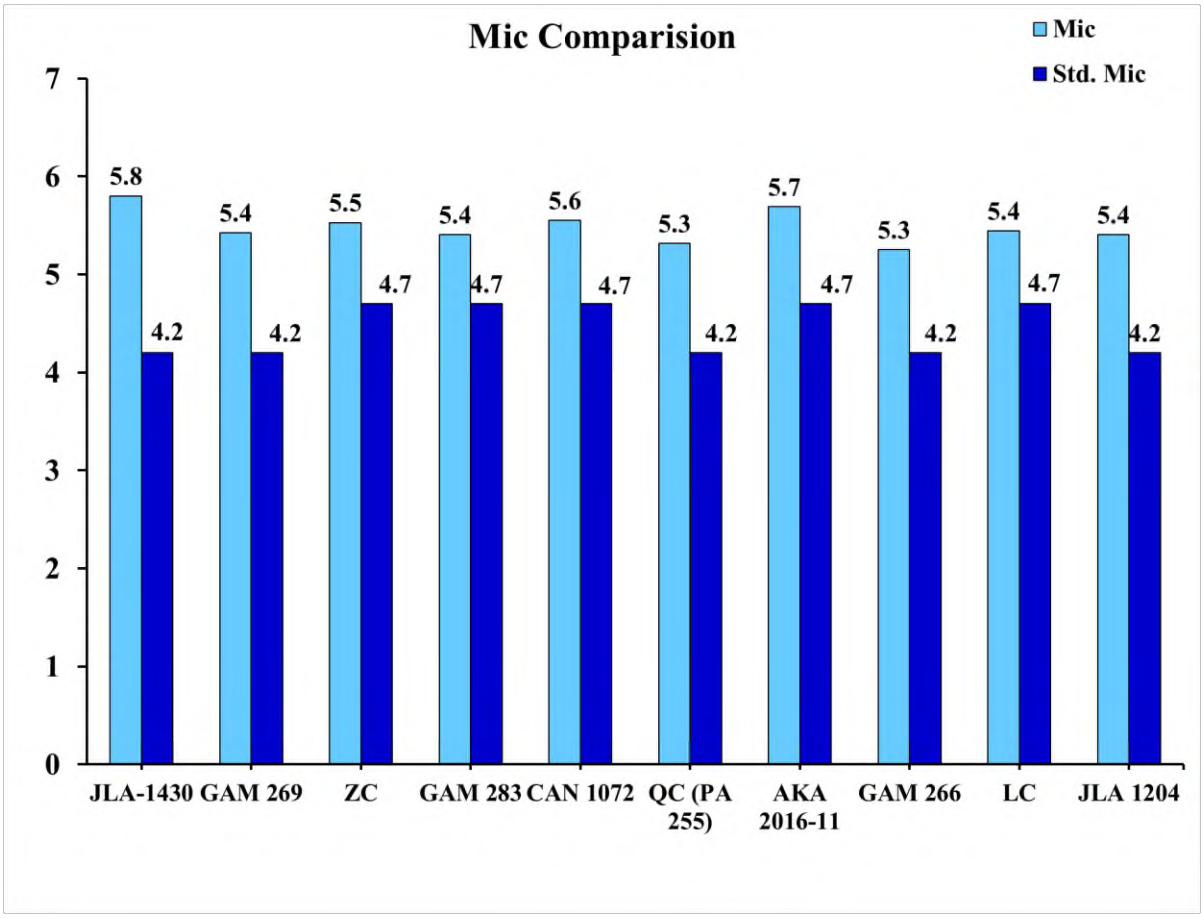
Observations

- Under this trial samples were received in the UHML range of 24-26 mm.
- The samples were having UI in the range of 81 which is found to be very good.
- The tenacity of the samples was at par with minimum requirement.
- The micronaire values of most the samples were very high in the range of 5-6.


UHML (mm)
30
25
20
25.2
25.1
24.2
24.8
24.9
26.0
24.4
25.3
24.9
25.6
JLA-1430
GAM 269
ZC
GAM 283
CAN 1072
QC (PA 255)
AKA 2016-11
GAM 266
LC
JLA 1204


Tenacity Comparision (g/tex)
Strength
Std. Strength
35
30
25
20
15
10
5
0
26.7
28
27.1
28
25.8
27.5
26.5
27.5
26.5
27.5
27.0
28
25.5
27.5
26.7
28
26.0
27.5
26.4
28
JLA-1430
GAM 269
ZC
GAM 283
CAN 1072
QC (PA 255)
AKA 2016-11
GAM 266
LC
JLA 1204


UI Comparision
UI
Std UI
85
80
75
70
80
82
81
82
81
81
80
81
81
81
81
82
81
81
81
82
81
81
82
82
JLA-1430
GAM 269
ZC
GAM 283
CAN 1072
QC (PA 255)
AKA 2016-11
GAM 266
LC
JLA 1204


Mic Comparision
Mic
Std. Mic
7
6
5
4
3
2
1
0
5.8
4.2
5.4
4.2
5.5
4.7
5.4
4.7
5.6
4.7
5.3
4.2
5.7
4.7
5.3
4.2
5.4
4.7
5.4
4.2
JLA-1430
GAM 269
ZC
GAM 283
CAN 1072
QC (PA 255)
AKA 2016-11
GAM 266
LC
JLA 1204

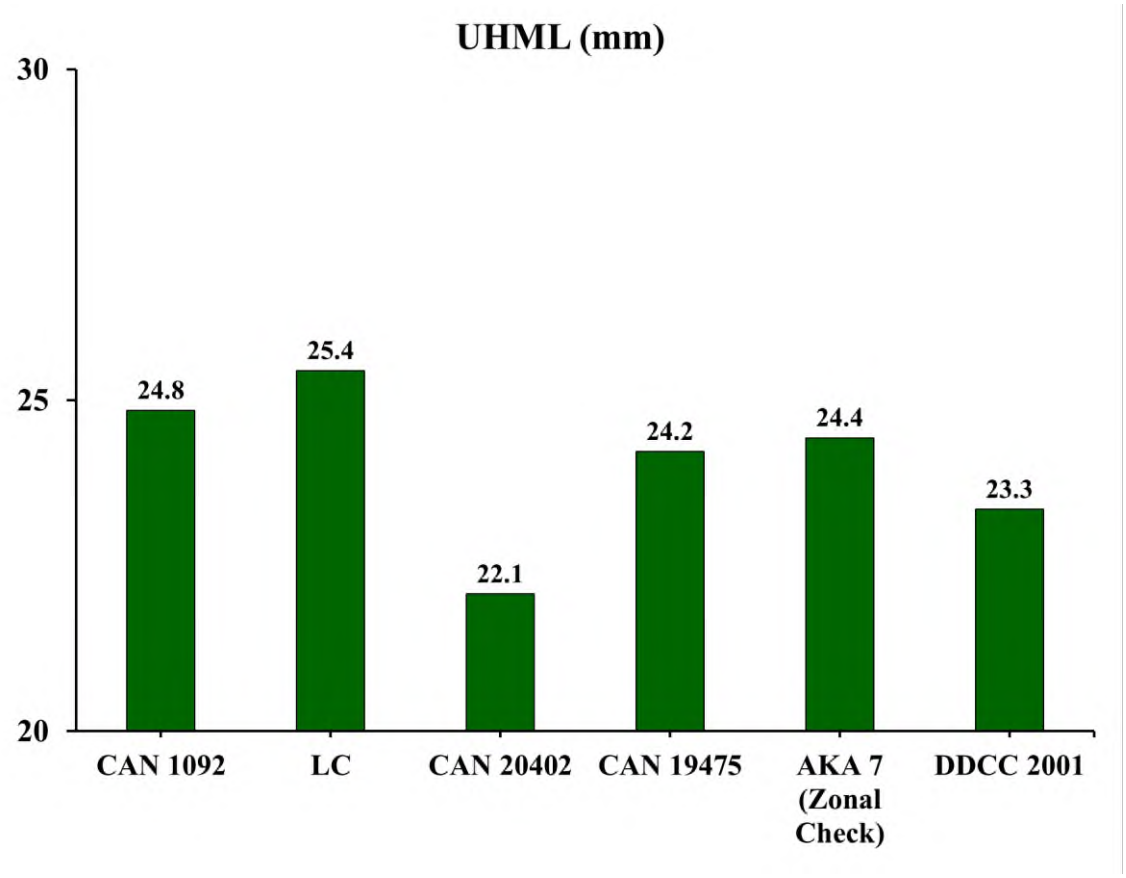
Recommendations

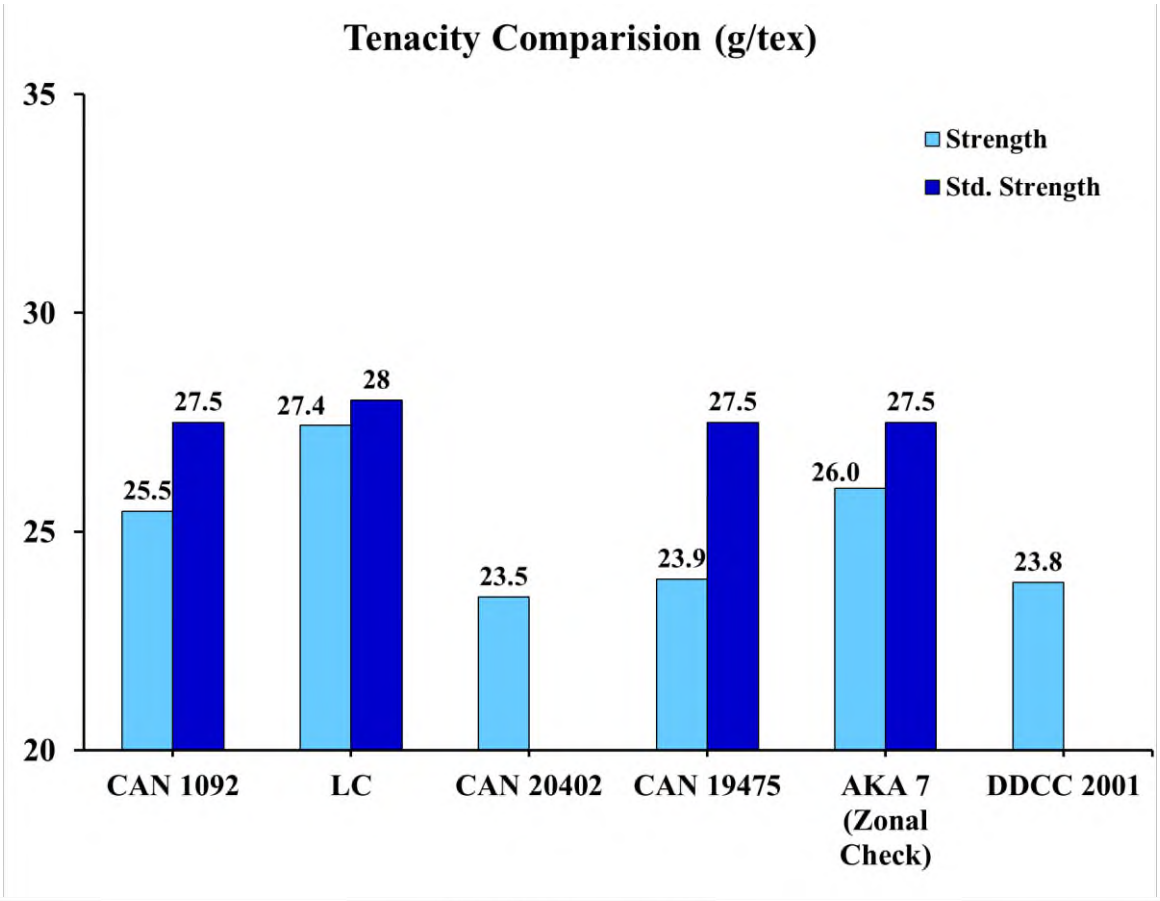
No entry has performed better than quality check. However promising entries are GAM 266 (UHML 25.3 mm, Tenacity 26.7 gpt, UI 81 and Micronaire 5.3) and JLA 1204 (UHML 25.6 mm, Tenacity 26.4 gpt, UI 82 and Micronaire -5.4).

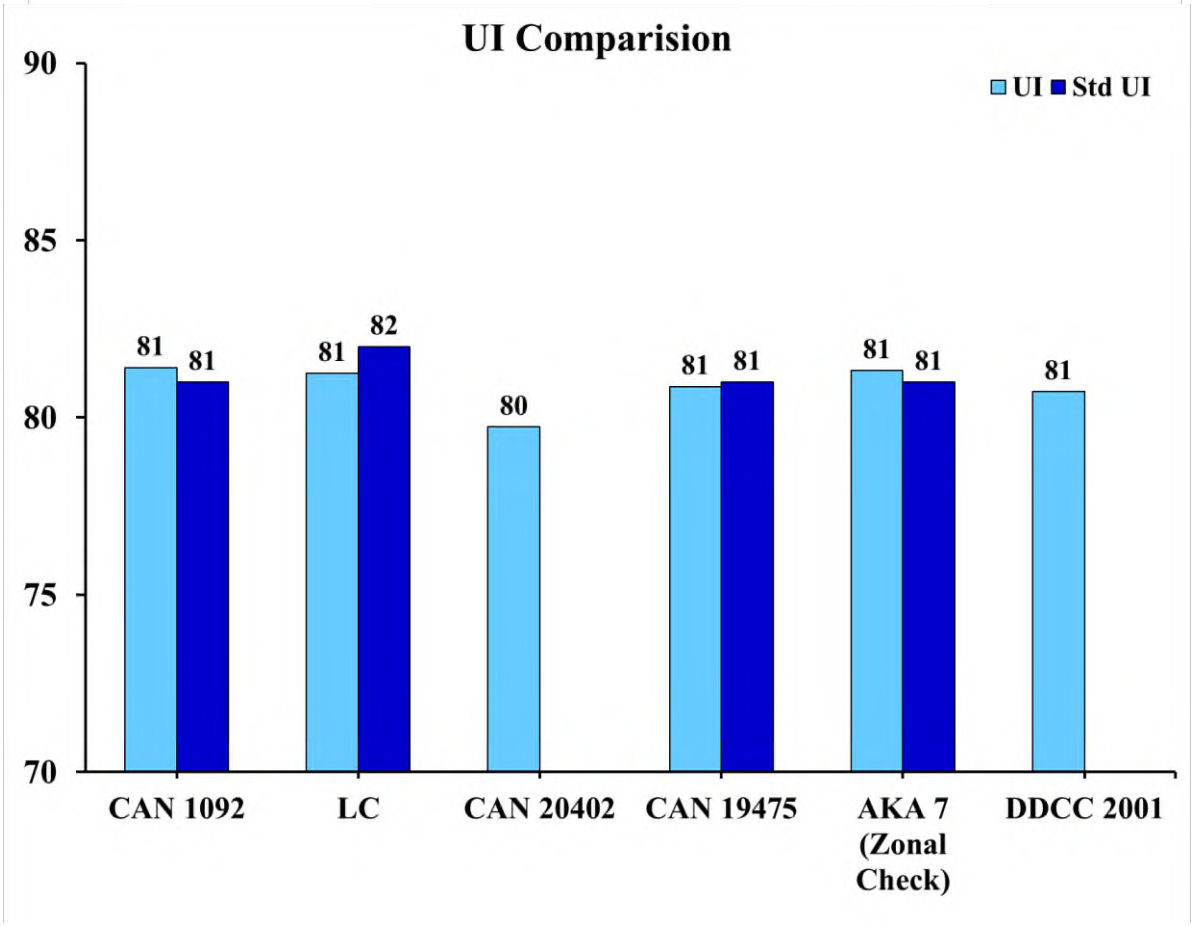
Br24b-CVT Coloured Cotton – G. *Arboreum*

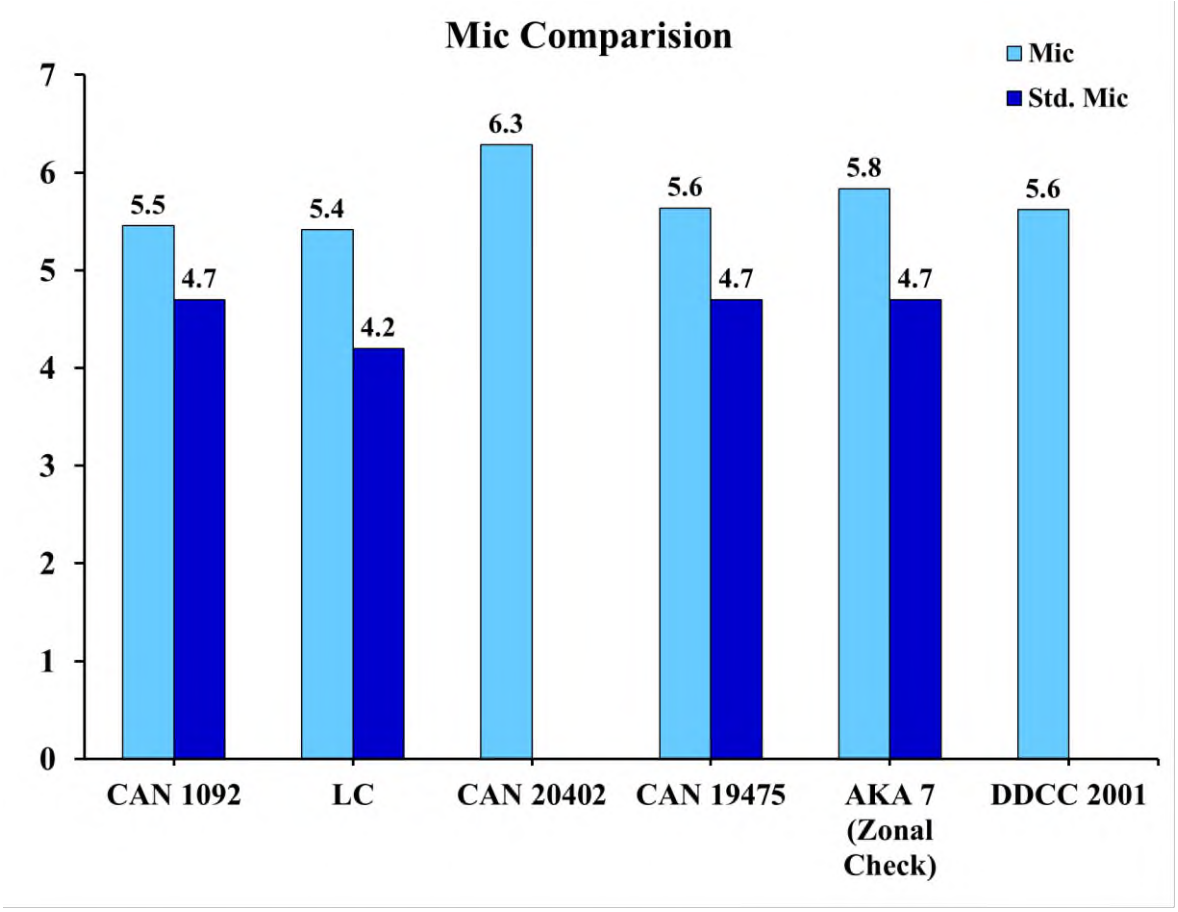
Observations

- Under this trial samples were received in the UHML range of 22-25 mm.
- The samples were having UI in the range of 80 which is very good.
- The tenacity of the samples was very good if we consider coloured cotton category.
- The micronaire values of most the samples were in the range of 5.5 – 5.6 higher than the requirement.




Tenacity Comparision (g/tex)
35
30
25
20
Strength
Std. Strength
25.5
27.5
27.4
28
23.5
23.9
27.5
26.0
27.5
23.8
CAN 1092
LC
CAN 20402
CAN 19475
AKA 7 (Zonal Check)
DDCC 2001


UI Comparision
90
85
80
75
70
UI
Std UI
81
81
81
82
80
81
81
81
81
81
CAN 1092
LC
CAN 20402
CAN 19475
AKA 7 (Zonal Check)
DDCC 2001



Recommendations

Entry CAN 1092 (*UHML 24.8 mm, Tenacity 25.5 gpt, UI 81 and Micronaire 5.5*) has shown better quality.

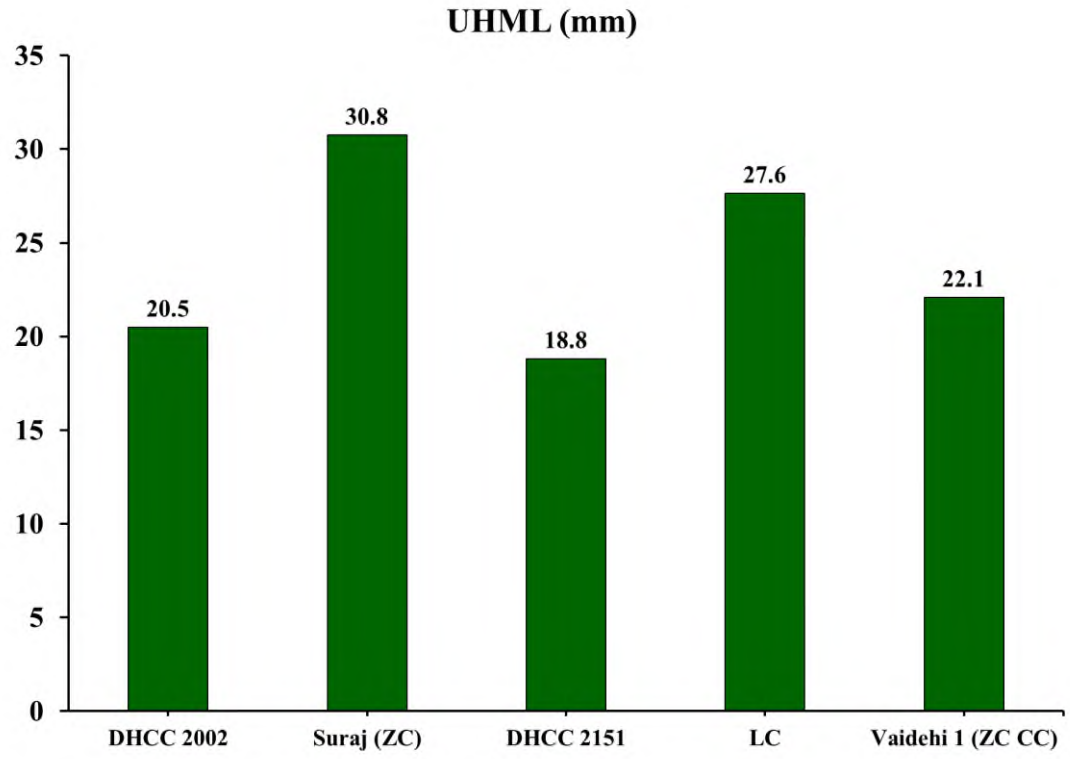
SOUTH ZONE

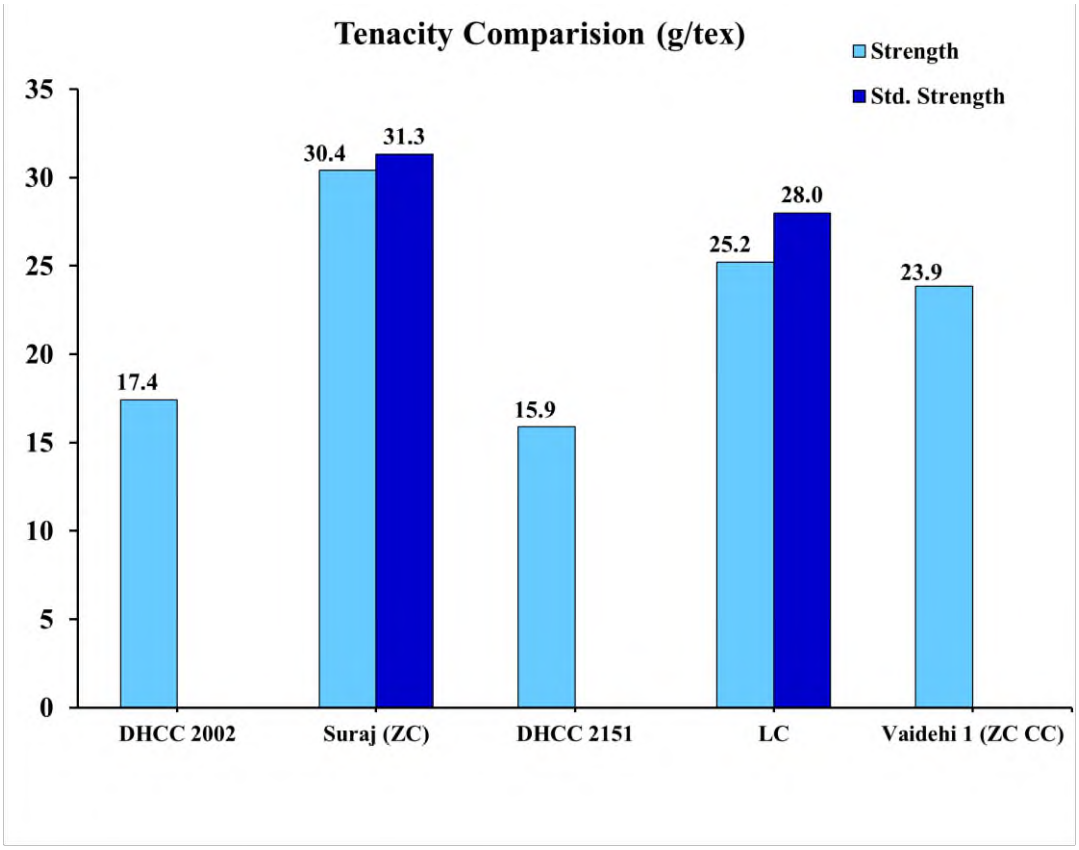
Br-03 a/b (CC) – PVT Colour Cotton – Irrigated

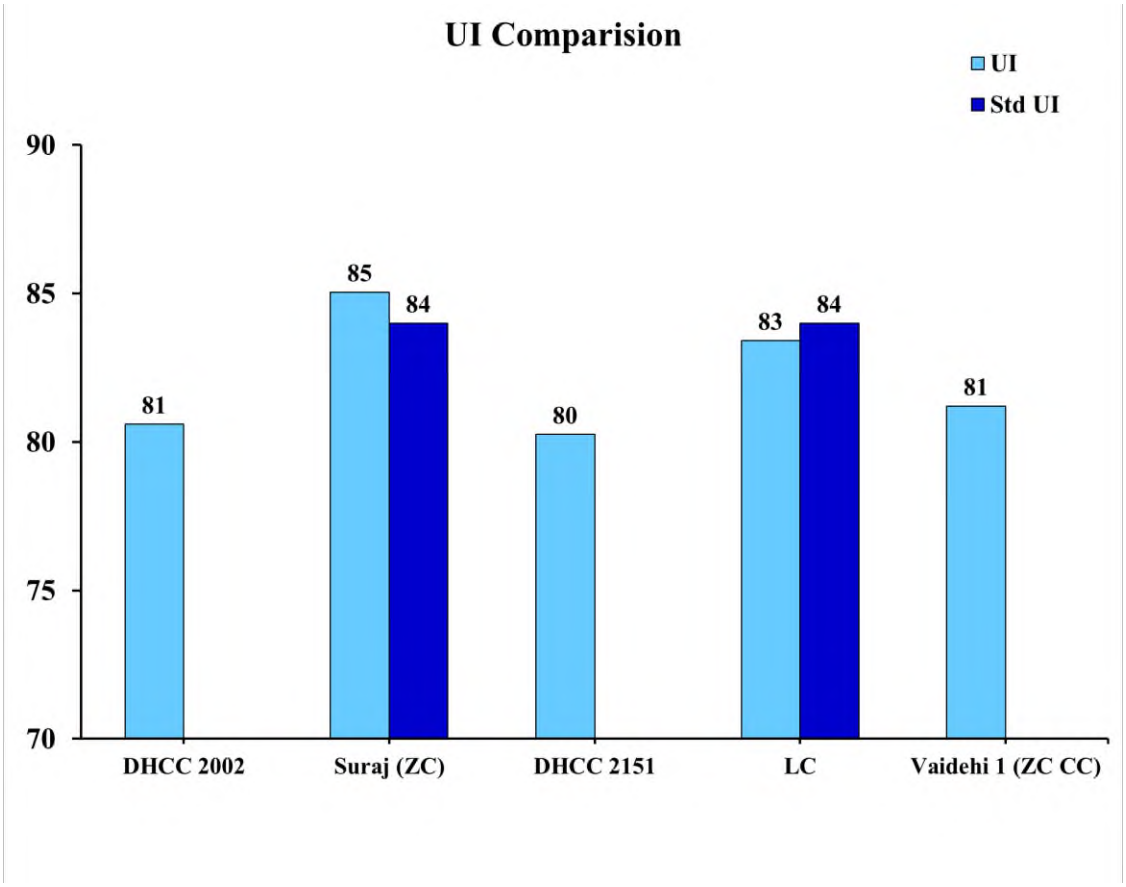
Observations

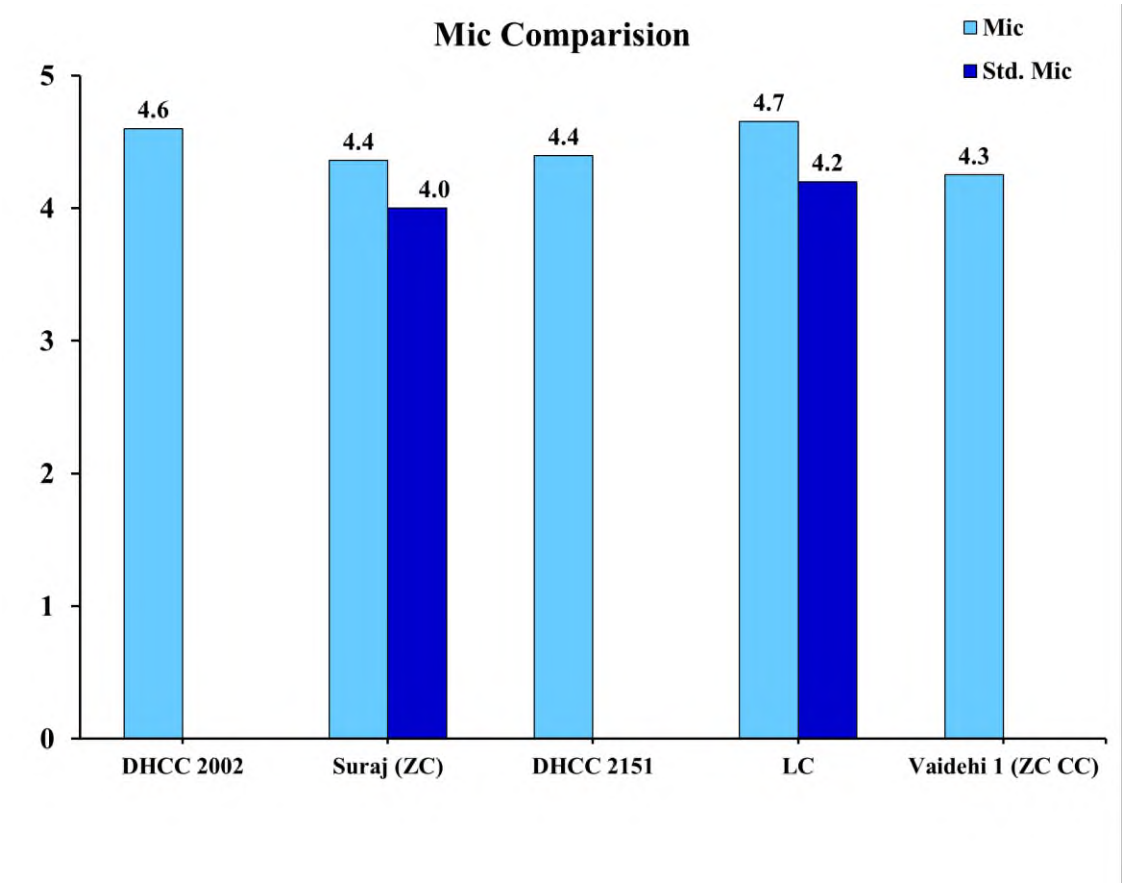
❖ Samples were having UHML less than 20 mm.

❖ Though UI was good but, tenacity of the samples were found to be very low i.e. 10-14 gpt only




Tenacity Comparision (g/tex)
Strength
Std. Strength
35
30
25
20
15
10
5
0
17.4
30.4
31.3
15.9
25.2
28.0
23.9
DHCC 2002
Suraj (ZC)
DHCC 2151
LC
Vaidehi 1 (ZC CC)


UI Comparision
UI
Std UI
90
85
80
75
70
81
85
84
80
83
84
81
DHCC 2002
Suraj (ZC)
DHCC 2151
LC
Vaidehi 1 (ZC CC)



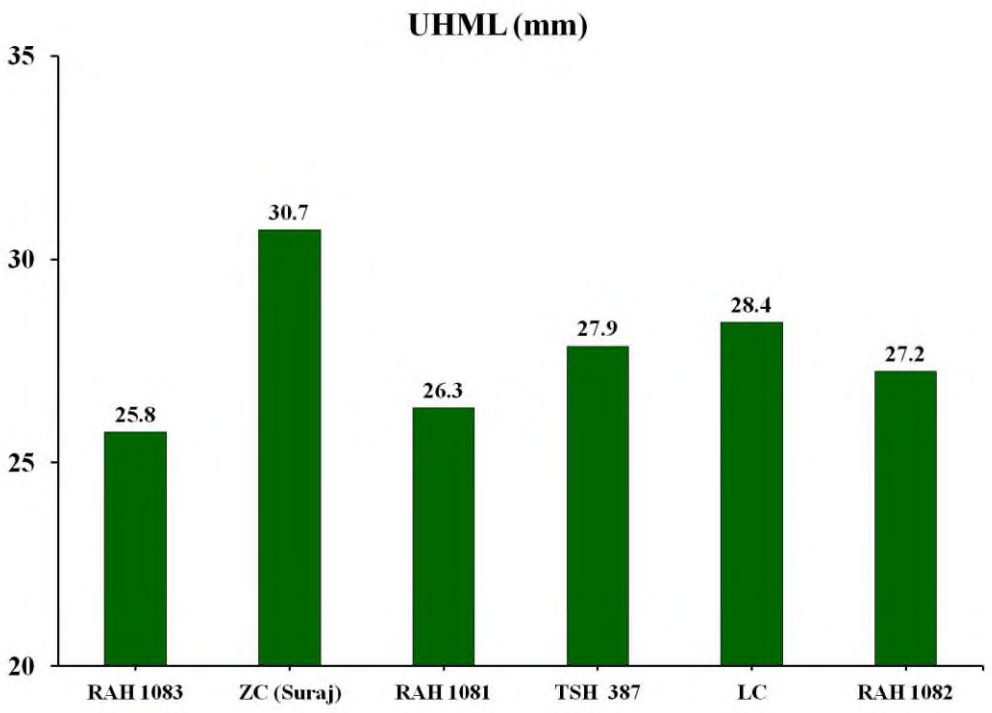
Recommendations

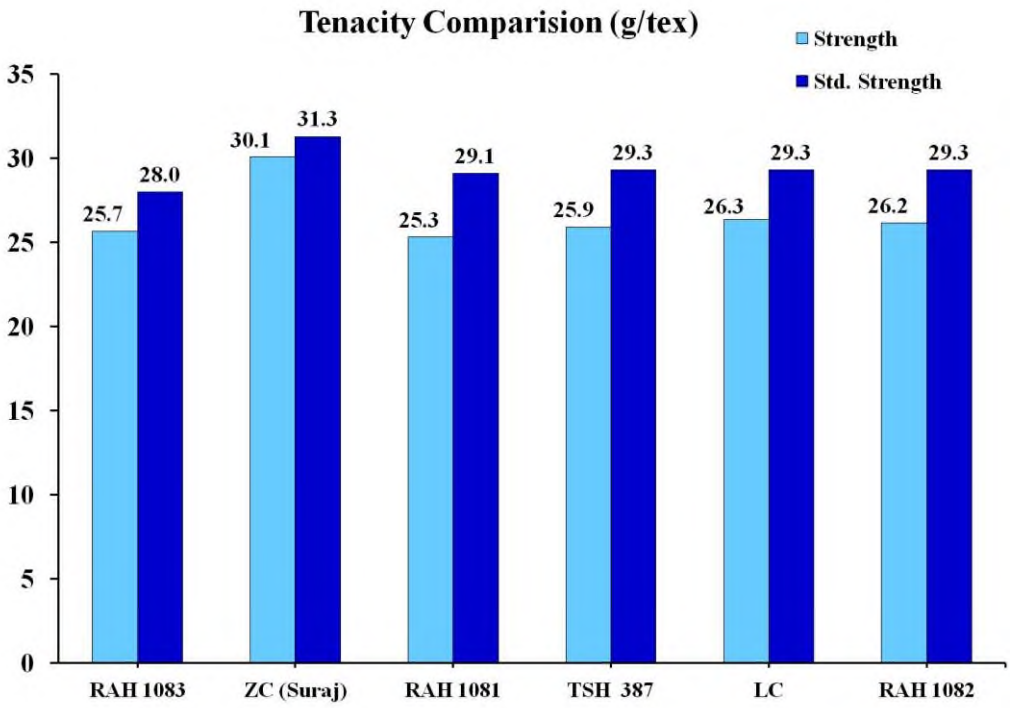
No entries were recommended due to inferior fibre properties

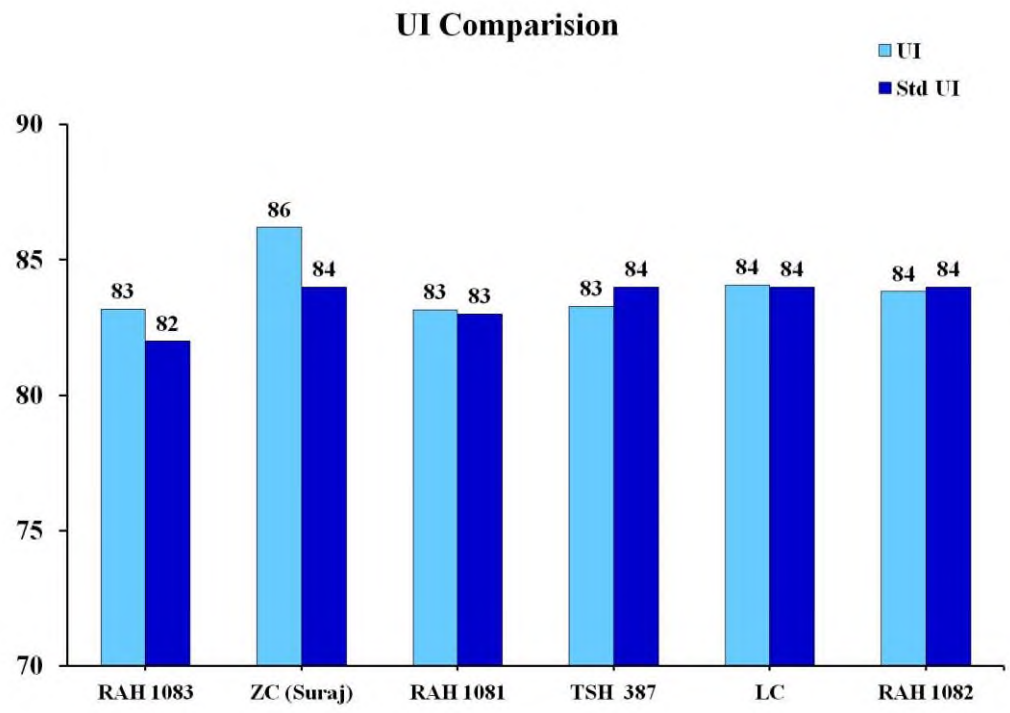
Br04a - CVT irrigated

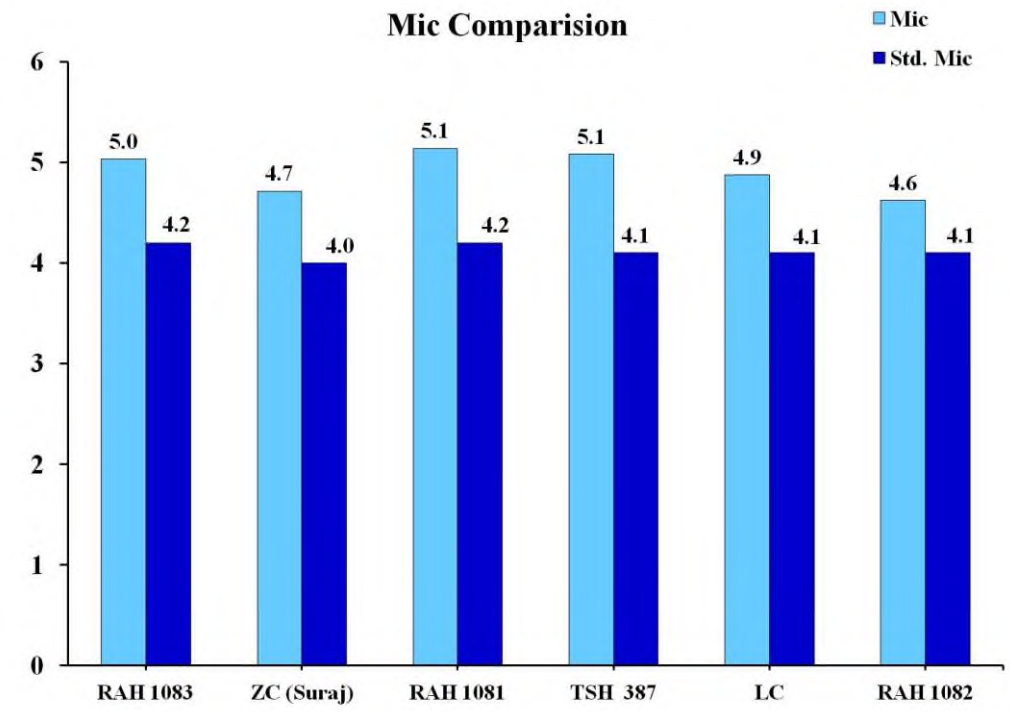
Observations

- Samples were having UHML from 26 mm to 28 mm.
- The tenacity of the samples were lower compared to the minimum requirement.
- The UI of the samples all samples was at par with the minimum requirement expect for TSH 325, wherein it was higher than the minimum requirement.
- The micronaire values were higher than the minimum required.


UHML (mm)
35
30
25
20
25.8
30.7
26.3
27.9
28.4
27.2
RAH 1083
ZC (Suraj)
RAH 1081
TSH 387
LC
RAH 1082


Tenacity Comparision (g/tex)
Strength
Std. Strength
35
30
25
20
15
10
5
0
25.7
28.0
30.1
31.3
25.3
29.1
25.9
29.3
26.3
29.3
26.2
29.3
RAH 1083
ZC (Suraj)
RAH 1081
TSH 387
LC
RAH 1082





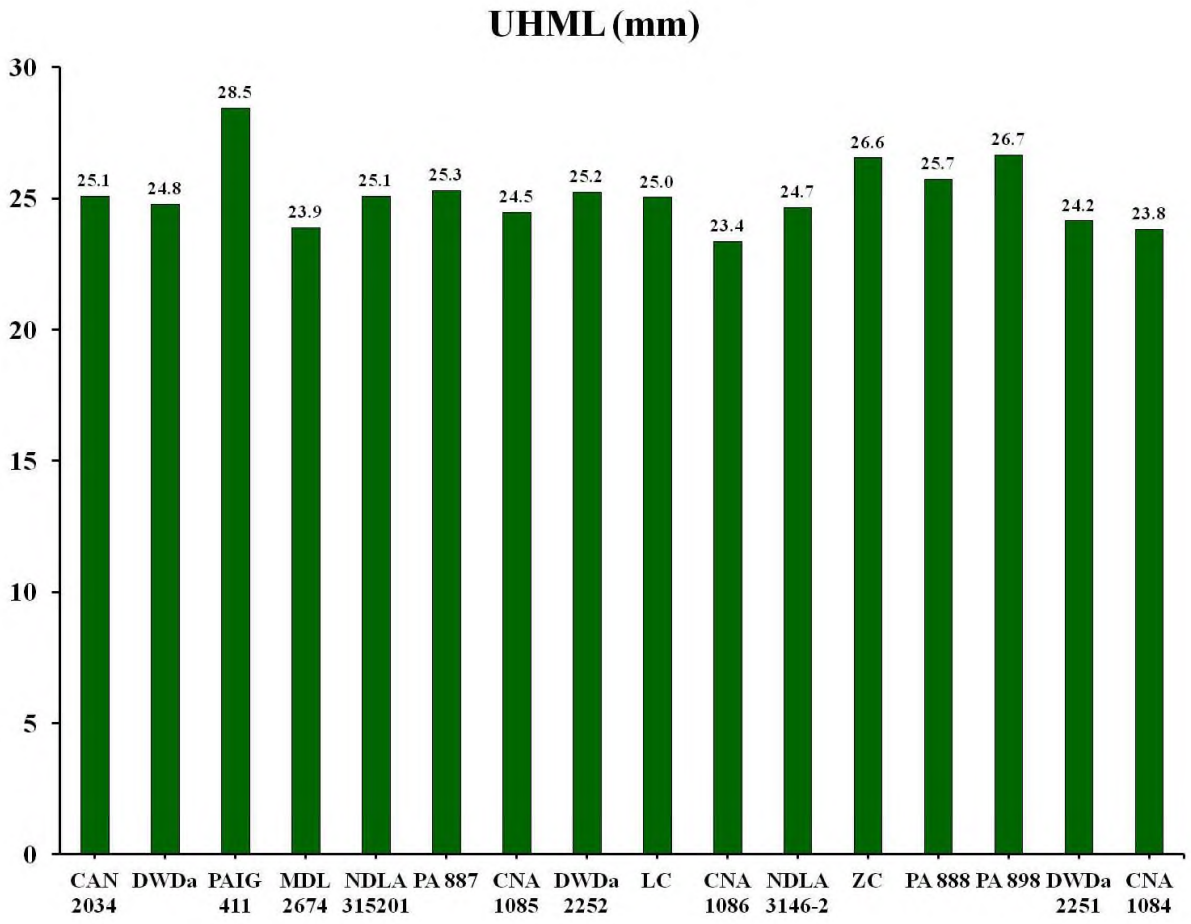
Recommendations

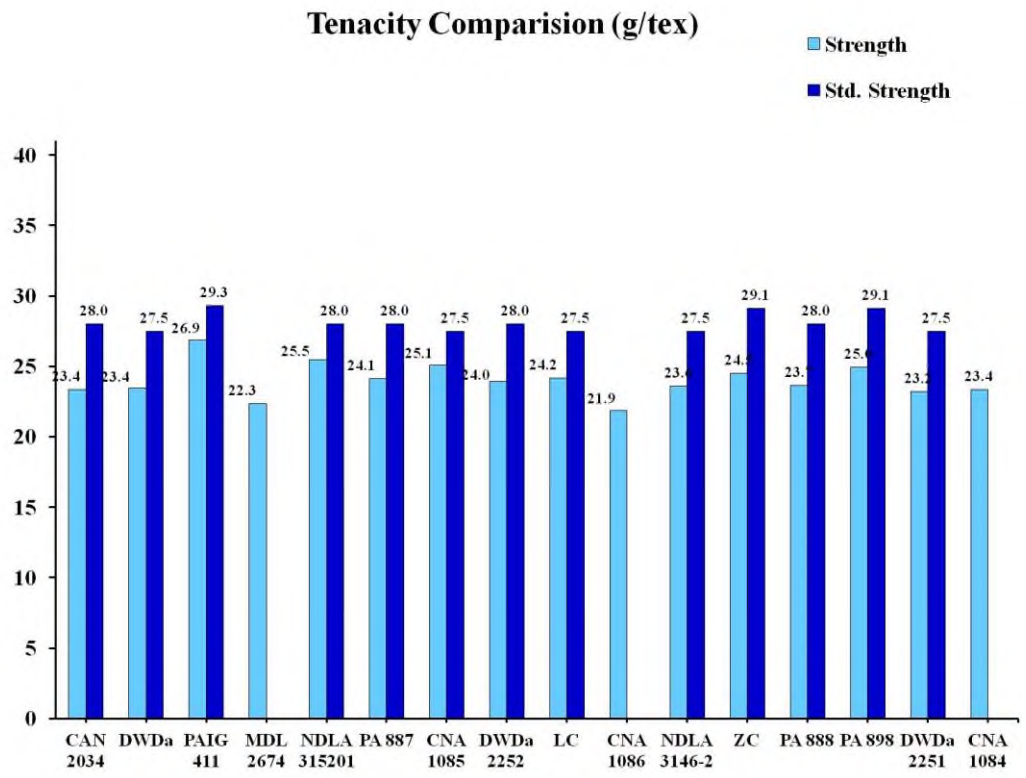
No entry has performed better than ZC

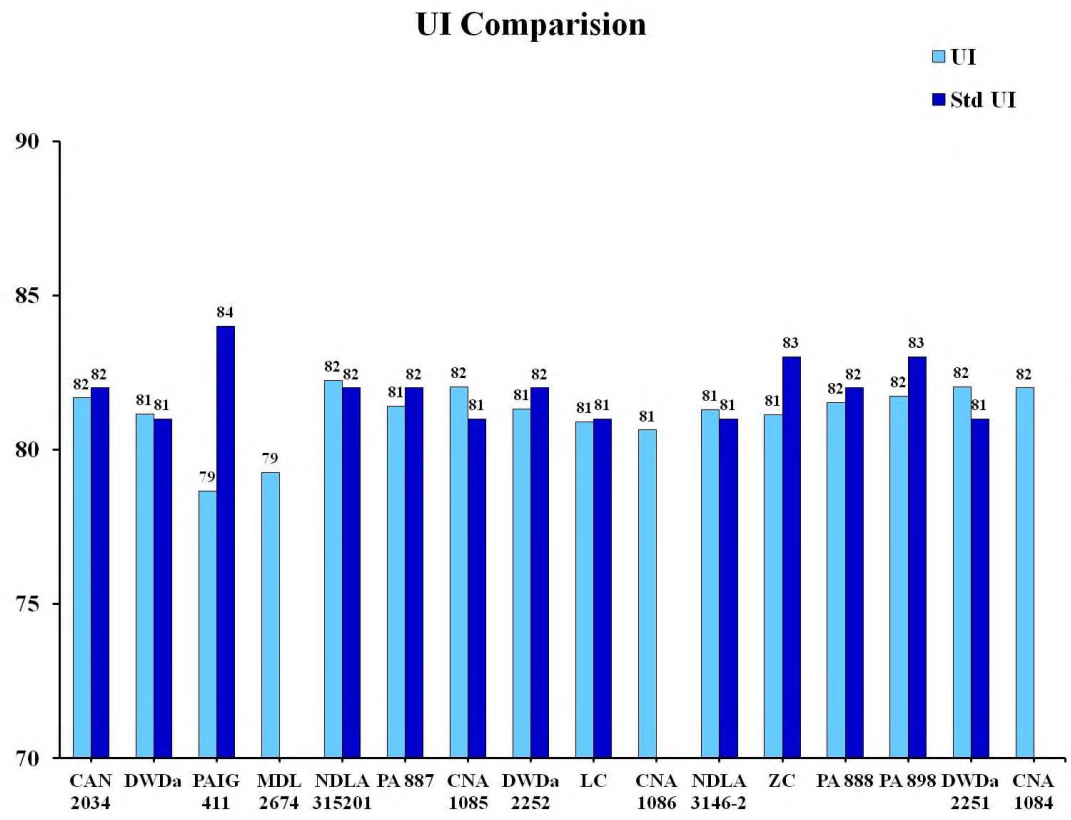
Br24b : CVT - G.arboreum

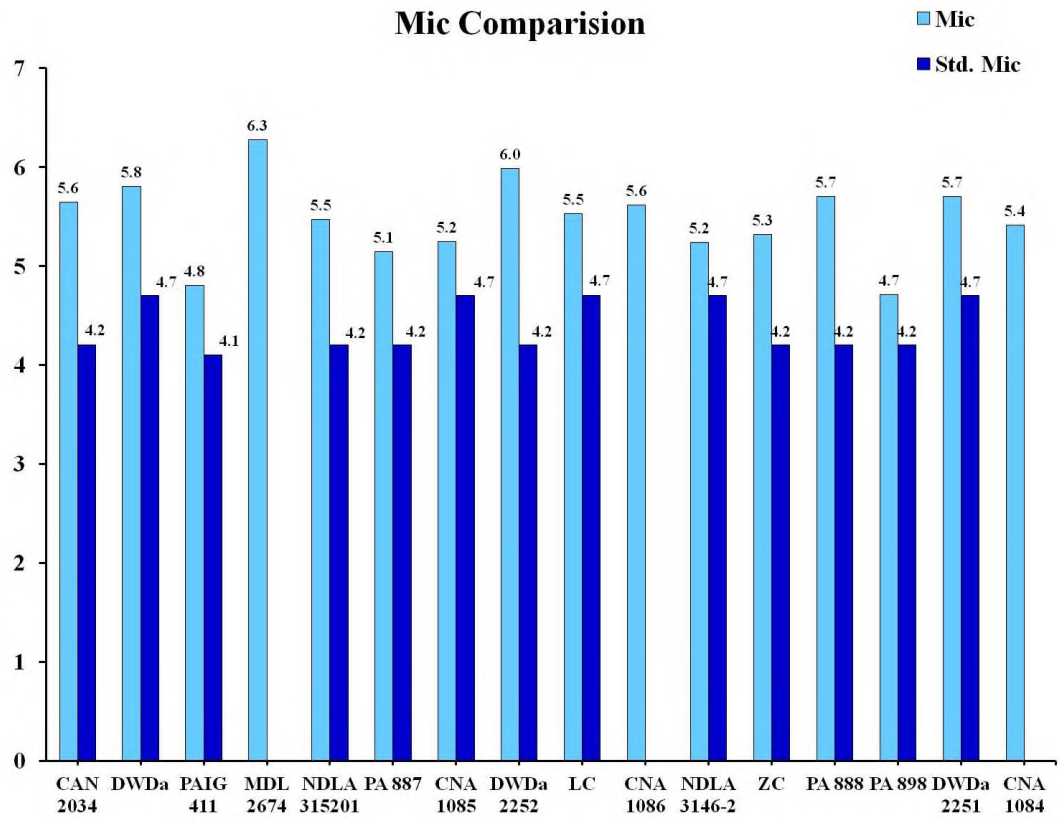
Observations

- The samples were having UHML range from 23 mm to 28 mm.
- The tenacity values were significantly lower than with the minimum requirement for all samples.
- All entries were having lower UI than the minimum requirement.
- The micronaire values of samples were higher than minimum required values.




Tenacity Comparision (g/tex)
Strength
Std. Strength
40
35
30
25
20
15
10
5
0
CAN 2034
DWDa
PAIG 411
MDL 2674
NDLA 315201
PA 887
CNA 1085
DWDa 2252
LC
CNA 1086
NDLA 3146-2
ZC
PA 888
PA 898
DWDa 2251
CNA 1084


UI Comparision
UI
Std UI
90
85
80
75
70
CAN 2034
DWDa
PAIG 411
MDL 2674
NDLA 315201
PA 887
CNA 1085
DWDa 2252
LC
CNA 1086
NDLA 3146-2
ZC
PA 888
PA 898
DWDa 2251
CNA 1084



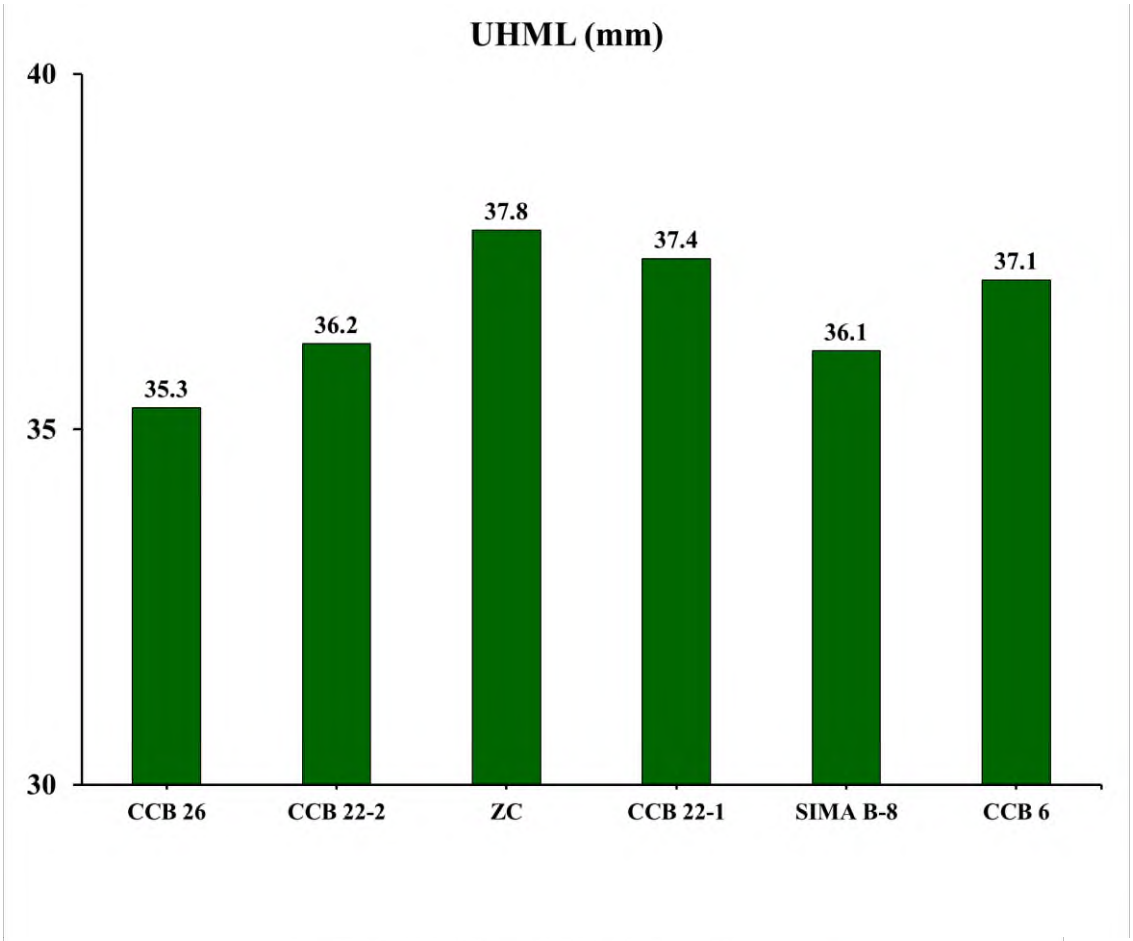
Recommendations

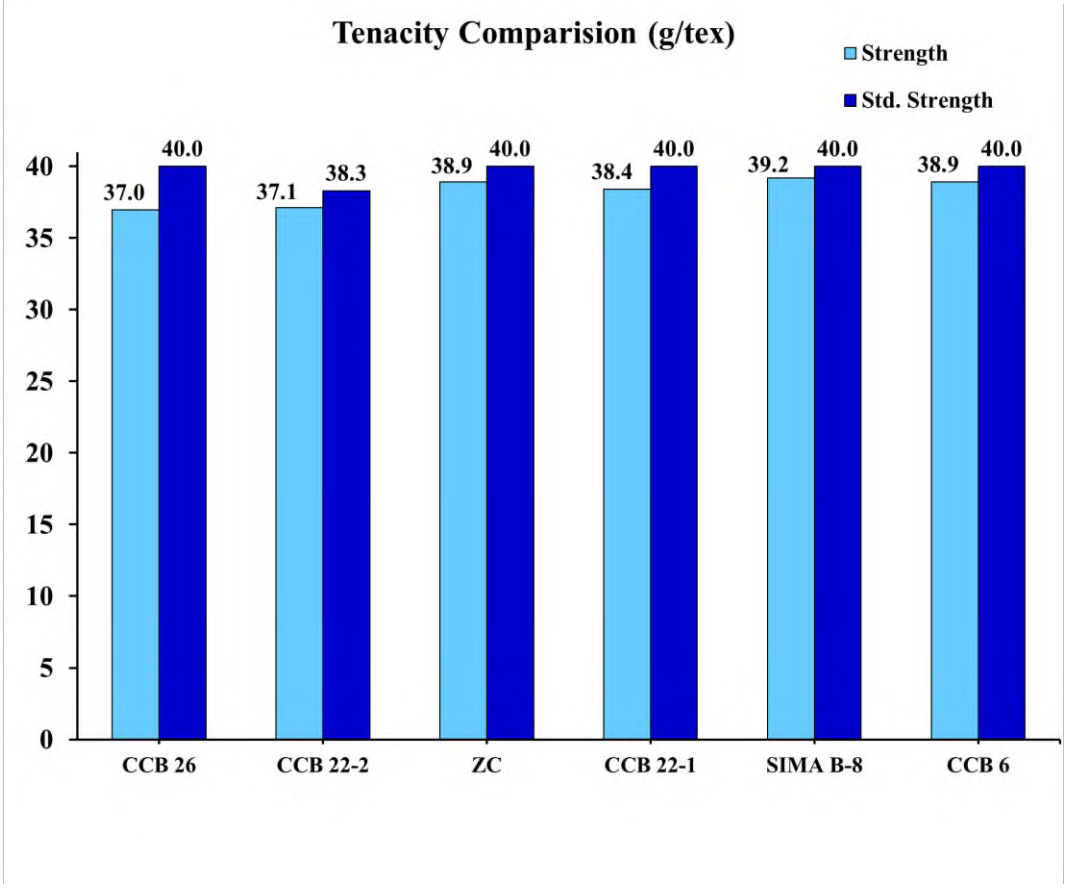
Entry PAIG 411 (*UHML 28.5 mm, Tenacity 26.9 gpt, UI 78 and Micronaire 4.8)* has performed well

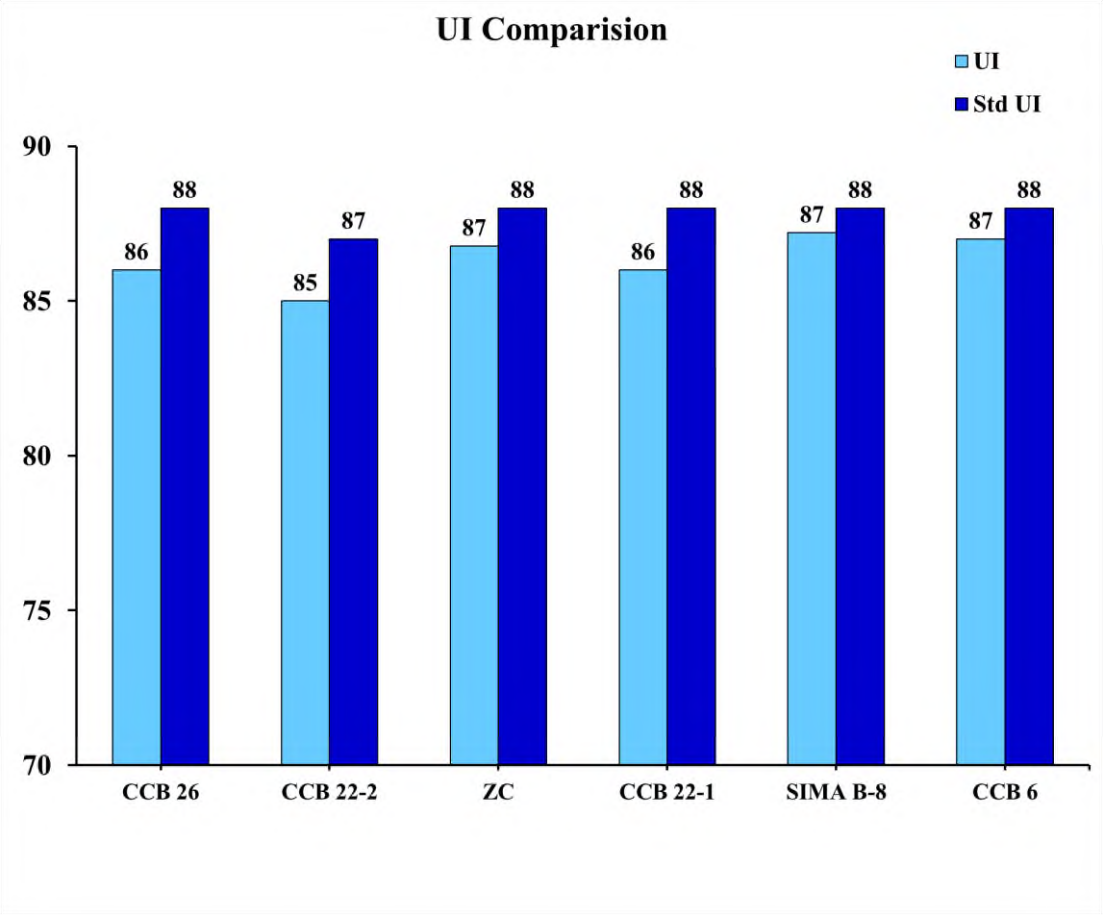
Br14a CVT *G.barbadense*

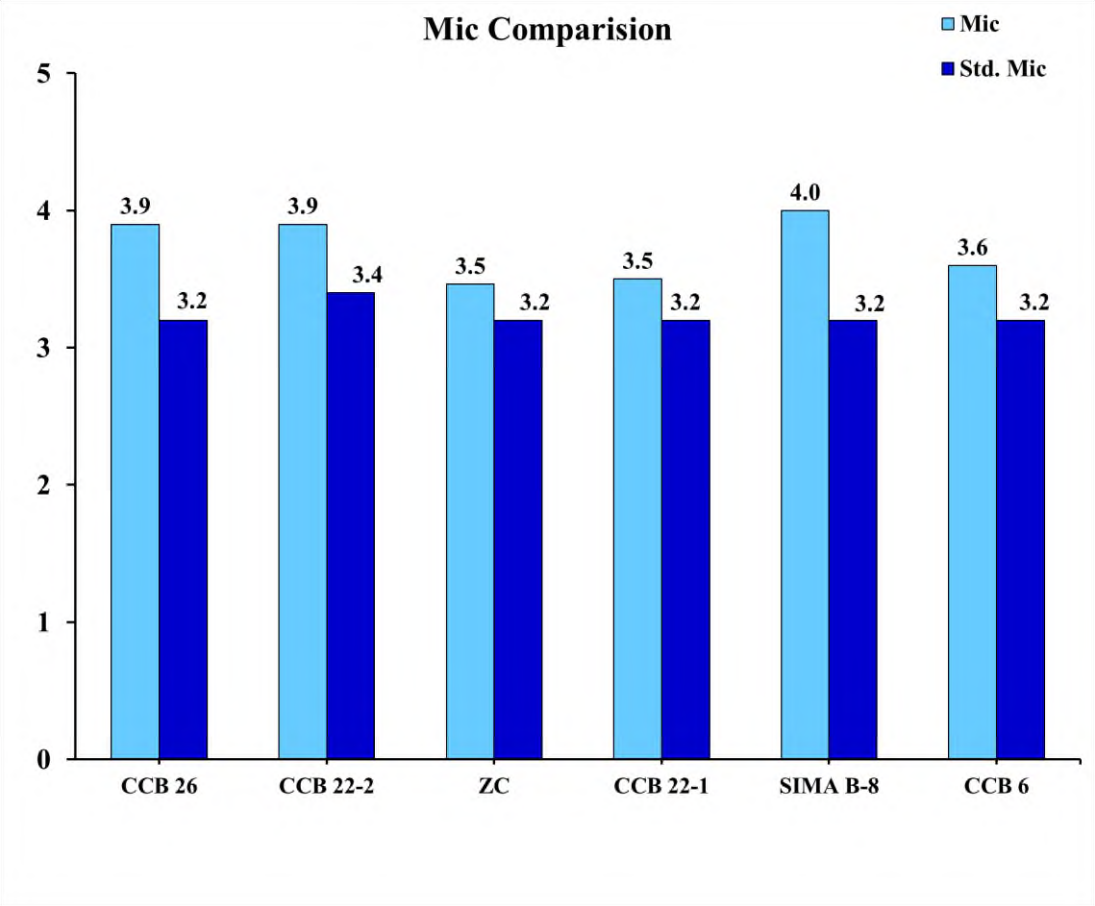
Observations

- The samples were having higher UHML range around 35-38 mm which are coming under ELS category.
- The tenacity values were equal to the minimum requirement for all samples.
- Though UI was very good for all entries and found to be marginally lower than the minimum requirement of ELS category
- Lot of variation in micronaire value of all entries were found.


UHML (mm)
40
35
30
35.3
36.2
37.8
37.4
36.1
37.1
CCB 26
CCB 22-2
ZC
CCB 22-1
SIMA B-8
CCB 6


Tenacity Comparision (g/tex)
Strength
Std. Strength
40
35
30
25
20
15
10
5
0
37.0
40.0
37.1
38.3
38.9
40.0
38.4
40.0
39.2
40.0
38.9
40.0
CCB 26
CCB 22-2
ZC
CCB 22-1
SIMA B-8
CCB 6


UI Comparision
UI
Std UI
90
85
80
75
70
86
88
85
87
87
88
86
88
87
88
87
88
CCB 26
CCB 22-2
ZC
CCB 22-1
SIMA B-8
CCB 6


Mic Comparision
Mic
Std. Mic
5
4
3
2
1
0
3.9
3.2
3.9
3.4
3.5
3.2
3.5
3.2
4.0
3.2
3.6
3.2
CCB 26
CCB 22-2
ZC
CCB 22-1
SIMA B-8
CCB 6

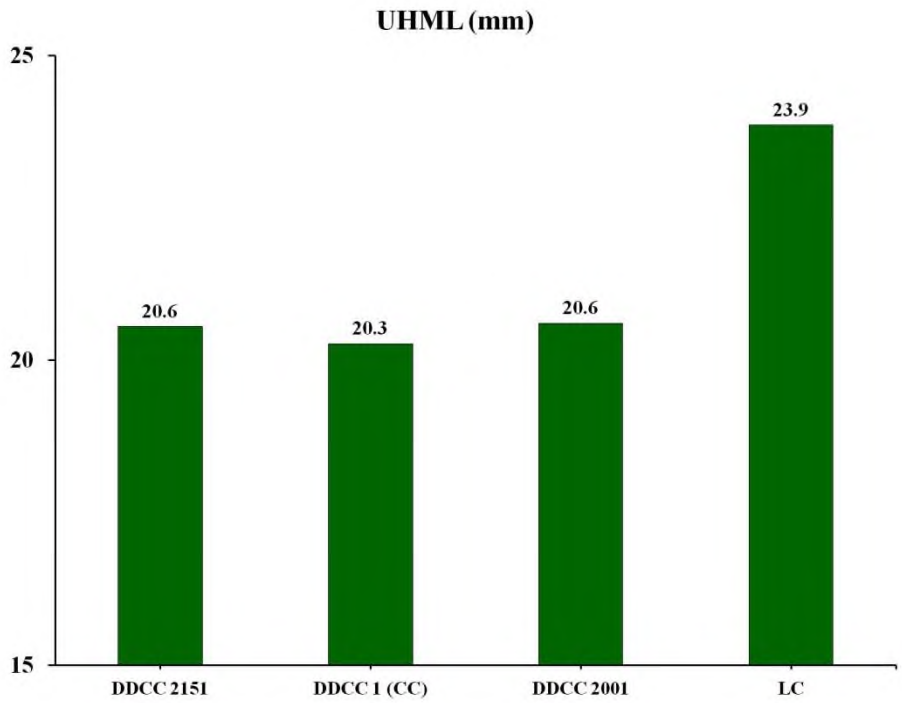
Recommendations

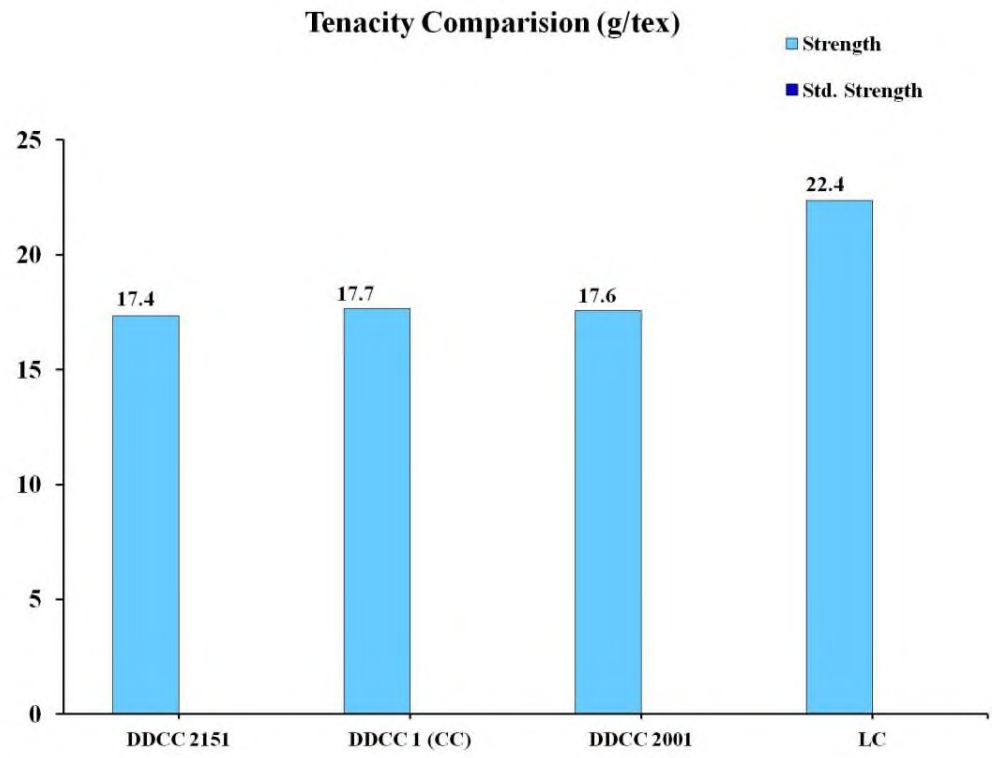
No entry has performed better than ZC. However, CCB-22-1 has comparable quality with UHML-37.4mm, UI-86, Strength-38.4g/tex and Mic-3.5

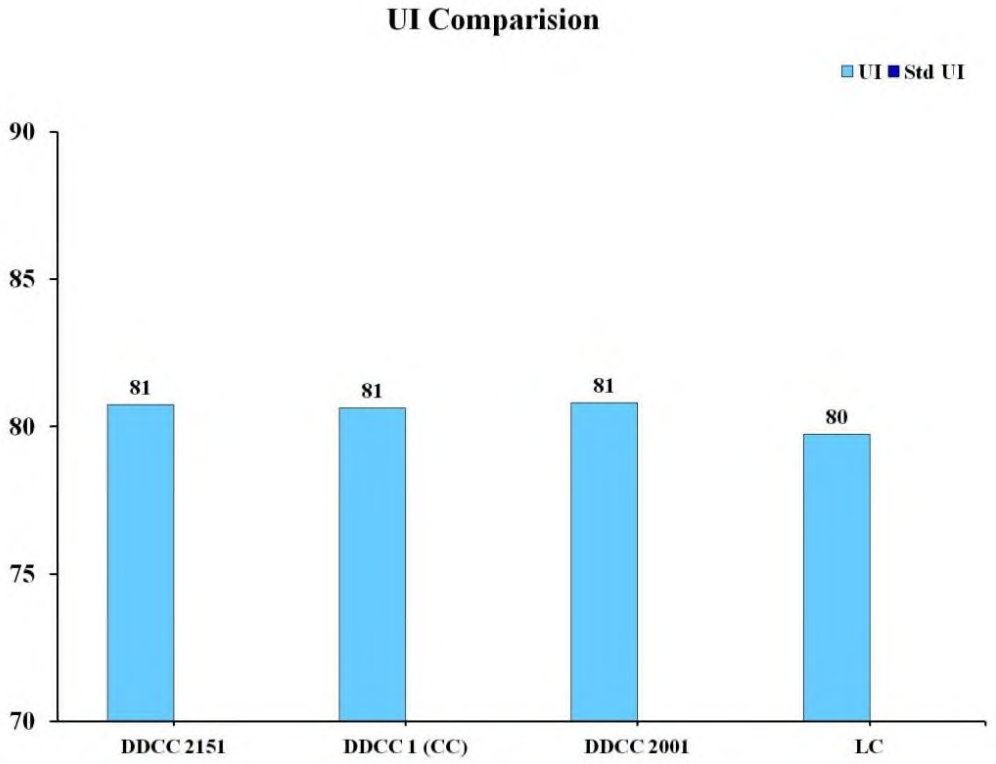
Br24 a/b - CVT Arboreum (CC) - Rainfed

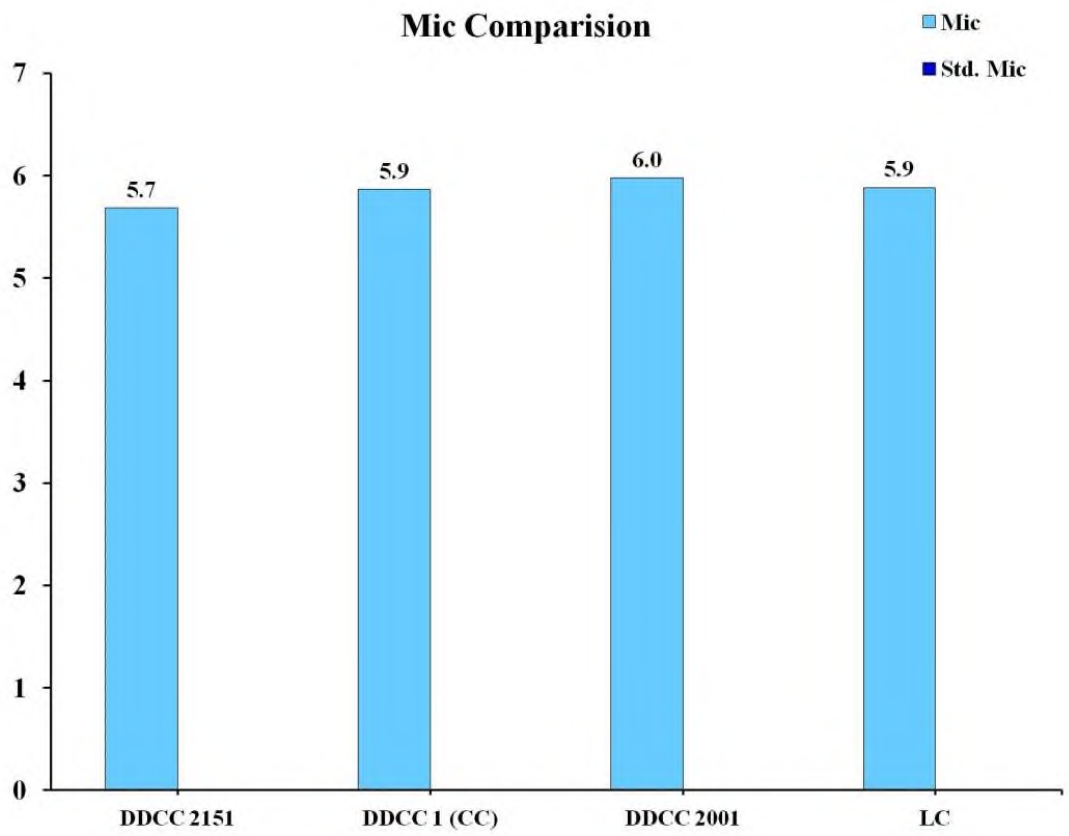
Observations

- The samples were having low UHML range around 20 mm.
- The tenacity values were significantly lower than with the minimum requirement for all samples which will give difficulty during spinning process.
- Micronaire of all entries were found to be in higher side.




Tenacity Comparision (g/tex)
Strength
Std. Strength
25
20
15
10
5
0
17.4
17.7
17.6
22.4
DDCC 2151
DDCC 1 (CC)
DDCC 2001
LC


UI Comparision
UI
Std UI
90
85
80
75
70
81
81
81
80
DDCC 2151
DDCC 1 (CC)
DDCC 2001
LC



Recommendations

No entry has performed well

NORTH ZONE TRIAL TEST RESULTS

Br.22 a/b Initial Evaluation Trial - *G.arboreum*

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)
1	201	HD 545	Bhatinda	20.1	77	7.1	19.4
2			Faridkot	20.2	80	5.2	20.0
3			Hisar	20.1	80	6.7	19.8
4			Sirsa	18.6	77	6.5	20.8
5			Sriganganagar	19.8	81	6.5	19.5
		Mean		**19.8**	**79**	**6.4**	**19.9**
6	202	FDK 341	Bhatinda	22.5	80	6.6	23.6
7			Faridkot	23.1	82	6.6	24.5
8			Hisar	22.3	80	6.7	22.2
9			Sirsa	22.3	82	6.1	23.4
10			Sriganganagar	23.2	82	5.6	24.7
		Mean		**22.7**	**81**	**6.3**	**23.7**
11	203	RG 895	Bhatinda	20.3	78	6.9	19.7
12			Faridkot	20.6	79	7.1	20.8
13			Hisar	20.7	79	6.8	20.2
14			Sirsa	20.1	79	6.5	19.5
15			Sriganganagar	21.4	80	6.8	20.6
		Mean		**20.6**	**79**	**6.8**	**20.2**
16	204	CISAA 33-9	Bhatinda	21.1	80	7.2	21.2
17			Faridkot	21.1	82	7.3	21.7
18			Hisar	21.0	81	6.5	20.2
19			Sirsa	19.4	78	7.3	18.7
20			Sriganganagar	21.0	82	7.0	20.4
		Mean		**20.7**	**81**	**7.1**	**20.4**
21	205	LC	Bhatinda	20.0	79	6.9	19.6
22			Faridkot	20.1	78	6.9	20.1
23			Hisar	22.1	81	6.5	20.9
24			Sirsa	19.8	79	7.2	19.8
25			Sriganganagar	21.9	80	6.6	21.8
		Mean		**20.8**	**79**	**6.8**	**20.4**
26	206	PBD 155	Bhatinda	19.9	77	7.1	19.4
27			Faridkot	20.3	79	6.3	19.9
28			Hisar	20.5	78	7.1	20.1
29			Sirsa	19.7	77	6.6	19.1
30			Sriganganagar	19.2	78	7.0	20.1
		Mean		**19.9**	**78**	**6.8**	**19.7**
31	207	HD 563	Bhatinda	21.7	80	6.7	22.8
32			Faridkot	22.7	82	6.5	23.8
33			Hisar	23.3	83	6.4	23.7
34			Sirsa	22.0	82	6.5	23.1
35			Sriganganagar	23.0	81	7.2	23.9

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)
		Mean		**22.5**	**82**	**6.7**	**23.5**
36	208	FDK 331	Bhatinda	21.5	80	6.7	22.5
37			Faridkot	22.6	80	6.5	23.8
38			Hisar	21.4	81	6.9	21.2
39			Sirsa	21.2	81	6.3	22.2
40			Sriganganagar	22.4	80	6.7	23.6
		Mean		**21.8**	**80**	**6.6**	**22.7**
41	209	ZC (FDK 124)	Bhatinda	20.8	79	7.3	21.3
42			Faridkot	20.4	79	7.3	20.1
43			Hisar	20.6	80	6.8	19.8
44			Sirsa	19.0	77	7.0	19.0
45			Sriganganagar	21.4	81	6.8	21.5
		Mean		**20.4**	**79**	**7.0**	**20.3**
46	210	RG 892	Bhatinda	20.5	79	6.8	19.6
47			Faridkot	20.8	79	6.9	21.6
48			Hisar	21.6	79	6.0	20.8
49			Sirsa	19.8	78	6.5	19.8
50			Sriganganagar	21.6	80	6.6	21.4
		Mean		**20.9**	**79**	**6.6**	**20.6**
51	211	FDK 345	Bhatinda	22.4	80	6.8	23.6
52			Faridkot	21.5	79	6.4	21.8
53			Hisar	21.5	79	6.4	20.8
54			Sirsa	20.4	78	6.0	20.3
55			Sriganganagar	21.8	79	6.0	21.1
		Mean		**21.5**	**79**	**6.3**	**21.5**
56	212	PBD 154	Bhatinda	20.3	78	7.1	19.3
57			Faridkot	20.2	78	7.0	20.0
58			Hisar	20.4	78	6.8	19.5
59			Sirsa	19.4	78	6.4	19.5
60			Sriganganagar	20.7	79	6.9	19.7
		Mean		**20.2**	**78**	**6.8**	**19.6**
61	213	CISAA 6-165	Bhatinda	20.6	79	7.3	19.7
62			Faridkot	21.2	81	7.1	22.0
63			Hisar	20.6	81	7.0	19.7
64			Sirsa	24.4	80	6.6	24.8
65			Sriganganagar	21.9	79	6.5	21.6
		Mean		**21.7**	**80**	**6.9**	**21.6**

Br25 a/b Preliminary Hybrid Trial - Desi Hybrid

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)
1	221	CISAA 21-2	Arya Nagar	19.4	78	7.2	19.4
2			Bhatinda	19.8	78	6.2	19.2
3			Hisar	21.2	81	5.7	21.0
Sr.No.	**Code No.**	**Entry**	**Location**	**UHML**	**UI**	**Mic**	**Str (g/tex)**
4			Sirsa	19.2	79	6.3	19.2
5			Sriganganagar	21.3	80	6.9	20.7
		Mean		**20.2**	**79**	**6.5**	**19.9**
6	222	KR 161	Arya Nagar	19.3	78	6.6	19.5
7			Bhatinda	19.9	78	6.5	19.5
8			Hisar	20.3	79	5.6	19.6
9			Sirsa	19.9	78	6.5	19.3
10			Sriganganagar	20.9	80	6.5	19.9
		Mean		**20.1**	**79**	**6.3**	**19.6**
11	223	ZC (KR 64-NZ)	Arya Nagar	**Sample not received**			
12			Bhatinda	19.5	77	7.4	19.5
13			Hisar	19.6	79	6.2	19.4
14			Sirsa	19.5	77	5.4	19.7
15			Sriganganagar	20.0	79	6.7	19.6
		Mean		**19.7**	**78**	**6.4**	**19.6**
16	224	AAH 47	Arya Nagar	20.1	78	6.3	19.5
17			Bhatinda	19.1	78	6.2	20.7
18			Hisar	19.6	78	6.1	19.9
19			Sirsa	17.4	77	5.7	19.1
20			Sriganganagar	19.3	78	6.9	20.1
		Mean		**19.1**	**78**	**6.2**	**19.9**
21	225	KR 160	Arya Nagar	19.4	78	6.6	19.7
22			Bhatinda	20.0	78	7.1	19.8
23			Hisar	20.4	80	6.3	19.8
24			Sirsa	18.9	77	5.8	20.7
25			Sriganganagar	20.1	78	7.1	19.4
		Mean		**19.8**	**78**	**6.6**	**19.9**
26	226	CISAA 21-1	Arya Nagar	22.6	81	6.5	23.9
27			Bhatinda	22.7	80	6.5	23.3
28			Hisar	23.3	81	6.0	23.3
29			Sirsa	22.8	80	6.2	23.1
30			Sriganganagar	24.7	81	6.3	24.1
		Mean		**23.2**	**81**	**6.3**	**23.5**
31	227	LC	Arya Nagar	18.2	78	7.0	19.5
32			Bhatinda	21.7	77	6.1	21.9
33			Hisar	**Sample not received**			
34			Sirsa	20.3	79	6.9	19.9

35			Sriganganagar	20.9	79	6.2	19.8
		Mean		**20.3**	**78**	**6.6**	**20.3**
36	228	KR 162	Arya Nagar	18.3	79	7.1	19.5
37			Bhatinda	19.0	76	6.8	20.6
38			Hisar	19.2	78	6.1	20.5
39			Sirsa	18.7	75	6.8	20.3
Sr.No.	**Code No.**	**Entry**	**Location**	**UHML**	**UI**	**Mic**	**Str (g/tex)**
40			Sriganganagar	18.7	77	6.6	20.7
		Mean		**18.8**	**77**	**6.7**	**20.3**
40	229	AAH 46	Arya Nagar	19.6	78	6.4	19.8
41			Bhatinda	19.6	77	7.2	19.6
42			Hisar	19.5	79	6.3	20.0
43			Sirsa	**Sample not received**			
44			Sriganganagar	19.2	77	6.6	20.3
		Mean		**19.5**	**78**	**6.6**	**19.9**

Br04 a - Coordinated Variety Trial of *G.hirsutum*

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)	E%
1	2001	QC (CSH 3129)	Bhatinda	27.2	79	29.2	4.7	6.9
2			Faridkot	27.1	79	27.4	4.2	6.9
3			Hisar	26.9	79	27.9	3.9	6.9
4			Sirsa	28.0	85	28.8	4.5	-
5			Sriganganagar	26.7	79	29.3	4.1	6.8
		Mean		**27.2**	**80**	**28.5**	**4.3**	**6.9**
6	2002	F 2732	Bhatinda	26.0	79	27.3	4.5	6.8
7			Faridkot	26.5	79	25.5	4.9	7.0
8			Hisar	26.6	79	29.0	4.3	6.9
9			Sirsa	27.5	83	27.9	4.5	-
10			Sriganganagar	26.9	79	28.8	4.4	6.6
		Mean		**26.7**	**80**	**27.7**	**4.5**	**6.8**
11	2003	ZC (F 2228)	Bhatinda	26.5	79	29.4	4.6	7.0
12			Faridkot	26.6	79	28.5	4.8	7.0
13			Hisar	25.4	79	28.5	4.4	7.1
14			Sirsa	26.0	84	27.7	4.6	-
15			Sriganganagar	27.0	79	30.3	4.2	6.8
		Mean		**26.3**	**80**	**28.9**	**4.5**	**7.0**
16	2004	F 2743	Bhatinda	26.7	79	26.9	4.9	7.1
17			Faridkot	24.7	79	24.3	5.1	6.9
18			Hisar	25.9	79	27.6	4.4	6.7
19			Sirsa	26.1	84	28.0	4.7	-
20			Sriganganagar	26.3	79	28.8	4.8	6.8
		Mean		**25.9**	**80**	**27.1**	**4.8**	**6.9**
21	2005	LC	Bhatinda	26.7	79	30.9	4.6	7.2
22			Faridkot	26.3	79	27.7	4.6	7.2

23			Hisar	26.8	79	27.5	4.1	6.6
24			Sirsa	27.4	85	27.8	4.2	-
25			Sriganganagar	24.3	79	23.9	3.8	6.4
		Mean		**26.3**	**80**	**27.6**	**4.3**	**6.9**

Br24 a - Coordinated Variety Trial of *G.arboreum*

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)	E%
1	2011	FDK 315	Bhatinda	22.0	78	22.0	5.8	6.9
2			Faridkot	21.3	78	21.6	7.0	6.9
3			Hisar	22.6	78	22.4	5.8	7.0
4			Sirsa	21.3	78	21.0	5.6	6.6
5			Sriganganagar	22.3	78	21.8	6.1	6.6
		Mean		**21.9**	**78**	**21.8**	**6.1**	**6.8**
6	2012	FDK 124 (ZC)	Bhatinda	20.7	78	20.5	6.1	6.7
7			Faridkot	21.2	78	21.6	7.3	7.0
8			Hisar	21.5	78	20.9	6.2	6.9
9			Sirsa	20.7	78	21.1	6.6	6.9
10			Sriganganagar	22.0	78	21.8	6.4	6.9
		Mean		**21.2**	**78**	**21.2**	**6.5**	**6.9**
11	2013	RG 888	Bhatinda	20.3	78	19.8	6.0	7.0
12			Faridkot	20.8	78	21.6	7.3	7.0
13			Hisar	22.4	78	21.8	6.1	6.8
14			Sirsa	20.2	78	19.6	5.8	6.4
15			Sriganganagar	21.7	78	21.5	6.4	6.8
		Mean		**21.1**	**78**	**20.9**	**6.3**	**6.8**
16	2014	CISA 33-7	Bhatinda	20.7	78	20.7	6.1	6.8
17			Faridkot	20.3	78	20.3	6.5	7.2
18			Hisar	20.6	78	19.7	6.3	6.9
19			Sirsa	20.2	78	19.8	6.6	6.7
20			Sriganganagar	21.3	78	22.1	6.6	7.0
		Mean		**20.6**	**78**	**20.5**	**6.4**	**6.9**
21	2015	FDK 312	Bhatinda	20.8	78	20.8	6.3	6.8
22			Faridkot	21.4	78	21.2	6.5	7.1
23			Hisar	21.5	78	21.0	5.9	6.7
24			Sirsa	20.5	78	20.8	5.8	6.9
25			Sriganganagar	22.2	78	22.4	6.3	6.9
		Mean		**21.3**	**78**	**21.2**	**6.2**	**6.9**
26	2016	FDK 325	Bhatinda	21.8	78	20.9	6.3	6.7
27			Faridkot	21.6	78	20.8	6.5	6.9
28			Hisar	22.7	78	22.4	6.5	6.9
29			Sirsa	21.9	78	21.9	6.1	6.9
30			Sriganganagar	21.8	78	22.2	6.2	7.1

		Mean		**22.0**	**78**	**21.6**	**6.3**	**6.9**
31	2017	LC	Bhatinda	19.8	78	19.6	6.4	6.8
32			Faridkot	19.8	78	19.6	7.0	7.0
33			Hisar	21.2	78	20.2	5.8	6.8
34			Sirsa	19.8	78	20.4	6.1	6.9
35			Sriganganagar	22.2	78	21.4	5.9	6.6
		Mean		**20.6**	**78**	**20.2**	**6.2**	**6.8**
Sr.No.	**Code No.**	**Entry**	**Location**	**UHML**	**UI**	**Mic**	**Str (g/tex)**	**E%**
36	2018	PBD 156	Bhatinda	19.6	78	19.5	6.3	6.7
37			Faridkot	19.9	78	20.0	6.9	7.1
38			Hisar	19.4	78	19.4	6.4	6.8
39			Sirsa	19.3	78	19.8	6.2	6.7
40			Sriganganagar	19.5	78	19.8	6.6	6.7
		Mean		**19.5**	**78**	**19.7**	**6.5**	**6.8**
41	2019	RG 868	Bhatinda	19.9	78	19.9	6.6	6.7
42			Faridkot	20.8	78	20.5	7.0	7.2
43			Hisar	21.7	78	21.0	6.8	7.1
44			Sirsa	19.8	78	20.2	6.7	6.9
45			Sriganganagar	20.9	78	21.0	6.9	6.8
		Mean		**20.6**	**78**	**20.5**	**6.8**	**6.9**
46	2020	FDK 324	Bhatinda	20.6	78	19.8	6.0	6.5
47			Faridkot	19.9	78	19.3	6.7	6.7
48			Hisar	20.9	78	20.0	6.5	6.5
49			Sirsa	20.3	78	20.5	6.6	6.8
50			Sriganganagar	21.0	78	21.0	6.5	6.6
		Mean		**20.5**	**78**	**20.1**	**6.5**	**6.6**

Br25 a - Coordinated Desi Hybrid Trial

Sr. No.	**Code No.**	**Entry**	**Location**	**UHML**	**UI**	**Mic**	**Str (g/tex)**	**E%**
1	2021	KR 153	Arya Nagar	20.0	78	19.9	6.4	6.6
2			Bhatinda	20.7	78	20.8	6.3	7.0
3			Faridkot	19.8	78	19.6	7.0	7.0
4			Hisar	19.6	78	19.1	6.6	6.5
5			Sirsa	19.7	78	19.7	6.5	6.6
6			Sriganganagar	20.6	78	21.1	6.5	6.9
		Mean		**20.1**	**78**	**20.0**	**6.6**	**6.8**
7	2022	KR 149	Arya Nagar	22.3	78	22.7	6.0	6.6
8			Bhatinda	20.5	78	20.2	6.1	6.7
9			Faridkot	20.6	78	21.4	6.9	7.1
10			Hisar	20.6	78	20.0	6.7	7.0
11			Sirsa	19.5	78	19.8	6.2	6.7
12			Sriganganagar	20.4	78	20.9	6.7	7.2

		Mean		**20.7**	**78**	**20.8**	**6.4**	**6.9**
13	2023	ZC	Arya Nagar	20.0	78	20.0	6.1	6.4
14			Bhatinda	19.9	78	19.7	6.2	6.4
15			Faridkot	19.1	78	19.4	7.1	6.7
16			Hisar	20.2	78	19.3	6.5	6.7
17			Sirsa	18.7	77	19.2	6.1	6.3
18			Sriganganagar	18.9	77	19.2	6.8	6.6
Sr. No.	**Code No.**	**Entry**	**Location**	**UHML**	**UI**	**Mic**	**Str (g/tex)**	**E%**
		Mean		**19.5**	**78**	**19.5**	**6.5**	**6.5**
19	2024	CISAA 20-1	Arya Nagar	18.9	77	18.9	6.0	6.1
20			Bhatinda	19.6	78	19.5	6.0	6.6
21			Faridkot	19.9	78	20.2	6.7	6.9
22			Hisar	20.4	78	20.0	6.8	6.9
23			Sirsa	19.4	78	19.6	6.0	6.4
24			Sriganganagar	19.8	78	20.1	7.0	7.0
		Mean		**19.7**	**78**	**19.7**	**6.4**	**6.7**
25	2025	LC	Arya Nagar	18.7	77	19.2	6.5	6.3
26			Bhatinda	22.1	78	21.4	6.5	6.7
27			Faridkot	23.3	79	22.4	6.1	6.9
28			Hisar	**Sample not received**				
29			Sirsa	20.4	78	20.5	6.2	6.8
30			Sriganganagar	23.0	79	22.2	5.6	6.9
		Mean		**21.5**	**78**	**21.1**	**6.2**	**6.7**
31	2026	KR 150	Arya Nagar	19.6	78	19.5	6.0	6.5
32			Bhatinda	19.8	78	19.9	6.0	6.7
33			Faridkot	19.7	78	19.7	6.8	6.9
34			Hisar	20.5	78	19.7	6.8	6.7
35			Sirsa	20.0	78	20.0	6.1	6.5
36			Sriganganagar	20.8	78	20.7	7.0	7.1
		Mean		**20.1**	**78**	**19.9**	**6.5**	**6.7**
37	2027	KR 152	Arya Nagar	20.9	78	20.6	6.3	6.4
38			Bhatinda	20.3	78	20.4	7.1	6.9
39			Faridkot	20.9	78	20.7	6.6	6.9
40			Hisar	21.4	78	21.3	6.3	6.8
41			Sirsa	19.9	78	20.1	6.1	6.5
42			Sriganganagar	21.5	78	21.9	7.0	7.0
		Mean		**20.8**	**78**	**20.8**	**6.6**	**6.8**
43	2028	CISAA 19-4	Arya Nagar	20.0	78	19.9	6.4	6.4
43			Bhatinda	21.8	78	22.6	6.4	7.0
43			Faridkot	22.4	78	22.4	7.1	7.1
43			Hisar	23.2	79	23.6	6.3	7.0
43			Sirsa	21.7	78	21.6	6.2	6.9
43			Sriganganagar	22.3	78	23.0	6.5	7.3
		Mean		**21.9**	**78**	**22.2**	**6.5**	**7.0**

CENTRAL ZONE TRIAL TEST RESULTS

Br 22b IET-*G.arboreum*

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)	E%
1	231	CNA 1085	Akola	25.3	83	5.6	27.9	5.9
2			Amreli	25.3	84	5.6	27.3	-
3			Bharuch	27.6	85	5.2	30.0	-
4			Jalgaon	26.3	79	4.8	24.6	5.8
5			Khandwa	24.9	82	4.1	27.7	5.6
6			Nagpur	26.6	79	4.9	27.2	6.4
7			Viramgaon	24.8	82	4.9	26.8	5.6
		Mean		**25.8**	**82**	**5.0**	**27.3**	**5.9**
8	232	GAM 296	Akola	22.6	80	5.5	23.0	4.9
9			Amreli	24.0	82	5.9	23.8	-
10			Bharuch	25.0	82	5.5	25.5	-
11			Jalgaon	27.1	79	5.0	28.0	5.8
12			Khandwa	23.9	80	4.6	25.7	5.5
13			Nagpur	25.4	79	5.0	25.1	6.0
14			Viramgaon	24.0	81	4.2	25.0	5.4
		Mean		**24.6**	**80**	**5.1**	**25.1**	**5.5**
15	233	PA 919	Akola	25.2	81	5.3	25.4	5.4
16			Amreli	26.0	82	5.6	26.5	-
17			Bharuch	28.4	85	5.3	28.2	-
18			Jalgaon	27.7	79	5.4	27.1.	6.0
19			Khandwa	25.5	82	4.0	30.0	5.8
20			Nagpur	27.6	79	4.8	27.8	6.2
21			Viramgaon	26.2	81	4.5	28.1	5.7
		Mean		**26.7**	**81**	**5.0**	**27.7**	**5.8**
22	234	GBav 181	Akola	25.2	82	4.9	26.9	5.4
23			Amreli	26.6	84	5.1	26.6	-
24			Bharuch	27.3	83	4.9	27.4	-
25			Jalgaon	28.2	80	4.6	28.8	5.8
26			Khandwa	26.3	81	4.5	27.8	5.6
27			Nagpur	27.7	79	4.2	27.1	6.0
28			Viramgaon	26.8	81	4.0	26.6	5.6
		Mean		**26.9**	**81**	**4.6**	**27.3**	**5.7**
29	235	JLA 1707	Akola	24.8	82	5.4	27.1	5.6
30			Amreli	25.5	83	5.7	26.4	-
31			Bharuch	25.8	84	5.3	27.4	-
32			Jalgaon	27.2	79	5.1	25.5	6.0
33			Khandwa	24.2	81	3.7	28.4	5.4
34			Nagpur	26.2	79	5.1	24.7	6.2
35			Viramgaon	25.1	82	4.7	27.3	5.7
		Mean		**25.5**	**81**	**5.0**	**26.7**	**5.8**
36	236	ZC	Akola	23.6	81	6.0	25.7	5.5
37			Amreli	23.5	81	5.8	24.4	

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)	E%
38			Bharuch	26.1	85	5.5	26.9	-
39			Jalgaon	26.0	79	5.2	25.6	6.3
40			Khandwa	24.1	82	5.2	26.1	5.6
41			Nagpur	25.8	79	5.1	25.6	6.4
42			Viramgaon	23.9	80	5.4	23.4	5.4
		Mean		**24.7**	**81**	**5.5**	**25.4**	**5.8**
43			Akola	26.5	82	5.0	26.4	5.5
44			Amreli	26.2	83	5.4	27.3	-
45			Bharuch	27.8	84	5.3	27.9	-
46	237	PA 929	Jalgaon	28.9	80	4.6	28.3	5.9
47			Khandwa	26.0	81	3.4	26.8	5.4
48			Nagpur	27.6	79	4.8	26.8	6.1
49			Viramgaon	26.0	82	4.9	26.6	5.6
		Mean		**27.0**	**81**	**4.8**	**27.2**	**5.7**
50			Akola	24.9	81	5.8	27.4	5.8
51			Amreli	24.2	84	5.7	25.7	-
52			Bharuch	25.3	85	5.5	27.1	-
53	238	CNA 1084	Jalgaon	26.5	79	4.9	26.8	5.9
54			Khandwa	23.0	82	4.2	28.2	5.5
55			Nagpur	25.2	79	5.6	25.1	6.5
56			Viramgaon	22.8	83	5.1	25.3	5.6
		Mean		**24.6**	**82**	**5.2**	**26.5**	**5.9**
57			Akola	27.0	83	4.7	28.7	5.8
58			Amreli	27.9	83	5.1	28.0	-
59			Bharuch	29.3	85	5.6	28.4	-
60	239	Gvav 1332	Jalgaon	**Sample not received**				
61			Khandwa	26.4	81	3.2	28.2	5.5
62			Nagpur	30.4	80	3.7	29.3	5.9
63			Viramgaon	27.1	82	3.8	28.2	5.7
		Mean		**28.0**	**82**	**4.4**	**28.5**	**5.7**
64			Akola	25.1	82	5.8	26.8	5.8
65			Amreli	24.3	83	5.6	25.6	-
66			Bharuch	28.7	84	5.0	28.1	-
67	240	LC	Jalgaon	27.4	79	5.1	28.4	6.0
68			Khandwa	24.5	80	3.7	27.8	5.5
69			Nagpur	27.3	79	4.8	27.2	6.5
70			Viramgaon	24.5	82	4.8	25.7	5.7
		Mean		**26.0**	**81**	**5.0**	**27.1**	**5.9**
71			Akola	24.4	81	5.9	25.9	5.4
72			Amreli	24.7	82	5.7	25.3	-
73			Bharuch	25.7	84	5.5	26.9	-
74	241	CNA 20178	Jalgaon	26.7	79	4.9	25.7	5.8
75			Khandwa	24.5	81	5.5	24.6	5.5
76			Nagpur	26.3	79	4.9	25.4	6.2
77			Viramgaon	23.2	81	5.0	26.2	5.6

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)	E%
		Mean		**25.1**	**81**	**5.3**	**25.7**	**5.7**
78	242	AKA 2016-3	Akola	23.9	82	5.5	26.1	5.3
79			Amreli	24.0	83	5.9	25.1	-
80			Bharuch	25.4	84	5.6	26.3	-
81			Jalgaon	27.9	79	5.3	27.9	6.0
82			Khandwa	23.5	81	4.9	26.7	5.5
83			Nagpur	25.3	79	5.2	25.0	6.4
84			Viramgaon	24.7	82	4.6	27.1	5.6
		Mean		**25.0**	**81**	**5.3**	**26.3**	**5.8**
85	243	CNA 1086	Akola	24.5	82	5.6	26.5	5.5
86			Amreli	24.5	82	5.6	26.0	-
87			Bharuch	25.3	84	5.3	26.2	-
88			Jalgaon	27.6	79	5.1	27.1	5.9
89			Khandwa	24.5	82	4.5	28.9	5.6
90			Nagpur	26.0	79	4.8	26.9	6.2
91			Viramgaon	24.8	82	4.3	28.0	5.6
		Mean		**25.3**	**81**	**5.0**	**27.1**	**5.8**
92	244	GAM 288	Akola	24.5	81	5.4	25.7	5.5
93			Amreli	24.0	82	5.6	25.3	-
94			Bharuch	26.3	83	5.2	27.2	-
95			Jalgaon	27.0	79	4.9	26.8	5.8
96			Khandwa	23.0	81	3.4	24.6	5.3
97			Nagpur	26.5	79	4.3	27.2	5.9
98			Viramgaon	23.0	82	4.0	25.8	5.6
		Mean		**24.9**	**81**	**4.7**	**26.1**	**5.6**
99	245	QC (PA 255)	Akola	24.5	81	5.5	25.6	5.3
100			Amreli	26.2	83	5.4	27.1	-
101			Bharuch	27.1	84	5.0	27.5	-
102			Jalgaon	29.1	80	4.6	30.3	5.8
103			Khandwa	25.0	82	4.7	29.2	5.6
104			Nagpur	26.0	79	4.5	25.5	6.3
105			Viramgaon	25.5	83	4.4	28.4	5.8
		Mean		**26.2**	**82**	**4.9**	**27.7**	**5.8**
106	246	JLA 1641	Akola	23.8	82	5.5	27.0	5.5
107			Amreli	24.7	83	5.5	26.2	-
108			Bharuch	24.3	83	5.3	26.1	-
109			Jalgaon	26.8	79	5.2	26.6	5.9
110			Khandwa	23.0	82	4.0	26.3	5.4
111			Nagpur	25.6	79	5.0	25.4	6.1
112			Viramgaon	24.3	82	4.9	26.9	5.6
		Mean		**24.6**	**81**	**5.1**	**26.3**	**5.7**
113	247	GBav 137	Akola	25.1	81	5.3	25.6	5.4
114			Amreli	26.3	83	5.3	25.8	-
115			Bharuch	27.1	84	5.2	27.9	-
116			Jalgaon	28.3	80	4.7	27.8	5.8

117			Khandwa	24.8	82	3.9	25.9	5.5
118			Nagpur	28.0	79	4.4	27.8	5.8
119			Viramgaon	25.8	81	4.0	27.2	5.6
		Mean		**26.5**	**81**	**4.7**	**26.8**	**5.6**

B.32b IET. of *G. herbaceum*

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)
1	251	CNh 66	Bharuch	25.7	81	5.3	25.5
2			Dhandhuka	23.7	82	4.6	26.0
3			Kukada	25.9	81	4.9	27.4
4			Surat	26.3	82	4.5	27.0
5			Viramgam	25.9	82	4.6	25.3
		Mean		**25.5**	**82**	**4.8**	**26.2**
6	252	GBhv 340	Bharuch	25.3	81	4.6	26.7
7			Dhandhuka	22.4	81	3.7	22.1
8			Kukada	23.7	82	4.8	22.7
9			Surat	22.9	81	3.7	24.0
10			Viramgam	24.2	83	3.7	23.9
		Mean		**23.7**	**82**	**4.1**	**23.9**
11	253	CNh-33	Bharuch	24.6	81	5.4	25.6
12			Dhandhuka	21.2	80	4.3	19.3
13			Kukada	22.2	80	5.0	21.2
14			Surat	22.7	80	4.7	23.2
15			Viramgam	22.4	81	4.1	22.3
		Mean		**22.6**	**80**	**4.7**	**22.3**
16	254	GBhv 334	Bharuch	24.7	82	4.4	25.6
17			Dhandhuka	21.9	79	4.1	21.5
18			Kukada	23.5	82	5.1	23.0
19			Surat	23.7	81	4.2	24.5
20			Viramgam	23.9	81	4.3	24.2
		Mean		**23.5**	**81**	**4.4**	**23.8**
21	255	ZC	Bharuch	24.6	82	4.7	25.4
22			Dhandhuka	22.9	81	3.2	24.4
23			Kukada	23.8	81	4.8	22.5
24			Surat	24.4	82	4.4	24.6
25			Viramgam	23.9	81	3.6	25.2
		Mean		**23.9**	**81**	**4.1**	**24.4**
26	256	GBhv 356	Bharuch	25.6	82	5.0	26.8
27			Dhandhuka	23.1	80	3.5	24.0
28			Kukada	23.8	82	4.9	23.3
29			Surat	23.2	81	4.6	23.4
30			Viramgam	23.8	81	3.9	24.2
		Mean		**23.9**	**81**	**4.4**	**24.3**
31	257	GShv 843/17	Bharuch	25.8	81	4.3	26.3

Sr.No.			Location	UHML	UI	Mic	Str (g/tex)
32			Dhandhuka	23.4	79	3.8	24.1
33			Kukada	26.4	83	5.2	26.0
34			Surat	24.0	81	3.9	24.8
35			Viramgam	24.3	80	4.5	26.6
		Mean		**24.8**	**81**	**4.3**	**25.5**
36	258	LC	Bharuch	24.0	80	4.8	24.9
37			Dhandhuka	21.0	80	3.0	18.5
38			Kukada	22.8	83	4.8	22.4
39			Surat	23.1	81	4.1	23.0
40			Viramgam	21.1	79	5.5	19.8
		Mean		**22.4**	**81**	**4.4**	**21.7**
41	259	GShv 812/17	Bharuch	24.0	83	4.7	24.8
42			Dhandhuka	23.2	81	3.4	23.6
43			Kukada	24.3	80	4.8	22.6
44			Surat	23.4	82	4.5	23.5
45			Viramgam	24.3	81	3.8	25.4
		Mean		**23.8**	**81**	**4.2**	**24.0**

Br-03 a/b - PVT Coloured Cotton - Irrigated

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)	E%
1	2101	CCH 20452	Khandwa	22.3	80	4.0	22.2	5.2
2			Nagpur	22.5	80	3.7	17.9	5.8
3			Surat	20.4	81	4.3	19.7	5.0
		Mean		**21.7**	**80**	**4.0**	**19.9**	**5.3**
4	2102	Phule Yamuna (ZC)	Khandwa	26.5	83	3.9	28.4	5.7
5			Nagpur	25.1	84	2.9	24.1	5.6
6			Surat	25.8	84	4.3	29.3	5.8
		Mean		**25.8**	**84**	**3.7**	**27.3**	**5.7**
7	2103	DHCC 2151	Khandwa	20.6	80	3.9	18.3	5.5
8			Nagpur	20.3	80	3.3	20.2	5.4
9			Surat	19.8	79	4.7	17.0	5.1
		Mean		**20.2**	**80**	**3.9**	**18.5**	**5.3**
10	2104	CNH 19325	Khandwa	23.1	81	3.6	23.7	5.3
11			Nagpur	23.3	81	3.5	21.4	5.8
12			Surat	21.7	82	4.2	23.4	5.3
		Mean		**22.7**	**81**	**3.8**	**22.8**	**5.5**
13	2105	CNH 19480	Khandwa	22.0	80	3.1	21.3	5.1
14			Nagpur	23.4	80	3.1	20.8	5.5
15			Surat	22.7	82	4.0	24.3	5.4
		Mean		**22.7**	**81**	**3.4**	**22.1**	**5.3**
16	2106	16301 DB	Khandwa	22.2	81	3.8	22.0	5.1
17			Nagpur	22.5	81	4.0	21.8	5.3
18			Surat	21.2	82	5.0	23.0	5.3

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)	E%
		Mean		**22.0**	**81**	**4.3**	**22.3**	**5.2**
19	2107	CNH 17395	Khandwa	21.8	81	4.0	20.5	5.3
20			Nagpur	23.6	81	4.0	22.9	5.4
21			Surat	22.3	81	4.8	24.5	5.5
		Mean		**22.6**	**81**	**4.3**	**22.7**	**5.4**
22	2108	CNH 20449	Khandwa	21.0	80	4.0	20.2	5.4
23			Nagpur	22.4	82	4.4	19.6	5.9
24			Surat	19.8	81	5.1	17.3	4.9
		Mean		**21.1**	**81**	**4.5**	**19.0**	**5.4**
25	2109	L.C.	Khandwa	25.1	81	3.9	27.4	5.5
26			Nagpur	27.0	81	4.2	24.8	5.3
27			Surat	24.2	84	4.8	30.2	5.7
		Mean		**25.4**	**82**	**4.3**	**27.4**	**5.5**

Br-24 b CVT - *G.arboreum*

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)	E%
1	2111	JLA-1430	Akola	24.1	81	6.0	26.9	5.6
2			Amreli	24.3	80	6.6	24.6	5.6
3			Jalgaon	25.7	81	5.9	27.9	-
4			Khandwa	24.1	81	5.0	26.7	5.6
5			Nagpur	28.0	79	5.5	27.4	6.1
		Mean		**25.2**	**80**	**5.8**	**26.7**	**5.7**
6	2112	GAM 269	Akola	24.0	81	6.0	25.9	5.5
7			Amreli	24.3	80	6.3	25.4	5.6
8			Jalgaon	25.6	83	5.3	26.8	-
9			Khandwa	25.3	82	3.8	29.6	5.6
10			Nagpur	26.4	79	5.7	27.7	6.3
		Mean		**25.1**	**81**	**5.4**	**27.1**	**5.7**
11	2113	ZC	Akola	23.5	81	6.0	25.0	5.4
12			Amreli	23.2	81	6.1	25.3	5.6
13			Jalgaon	25.1	84	5.5	27.7	-
14			Khandwa	23.4	81	4.5	25.2	5.5
15			Nagpur	25.8	79	5.6	25.8	6.1
		Mean		**24.2**	**81**	**5.5**	**25.8**	**5.6**
16	2114	GAM 283	Akola	24.8	79	5.9	26.5	5.5
17			Amreli	25.3	80	6.0	25.9	5.6
18			Jalgaon	24.9	82	5.1	26.6	-
19			Khandwa	24.2	81	4.3	26.9	5.5
20			Nagpur	24.9	79	5.7	26.7	6.1
		Mean		**24.8**	**80**	**5.4**	**26.5**	**5.7**
21	2115	CNA 1072	Akola	25.1	79	6.1	27.7	5.9
22			Amreli	24.6	81	6.7	24.8	5.6
23			Jalgaon	25.4	84	5.6	27.4	-

Sr.No.			Location	UHML	UI	Mic	Str (g/tex)	E%
24			Khandwa	23.9	82	3.8	27.6	5.5
25			Nagpur	25.7	79	5.7	25.1	6.1
		Mean		**24.9**	**81**	**5.6**	**26.5**	**5.8**
26	2116	QC (PA 255)	Akola	25.2	81	5.7	27.0	5.8
27			Amreli	26.2	81	5.5	26.7	5.7
28			Jalgaon	26.5	83	5.1	27.5	-
29			Khandwa	24.7	82	4.7	25.8	5.5
30			Nagpur	27.6	79	5.6	28.2	6.1
		Mean		**26.0**	**81**	**5.3**	**27.0**	**5.7**
31	2117	AKA 2016-11	Akola	23.1	81	6.0	25.6	5.4
32			Amreli	24.9	80	6.6	25.1	5.7
33			Jalgaon	24.8	82	5.4	26.5	-
34			Khandwa	23.0	82	4.9	24.5	5.5
35			Nagpur	26.4	79	5.6	25.9	6.3
		Mean		**24.4**	**81**	**5.7**	**25.5**	**5.7**
36	2118	GAM 266	Akola	25.1	81	5.8	26.9	5.7
37			Amreli	24.9	81	6.0	25.5	5.6
38			Jalgaon	25.6	83	4.4	27.0	-
39			Khandwa	25.0	82	4.6	27.1	5.6
40			Nagpur	26.1	79	5.4	27.2	6.0
		Mean		**25.3**	**81**	**5.3**	**26.7**	**5.7**
41	2119	LC	Akola	24.4	81	5.7	25.9	5.5
42			Amreli	24.9	81	6.1	25.1	5.6
43			Jalgaon	24.9	84	5.5	26.1	-
44			Khandwa	23.9	81	4.6	26.2	5.5
45			Nagpur	26.4	79	5.3	26.8	6.2
		Mean		**24.9**	**81**	**5.4**	**26.0**	**5.7**
46	2120	JLA 1204	Akola	24.5	82	6.0	25.7	5.6
47			Amreli	25.2	81	6.3	25.1	5.6
48			Jalgaon	26.0	85	4.9	27.8	-
49			Khandwa	24.6	82	4.6	26.8	5.6
50			Nagpur	27.6	79	5.2	26.8	6.4
		Mean		**25.6**	**82**	**5.4**	**26.4**	**5.8**

Br24b-CVT Coloured Cotton – *G Arboreum*

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)	E%
1	2121	CNA 1092	Khandwa	23.8	82	5.2	24.7	5.5
2			Jalgaon	25.5	82	5.1	25.1	-
3			Nagpur	26.3	79	4.9	26.3	6.3
4			Nanded	24.1	81	6.0	25.0	5.6
5			Surart	24.6	83	6.0	26.2	5.7
		Mean		**24.8**	**81**	**5.5**	**25.5**	**5.8**

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)	E%
6	2122	LC	Khandwa	23.6	81	5.0	25.6	5.5
7			Jalgaon	25.5	82	5.2	27.6	-
8			Nagpur	27.2	78	5.4	28.6	6.4
9			Nanded	26.0	83	5.6	27.4	5.8
10			Surart	25.0	82	5.9	28.1	5.8
		Mean		**25.4**	**81**	**5.4**	**27.4**	**5.8**
11	2123	CNA 20402	Khandwa	21.7	79	6.1	23.0	5.3
12			Jalgaon	22.8	80	5.4	24.9	-
13			Nagpur	22.0	78	6.2	22.2	5.9
14			Nanded	21.6	81	6.7	22.4	5.4
15			Surart	22.3	80	7.0	25.1	5.6
		Mean		**22.1**	**80**	**6.3**	**23.5**	**5.5**
16	2124	CNA 19475	Khandwa	23.7	80	5.2	24.8	5.5
17			Jalgaon	24.3	82	5.2	24.4	-
18			Nagpur	26.1	79	5.1	24.4	6.8
19			Nanded	23.3	81	6.2	23.0	5.4
20			Surart	23.6	82	6.5	23.0	5.5
		Mean		**24.2**	**81**	**5.6**	**23.9**	**5.8**
21	2125	AKA 7 (ZC)	Khandwa	23.4	82	5.7	25.8	5.5
22			Jalgaon	24.8	82	5.4	25.3	-
23			Nagpur	25.5	79	5.8	27.3	6.3
24			Nanded	23.7	81	5.9	25.2	5.6
25			Surart	24.7	83	6.5	26.4	5.7
		Mean		**24.4**	**81**	**5.8**	**26.0**	**5.8**
26	2126	DDCC 2001	Khandwa	21.5	81	5.8	21.5	5.2
27			Jalgaon	24.3	81	5.1	24.0	-
28			Nagpur	24.1	79	5.4	23.8	5.9
29			Nanded	21.8	81	6.2	22.0	5.3
30			Surart	25.0	82	5.6	27.9	5.7
		Mean		**23.3**	**81**	**5.6**	**23.8**	**5.5**

SOUTH ZONE

Br-03 a/b (CC) – PVT Colour Cotton – Irrigated

Sr. No.	Code No.	Entry	Location	UHML	UI	Mic	Str (g/tex)	E%
1	2201	DHCC 2002	Dharwad	21.4	81	4.6	19.0	6.3
2			Lam	21.0	81	4.9	18.2	6.2
3			Nandyal	15.9	79	3.6	-	-
4			Raichur	20.0	80	3.9	17.2	6.8
5			Sriviliputhur	19.6	81	4.9	15.3	6.8
		Mean		**20.5**	**81**	**4.6**	**17.4**	**6.5**
6	2202	Suraj (ZC)	Dharwad	31.0	86	4.6	31.2	6.5
7			Lam	31.7	88	4.9	31.5	6.4
8			Nandyal	29.8	83	3.6	29.3	6.4
9			Raichur	30.8	85	4.3	30.0	6.4
10			Sriviliputhur	30.5	84	4.3	30.2	6.5
		Mean		**30.8**	**85**	**4.4**	**30.4**	6.4
11	2203	DHCC 2151	Dharwad	19.4	81	4.7	15.7	7.0
12			Lam	20.6	81	5.0	16.6	6.8
13			Nandyal	17.0	80	3.7	-	-
14			Raichur	17.5	81	4.0	-	-
15			Sriviliputhur	19.7	79	4.5	15.3	6.7
		Mean		**18.8**	**80**	**4.4**	**15.9**	**4.1**
16	2204	LC	Dharwad	27.2	83	4.7	25.2	6.3
17			Lam	28.8	86	5.2	28.5	6.2
18			Nandyal	25.8	81	4.0	24.8	6.2
19			Raichur	27.6	82	4.9	25.0	6.3
20			Sriviliputhur	28.8	85	4.6	25.9	6.3
		Mean		**27.6**	**83**	**4.7**	**25.2**	**6.2**
21	2205	Vaidehi 1 (ZC CC)	Dharwad	24.1	82	4.3	23.9	6.1
22			Lam	22.7	82	5.3	20.1	5.9
23			Nandyal	19.9	81	3.9	16.6	7.0
24			Raichur	21.9	81	4.0	19.2	6.1
25			Sriviliputhur	21.9	80	4.7	19.3	6.1
		Mean		**22.1**	**81**	**4.3**	**23.9**	**6.2**

Br04a - CVT irrigated

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Strength (g/tex)	E%
1	2211	RAH 1083	Dharwad	26.3	83	5.1	25.6	6.4
2			Lam	27.5	84	5.2	28.1	6.3
3			Raichur	25.7	83	4.9	25.3	6.3
4			Srivilliputtur	23.5	82	5.0	23.8	6.2
		Mean		**25.8**	**83**	**5.0**	**25.7**	**6.3**
5	2212	ZC (Suraj)	Dharwad	31.4	87	4.9	31.4	6.5

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Strength (g/tex)	E%
6			Lam	31.1	87	4.7	31.9	6.4
7			Raichur	30.4	86	4.6	28.7	6.4
8			Srivilliputtur	30.0	85	4.6	28.5	6.4
		Mean		**30.7**	**86**	**4.7**	**30.1**	**6.4**
9	2213	RAH 1081	Dharwad	26.8	85	5.0	26.9	6.3
10			Lam	25.9	83	5.7	25.4	6.2
11			Raichur	25.6	83	4.9	24.4	6.3
12			Srivilliputtur	27.0	82	5.0	24.7	6.3
		Mean		**26.3**	**83**	**5.1**	**25.3**	**6.3**
13	2214	TSH 387	Dharwad	27.9	84	5.1	27.4	6.5
14			Lam	26.7	84	5.6	24.7	6.3
15			Raichur	28.6	84	4.7	26.3	6.3
16			Srivilliputtur	28.3	81	4.9	25.3	6.3
		Mean		**27.9**	**83**	**5.1**	**25.9**	**6.3**
17	2215	LC	Dharwad	26.7	85	5.0	25.0	6.3
18			Lam	29.5	85	5.1	28.6	6.3
19			Raichur	29.6	83	5.1	26.3	6.4
20			Srivilliputtur	28.1	84	4.3	25.5	6.3
		Mean		**28.4**	**84**	**4.9**	**26.3**	**6.3**
21	2216	RAH 1082	Dharwad	27.2	84	4.9	27.8	6.4
22			Lam	28.5	86	4.9	27.8	6.3
23			Raichur	27.8	82	4.1	24.9	6.2
24			Srivilliputtur	25.5	84	4.6	24.1	6.2
		Mean		**27.2**	**84**	**4.6**	**26.2**	**6.3**

Br24b : CVT - *G.arboreum*

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Strength (g/tex)	E%
1	2231	CNA 2034	Dharward	24.6	81	22.8	5.5	6.2
2			Nandyal	25.6	83	23.9	5.8	6.4
		Mean		**25.1**	**82**	**23.4**	**5.6**	**6.3**
3	2232	DWDa	Dharward	25.0	81	23.5	6.0	6.3
4			Nandyal	24.6	82	23.4	5.6	6.3
		Mean		**24.8**	**81**	**23.4**	**5.8**	**6.3**
5	2233	PAIG 411	Dharward	31.6	76	29.3	4.7	6.4
6			Nandyal	25.3	81	24.5	4.9	6.2
		Mean		**28.5**	**79**	**26.9**	**4.8**	**6.3**
7	2234	MDL 2674	Dharward	22.8	80	21.3	6.4	6.1
8			Nandyal	25.0	79	23.4	6.2	6.2
		Mean		**23.9**	**79**	**22.3**	**6.3**	**6.2**
9	2235	NDLA 3152-1	Dharward	24.8	80	24.7	5.4	6.3
10			Nandyal	25.4	84	26.3	5.5	6.3

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Strength (g/tex)	E%
		Mean		**25.1**	**82**	**25.5**	**5.5**	**6.3**
11	2236	PA 887	Dharward	25.1	80	24.1	5.2	6.2
12			Nandyal	25.5	83	24.2	5.1	6.3
		Mean		**25.3**	**81**	**24.1**	**5.1**	**6.3**
13	2237	CNA 1085	Dharward	24.3	81	24.7	5.3	6.3
14			Nandyal	24.7	83	25.6	5.2	6.3
		Mean		**24.5**	**82**	**25.1**	**5.2**	**6.3**
15	2238	DWDa 2252	Dharward	25.2	80	23.4	6.0	6.3
16			Nandyal	25.3	82	24.6	6.0	6.4
		Mean		**25.2**	**81**	**24.0**	**6.0**	**6.4**
17	2239	LC	Dharward	25.5	80	24.3	5.7	6.4
18			Nandyal	24.6	82	24.1	5.4	6.4
		Mean		**25.0**	**81**	**24.2**	**5.5**	**6.4**
19	2240	CNA 1086	Dharward	23.7	80	22.0	5.8	6.1
20			Nandyal	23.1	81	21.8	5.4	6.1
		Mean		**23.4**	**81**	**21.9**	**5.6**	**6.1**
21	2241	NDLA 3146-2	Dharward	24.6	81	23.4	5.3	6.3
22			Nandyal	24.8	82	23.9	5.2	6.4
		Mean		**24.7**	**81**	**23.6**	**5.2**	**6.3**
23	2242	ZC	Dharward	26.1	82	23.8	5.4	6.2
23			Nandyal	27.0	80	25.2	5.2	6.2
		Mean		**26.6**	**81**	**24.5**	**5.3**	**6.2**
25	2243	PA 888	Dharward	26.2	81	24.0	5.9	6.3
26			Nandyal	25.3	82	23.3	5.5	6.4
		Mean		**25.7**	**82**	**23.7**	**5.7**	**6.3**
27	2244	PA 898	Dharward	27.0	81	25.4	4.3	6.2
28			Nandyal	26.4	82	24.5	5.1	6.3
		Mean		**26.7**	**82**	**25.0**	**4.7**	**6.3**
29	2245	DWDa 2251	Dharward	24.4	82	23.1	6.0	6.3
30			Nandyal	23.9	82	23.4	5.4	6.3
		Mean		**24.2**	**82**	**23.2**	**5.7**	**6.3**
31	2246	CNA 1084	Dharward	24.6	82	23.5	5.6	6.3
32			Nandyal	23.1	81	23.2	5.2	6.2
		Mean		**23.8**	**82**	**23.4**	**5.4**	**6.2**

Br24 a/b - CVT *G Arboreum* (CC) - Rainfed

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Strength (g/tex)	E%
1	2251	DDCC 2151	Dharward	20.7	80	17.7	5.9	6.9
2			Nandyal	20.4	82	17.1	5.4	6.8
		Mean		**20.6**	**81**	**17.4**	5.7	**6.9**
3	2252	DDCC 1 (CC)	Dharward	20.4	81	17.2	6.1	6.9

Sr.No.	Code No.	Entry	Location	UHML	UI	Mic	Strength (g/tex)	E%
4			Nandyal	20.2	80	18.1	5.7	6.9
		Mean		**20.3**	**81**	**17.7**	5.9	**6.9**
5	2253	DDCC 2001	Dharward	20.3	81	16.8	6.0	6.8
6			Nandyal	21.0	80	18.4	5.9	6.9
		Mean		**20.6**	**81**	**17.6**	6.0	**6.9**
7	2254	LC	Dharward	24.8	80	23.1	5.8	6.3
8			Nandyal	22.9	79	21.6	6.0	6.3
		Mean		**23.9**	**80**	**22.4**	5.9	**6.3**

Br14a CVT G.barbadense

Sr.No.	Code No.	Entry	Location	UHML	UI	Strength (g/tex)	Mic	E%
1	2221	CCB 26	Dharward	36.9	87	38.9	4.3	6.8
			Coimbatore	33.6	85	35	3.5	6.7
		Mean		**35.3**	**86**	**36.95**	**3.9**	**6.8**
2	2222	CCB 22-2	Dharward	35.6	85	36.7	4.2	6.6
			Coimbatore	36.7	85	37.5	3.5	6.7
		Mean		**36.2**	**85**	**37.1**	**3.9**	**6.65**
3	2223	ZC	Dharward	38.4	87	39.6	3.5	6.7
			Coimbatore	37.1	86	38.1	3.4	6.6
		Mean		**37.8**	**87**	**38.9**	**3.5**	**6.65**
4	2224	CCB 22-1	Dharward	37.7	85	38.4	3.4	6.6
			Coimbatore	37.1	86	38.4	3.6	6.7
		Mean		**37.4**	**86**	**38.4**	**3.5**	**6.7**
5	2225	SIMA B-8	Dharward	36.8	87	39.7	3.7	6.8
			Coimbatore	35.4	87	38.6	4.2	6.8
		Mean		**36.1**	**87**	**39.2**	**4**	**6.8**
6	2226	CCB 6	Dharward	37.1	86	38.2	3.4	6.6
			Coimbatore	37.1	87	39.6	3.8	6.7
		Mean		**37.1**	**87**	**38.9**	**3.6**	**6.65**

Agronomy IA: Agronomic requirements of promising pre-release/ recently released *hirsutum/ arboretum* genotypes/ hybrids of cotton

I. Agronomy Trials North Zone (Irrigated) - Full Spinning Results

Sr. No.	Sample No.	Entry	Location	UHML (mm)	UI	Mic	Str (g/tex)	E %	Count 1	CSP 1	Count 2	CSP 2
1.	230021	PBD 88	Batinda	20.2	78	7.1	19.6	5.0	10s	1108	--	--
2.	230016	KCH 9344 BGII	Fridkot	26.0	81	4.1	27.0	5.2	20s	**2198**	30s	1938
3.	230017	ACH 902-2 BGII	-do-	26.4	81	3.8	28.3	5.3	40s	**2408**	50s	2165
4.	230018	KCH 9322 BG II	-do-	28.5	84	3.7	28.1	5.5	**30s**	**2307**	40s	2116
5.	230019	RCH 776 BGII	-do-	25.5	83	4.7	27.3	5.6	40s	**2312**	50s	2080
6.	230010	MC 540 BGII	Hisar	25.6	82	4.0	27.0	5.6	20s	**2220**	30s	**2196**
7.	230011	ARCV 22 Bt	-do-	25.9	82	4.3	25.8	5.5	20s	**2096**	--	--
8		C 9314 BG II	Sriganaga nagar	Not received								
9		RCH 983 BG II	-do-	Not received								
10		FBt 1908	-do-									

II. Agronomy Trials Central Zone (Irrigated) - Full Spinning Results

Sr. No.	Sample No.	Entry	Location	UHML (mm)	UI	Mic	Str (g/tex)	E %	Count 1	CSP 1	Count 2	CSP 2
1	230044	BIO 6511 BG II	Akola	30.9	84	4.6	30.5	5.8	20s	**2356**	30s	**2292**
2	230045	CICR Bt 20-31	-do-	25.9	82	5.0	26.3	5.6	20s	**2096**	30s	1915
3	230040	NDLA 3116-3	-do-	23.5	81	**6.2**	24.9	5.7	12s	1857	16s	1699
4	230041	AKA 2013-8	-do-	26.1	82	5.6	27.0	5.7	16s	**2457**	20s	**2380**
5	230042	PA 873	-do-	28.6	84	**5.0**	30.1	5.8	16s	**2267**	20s	**2210**
6	230043	TVH 007	-do-	29.2	83	**4.9**	29.1	5.7	20s	**2246**	30s	2040
7	230027	NH 1904 Bt	Bharuch	26.6	82	4.0	27.7	5.6	20s	**2254**	30s	1884
8	230001	CNH 18529	Junagadh	25.0	83	4.9	26.1	5.5	30s	**2151**	40s	1884
9	230002	ATCH 1365 BG II	-do-	29.7	83	4.0	30.0	5.6	50s	**2430**	60s	**2412**
10	230003	RCH 989 BG II	-do-	28.0	85	3.8	28.7	5.7	50s	**2605**	-	-
11	230004	JKCH 161042 BG II	-do-	26.3	84	**5.9**	25.8	5.6	16s	1947	20s	1910
12	230005	Jaiho BG II	-do-	30.6	84	4.5	30.4	5.8	50s	**2405**	60s	2190
13	230006	CICR 18 Bt, Junagadh	-do-	24.1	82	4.8	24.9	5.5	16s	**1902**	12	1751
14		Super 2141 BG II	Khandwa	**Sample not received**								
15		BIO 6101 BG II	-do-	**Sample not received**								
16	230045	CICR Bt 20-31	Akola	25.9	82	5.0	26.3	5.6	**20s**	**2096**	30s	1915
17	230020	NH 1901 Bt	Nagpur	26.2	81	3.5	24.6	5.4	20s	**2224**	30s	**2175**
18	230022	CICR 18 Bt, Nanded	Nanded	23.9	81	4.8	24.1	5.4	12s	1851	16s	1899
19	230023	DDCC 1901	-do-	22.6	79	**5.5**	22.6	5.4	12s	1924	16s	1894
20	230024	CNH 18529	-do-	23.7	80	4.8	23.3	5.4	16s	**1974**	-	-
21	230013	RCH 981 BG II	Rahuri	26.6	85	5.2	26.9	5.7	30s	**2103**	40s	1976

22	230014	ACH 981-2 BG II	-do-	28.2	84	4.1	28.2	5.8	30s	**2127**	40s	1848
23	230015	*MR*C 7938 BG II	-do-	35.4	86	3.4	32.4	6.1	60s	**2634**	80s	**2504**
24	230012	G Cot 16 Cry 1 Ac	-do-	25.1	82	4.7	25.1	5.6	20s	**2308**	30s	**2223**
25	230008	RCH 990 BG II	Surat	27.4	82	4.5	28.3	5.7	20s	**2190**	30s	2058
26	230009	NH 1902 Bt	-do-	24.9	**80**	3.8	24.8	5.5	20s	1938	30s	1929
27	230007	GJHV 566	-do-	23.5	81	4.3	24.5	5.6	Not spinnable (Honey dew)			
28		D 1199 BG II	Talod	**Sample not received**								
29		D 1579 BG II	-do-	**Sample not received**								
30		G Cot 10 Cry 1 Ac	-do-	**Sample not received**								
31	230039	GVhv-1028	Viramgam	28.1	82	3.4	30.6	5.6	20s	**2189**	30s	2000
32	230050	NH677	CRS Nanded	27.1	81	4.0	27.0	5.6	20s	**2174**	30s	1920

III. Agronomy Trials South Zone (Irrigated) - Full Spinning Results

Sr. No.	Sample No.	Entry	Location	UHML (mm)	UI	Mic	Str (g/tex)	E %	Count 1	CSP 1	Count 2	CSP 2
1		RCH 990 BG II	Adilabad	**Sample not received**								
2	230033	Daftari 2244 BG II	Raichur	30.3	84	3.5	29.6	5.8	**30s**	**2340**	**40s**	**2305**
3	230029	Jaiho BG II	-do-	28.1	84	3.4	28.4	5.7	**40s**	**2332**	**50s**	**2230**
4	230035	DHCC 1901(Hirsutum)	Dharwad	27.0	82	3.7	26.0	5.6	16s	**2016**	20s	2009
5	230036	CCHC 19-1 (hirsutum)	-do-	22.5	83	4.8	22.8	5.4	12s	1760	16s	1726
6	230037	NDLA 3104-4 (Arboreum)	-do-	22.6	**79**	**6.8**	24.0	5.5	12s	1553	-	-
7	230038	CCHC 19-2 (hirsutum)	-do-	27.7	83	3.5	26.4	5.5	12s	**2188**	16s	**2169**
8		SS 246 BG II		**Sample not received**								
9		60 SS 66 BG II	-do-	**Sample not received**								
10		US 707 BG II	ANGRAU Lam	**Sample not received**								
11		BIO GHH 074 BG II (BIO 6074 BGII)	-do-	**Sample not received**								
12		RCH 996 BG II	ANGRAU Nandyal	**Sample not received**								
13	230034	SP 7688 BG II	Mudhole	28.2	85	4.3	28.2	5.6	30s	**2228**	40s	2174
14		SP 7680 BG II	TNAU Perambalur	**Sample not received**								
15	230032	RCH 989 BG II	UAS, Raichur	27.5	84	3.8	28.1	5.7	20s	**2326**	30s	**2352**
16	230028	RCH 981 BG II	-do-	27.7	82	3.2	27.6	5.6	30s	**2334**	40s	2188
17	230031	CPD 1902	-do	27.7	83	4.0	27.1	5.6	40s	**2284**	-	-
18	230030	CCH 19-2	-do	27.4	85	4.4	27.5	5.7	30s	**2274**	40s	**2204**
19	230033	Daftari 2244 BG II	-do	30.3	84	3.5	29.6	5.8	40s	**2344**	50s	2164

20	230029	Jaiho BG II	-do	28.1	84	3.4	28.4	5.7	40s	**2332**	50s	2230
21	230026	D 1199 BG II	Warangal	30.1	85	4.1	31.2	5.8	40s	2184	50s	2145
22	230025	ACH 909-2 BG II	-do-	30.1	84	4.0	30.2	5.8	50s	**2355**	-	-
23	230051	DB1901	TNAU Coimbatore	30.3	83	3.4	31.1	6.0	50s	**2543**	-	-
24	230046	NDLH-2056-4	ARRS Nandyal	25.5	83	3.4	25.8	6.3	16s	**1984**	20s	1956
25	230047	CCH 19-2	-do-	25.9	83	3.2	26.6	6.4	16s	**1985**	20s	**2016**
26	230048	DDCC1901	-do-	21.9	79	5.0	22.9	5.4	**Non-spinnable**			
27	230049	CICR BT-23	-do-	22.7	76	3.3	21.3	5.2	16s	1898	20s	1926

Annexure I : Technical programme of ICAR-AICRP on Cotton Trials

NORTH ZONE TRIAL

Br. 22 a/b Initial Evaluation Trial -*G. arboreum*

Sr.No.	Code	Entry	Sponsored by	Locations	LC (2)
1	201	HD 545	CCS HAU, Hisar	Sirsa (C)	CISA 310
2	202	FDK 341	PAU, Faridkot		
3	203	RG 895	SKRAU, Sriganganagar	Hisar	HD 432
4	204	CISAA 33-9	CICR, Sirsa		
5	205	LC			
6	206	PBD 155	PAU, Bathinda	Faridkot	LD 949
7	207	HD 563	CCS HAU, Hisar		
8	208	FDK 331	PAU, Faridkot		
9	209	ZC (FDK 124)			
10	210	RG 892	SKRAU, Sriganganagar	Bathinda	LD 949
11	211	FDK 345	PAU, Faridkot		
12	212	PBD 154	PAU, Bathinda	SGNR	RG 542
13	213	CISAA 6-165	CICR, Sirsa		

Br. 25 a/b Preliminary Hybrid Trial - Desi Hybrid

S. No	Code	Name of Entry	Sponsor	Locations	LC
1	221	CISAA 21-2	CICR, Sirsa		
2	222	KR 161	Shakti Vardhak	Arya Nagar (Shakti Vardhak)	AAH 1
3	223	ZC (KR 64-NZ)			
4	224	AAH 47	CCS HAU, Hisar	Bhatinda	FMDH 9
5	225	KR 160	Shakti Vardhak	Hisar	AAH 1
6	226	CISAA 21-1	CICR, Sirsa		
7	227	LC			
8	228	KR 162	Shakti Vardhak	Sirsa (CICR)	CICR-2
9	229	AAH 46	CCS HAU, Hisar	Sriganganagar	RAJ DH. 9

Br-04 a – Coordinated Variety trial of *G. hirsutum*

S. No.	Code	Entries	Location	Local Check
1	2001	Quality Check (CSH 3129)	Hisar	H 1098 i
2	2002	F 2732	Sriganganagar	RS 2013
3	2003	ZC (F 2228)	Bathinda	LH 2108
4	2004	F 2743	Faridkot	LH 2108
5	2005	LC	Sirsa	CSH 3129

Br-24 a - Coordinated Variety trial of *G. arboreum*

S. No.	Code	Entries	Location	Local Check
1	2011	FDK 315	Bathinda	LD 949
2	2012	FDK 124 (ZC)		
3	2013	RG 888	Sirsa (CICR)	CISA 614
4	2014	CISA 33-7		
5	2015	FDK 312		
6	2016	FDK 325	Sriganganagar	RG 542
7	2017	Local Check		
8	2018	PBD 156	Hisar	HD 432
9	2019	RG 868	Faridkot	LD 949
10	2020	FDK 324		

Br-25 a Coordinated Desi Hybrid trial

S. No.	Code	Entries promoted	Location	Local Check
1	2021	KR 153	Faridkot	FMDH 9
2	2022	KR 149	Bathinda	FMDH 9
3	2023	Zonal Check (KR 64)		
4	2024	CISAA 20-1	Hisar	AAH 1
5	2025	Local Check		
6	2026	KR 150	Sirsa (CICR)	CISAA 2
7	2027	KR 152	Sriganganagar	RAJ DH 9
8	2028	CISAA 19-4	Aryanagar (Shaktivardhak)	CISAA 2

CENTRAL ZONE TRIALS

Br. 22 b IET-*G. arboreum*

Sr.No.	Code	Entry	Sponsor	Locations	LC (2)
1	231	CNA 1085	CICR, Nagpur	Parbhani	PA 740
2	232	GAM 296	JAU, Amreli	Khandwa	JK 5
3	233	PA 919	VNMKV, Parbhani		
4	234	GBav 181	NAU, Bharuch	Viramgam	G Cot 19
5	235	JLA 1707	MPKV, Jalgaon		
6	236	ZC (AKA 7)			
7	237	PA 929	VNMKV, Parbhani		
8	238	CNA 1084	CICR, Nagpur	Akola	AKA. 8
9	239	GVav 1332	AAU, Viramgam		
10	240	LC			
11	241	CNA20178	CICR, Nagpur	Nagpur	AKA. 8
12	242	AKA 2016-3	PDKV, Akola		
13	243	CNA 1086	CICR, Nagpur	Jalgaon	JLA 505
14	244	GAM 288	JAU, Amreli	Amreli	G.Cot.19
15	245	QC (PA 255)			
16	246	JLA 1641	MPKV, Jalgaon		
17	247	GBav 137	NAU, Bharuch	Bharuch	GN Cot 29

Br. 32b IET of *G. herbaceum*

Sr.No.	Code	Name of Entry	Sponsor	Locations	LC (2)
1	251	CNh 66	CICR, Nagpur		
2	252	GBhv 340	NAU, Bharuch	Bharuch (CSSRI)	GN.Cot.25
3	253	CNh-33	CICR, Nagpur	Kukada	GN Cot 25
4	254	GBhv 334	NAU, Bharuch	Viramgam	GADC 3
5	255	ZC (G Cot 23)			
6	256	GBhv 356	NAU, Bharuch	Dhandhuka	GADC 3
7	257	GShv 843/17	NAU, Surat	Bharuch	GN.Cot.25
8	258	LC			
9	259	GShv 812/17	NAU, Surat	Surat	GN.Cot.25

Br-03 a/b – PVT Coloured cotton - Irrigated

S. No.	Code	Entry	Location	Local Check
1.	2101	CCH 20452	Khandwa (I)	JK 4
2.	2102	Phule Yamuna (ZC)		
3.	2103	DHCC 2151	CICR, Nagpur (R)	AKH 8828
4.	2104	CNH 19325		
5.	2105	CNH 19480		
6.	2106	16301 DB	Surat (R)	GN.Cot. 22
7.	2107	CNH 17395		
8.	2108	CNH 20449		
9.	2109	Local Check		

Br-24 b CVT – *G. arboreum*

S. No.	Code	Entries	Location	Local Check
1.	2111	JLA-1430	Khandwa	JK 5
2.	2112	GAM 269	Nagpur	AKA 8
3.	2113	ZC (AKA 7)		
4.	2114	GAM 283	Akola	AKA 8
5.	2115	CNA 1072	Parbhani	PA 740
6.	2116	QC (PA 255)		
7.	2117	AKA 2016-11	Jalgaon	JLA 505
8.	2118	GAM 266		
9.	2119	LC		
10.	2120	JLA 1204	Amreli	G Cot 19

Br-24b – CVT Coloured Cotton - Arboreum

S. No.	Code	Entries	Location	Local Check
1.	2121	CNA 1092	Nanded	PA 255
2.	2122	Local Check	Jalgaon	JLA 505
3.	2123	CNA 20402	Nagpur	AKA 8
4.	2124	CNA 19475	Surat	G. Cot 19
5.	2125	AKA 7 (Zonal Check)	Parbhani	PA 740
6.	2126	DDCC 2001	Khandwa	JK 5

SOUTH ZONE TRIAL

Br-03 a/b (CC) – PVT Colour Cotton – Irrigated

S. No.	Code	Entries	Location	Local Check
1.	2201	DHCC 2002	Raichur (I)	BGDS1063
2.	2202	Suraj (Zonal Check)	Dharwad (R)	ARBH 813
3.	2203	DHCC 2151	Srivilliputhur (I)	SVPR 6
4.	2204	Local Check	Lam (I)	Sivanandi
5.	2205	Vaidehi 1 (ZC CC)	Nandyal (R)	Sivanandi

Br-04a – CVT – Irrigated

S. No.	Code	Entries	Location	Local Check
1.	2211	RAH 1083	Srivilliputhur	SVPR 6
2.	2212	ZC (Suraj)		
3.	2213	RAH 1081	Arabhavi	ARBH 813
4.	2214	TSH 387	Raichur	BGDS1063
5.	2215	LC		
6.	2216	RAH 1082	Lam	NDLH 1938

Br – 14 a CVT *G. barbadense*

S. No.	Code	Entries	Location
1.	2221	CCB 26	Rahuri
2.	2222	CCB22-2	Coimbatore (TNAU)
3.	2223	ZC (Rhcb-011-CZ; Suvin-SZ)	
4.	2224	CCB22-1	Dharwad
5.	2225	SIMA B-8	Chamraj Nagar
6.	2226	CCB 6	

Br-24 b: CVT – G. arboreum

S. No.	Code	Entries	Location	Local Check
1.	2231	CNA 2034		
2.	2232	DWDa 2051		
3.	2233	PAIG 411		
4.	2234	MDL 2674		
5.	2235	NDLA 3152-1	Dharwad	AKA 235
6.	2236	PA 887		
7.	2237	CNA 1085		
8.	2238	DWDa 2252		
9.	2239	LC		
10.	2240	CNA 1086		
11.	2241	NDLA 3146-2	Nandyal	Yaganti
12.	2242	ZC (DLSa 17)		
13.	2243	PA 888		
14.	2244	PA 898		
15.	2245	DWDa 2251	Kovilpatti	K 12
16.	2246	CNA 1084		

Br24a/b – CVT Arboreum (CC) – Rainfed

S. No.	Code	Entries	Location	Local Check
1.	2251	DDCC 2151	Nandyal	Yaganti
2.	2252	DDCC 1 (CC)	Kovilpatti	K 12
3.	2253	DDCC 2001	Dharwad	AKA 235
4.	2254	Local Check		

Annexure II: Fibre and Yarn Quality Norms

ICAR-CIRCOT Yarn CSP Norms

Count	CSP	Count	CSP
16s	1987	60s	2392
20s	2024	70s	2484
30s	2116	80s	2576
40s	2208	100s	2760
50s	2300	120s	2944

TMC Norms for Trash (%)

Staple Class	**Trash Limit (%)**
Extra Long Staple	2.0
Long and Medium Long	3.0
Medium and Short	3.5
Closed Boll Types	6.0

Staple Length Categories of Indian Cottons Based on UHML*

Category	Range of 2.5% S.L.(mm)
Short	20 mm and below
Medium	20.5 - 24.5
Medium Long	25.0 - 27.0
Long	27.5 - 32.0
Extra long	32.5 mm and above

Ratings of Cotton on The Basis of Length Uniformity*

Category	UI
Poor	Below 76
Fair	76 to 78
Average	79 to 83
Good	83 to 85
Excellent	Above 85

Classification of Cottons According to Micronaire Value

Category	**Range of Micronaire Value**
Very fine	Below 3.0
Fine	3.0 to 3.9
Average	4.0 to 4.9
Coarse	5.0 to 5.9
Very coarse	6.0 and above

Ratings of cotton based on tenacity at 3.2 mm gauge length (HVI mode)*

Category	Range of Bundle tenacity values in g/tex
Very weak	20.0 & below
Weak	20.1 - 25.0
Average	25.1 – 29.0
Good	29.1 – 32.5
Very good	Above 32.5

* The values are provisional subject to revision

Provisional Norms on the basis of HVI mode of testing

Sr. No.	Count Range	Range of UHML (mm)	Minimum value of UI	Minimum Tenacity (g/t) (HVI mode)	Range of Micronaire
1.	14s-18s	24-25	81	27.5	3.9-4.7
2.	20s-24s	25-26	82	28.0	3.8-4.2
3.	25s-30s	26-27	83	29.1	3.4-4.2
4.	31s-40s	27-29	84	29.3	3.3-4.1
5.	41s-50s	29-31	84	31.3	3.3-4.0
6.	51s-60s	31-33	86	33.6	3.2-3.9
7.	61s-80s	33-34	86	36.6	3.2-3.8
8.	81s-100s	34-36	87	38.3	3.1-3.4
9.	101s-120s	36>	88	40.0	2.9-3.2

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