

Annual Report of AICRP on Cotton 2021-22



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ICAR – All India Coordinated Research Project on Cotton
Coimbatore, Tamil Nadu

Published By **Dr. A. H. Prakash,**
Project Coordinator (Cotton Improvement),
ICAR – Central Institute for Cotton Research,
Regional Station, Coimbatore – 641 003.

Compiled & Edited by Dr. A. H. Prakash, Project Coordinator & Head
Dr. S. Manickam, Principal Investigator (Breeding)
Dr. K. Sankaranarayanan, Principal Investigator (Agronomy)
Dr. Rishikumar, Principal Investigator (Entomology)
Dr. S. K. Sain, Principal Investigator (Plant Pathology)
Dr. P. K. Mandhyan, Principal Investigator (Fibre Technology)
Dr. M. Sabesh, Senior Scientist (Computer Application)
Sh. S Sathya Kumar ACTO, CICR, Cbe

Cover Page Design by: Dr. M. Sabesh, Senior Scientist, ICAR-CICR, RS, Coimbatore

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Preface

Cotton is the world's most valuable non-food agricultural product. Five countries make up around 75% of global cotton production with India leading from the front with 6.1 million tonnes followed by China (5.5 Mt), USA (4.1 Mt), Brazil (1.9 Mt) and Pakistan (1.7 Mt) production.

World cotton production is projected to grow 1.5% p.a. to reach almost 30 Mt in 2029. This growth will come from an expansion of the cotton area (0.5% p.a.) as well as growth in average global yields (1% p.a.). Yields have been flat since 2004 as several countries struggled with pest problems and water scarcity, and because production shares of low-yielding countries have been increasing. Better genetics and the adoption of better agronomic practices for sustainable cotton production could bring improvement over the coming decade, but yield growth could remain a challenge in several countries. India will continue to be the world's largest cotton producer, but in line with recent trends cotton area expansion is expected to be limited. The flagship project on Pre-Breeding has brought in versatility in Breeding programmes. In addition, the location-specific production and cotton protection technologies like Integrated Nutrient management, Integrated Weed Management, Integrated pest management etc. Interactive Public-Private partnership programmes, especially in the evaluation of the production potential of Bt cotton hybrids, led to revolution in cotton production in the country.

During the year, twenty five non Bt Variety / Hybrid and sixty nine Bt varieties/ Hybrids was identified and fifty five were notified for commercial cultivation, for various agro-climatic regions.

Leading from the front is **Dr. Trilochan Mohapatra**, Secretary, DARE & 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 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 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. (Mrs) Sujata Saxena**, Director, ICAR-CIRCOT, Mumbai, who have been very helpful and remain as sources of strength and knowledge for efficient running of the 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** has 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. P.K. Mandhyan**, Principal Investigator (Fiber Technology), **Dr. M. Sabesh** (Senior Scientist-Computer Applications), **Dr. (Mrs) S. Usha Rani** (Pr. Scientist, Extension) and **Dr. K. Rathinavel**, Principal Scientist (Seed Tech.), in running various technical activities of this huge Project. 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. Ashvini Garg** (Sr. Finance & Accounts Officer) and their team at 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 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.



A. H. Prakash

Project Coordinator (Cotton Improvement)

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All India Coordinated
Research Project on Cotton

Annual Report:2021-22

Report of Project Coordinator



Project Coordinator (Cotton Improvement)
All India Coordinated Research Project on Cotton
(Indian Council of Agricultural Research)
Central Institute for Cotton Research
Regional Station, Coimbatore- 641003
www.cicr.org.in

PROJECT COORDINATOR REPORT

Introduction

The world's first commercial intra-hirsutum cotton Hybrid 4 (H4, or Shankar4) was developed by Dr. C. T. PATEL at the Main Cotton Research Station, Surat (Gujrat) in 1970.. This year we are celebrating the **"GOLDEN JUBILEE OF HYBRID COTTON TECHNOLOGY"** developed through AICRP on Cotton. The technology revolutionized cotton farming due to the genetic phenomena of HETEROSIS and breeding becoming popular as hybrid technology, with a phenomenal increase in production from a meagre 47.63 lakh bales during 1970s to 370 lakh bales in the year 2021-22.

Despite the Covid pandemic across the globe, the Cotton supply and demand chain was unaffected, and sustainability has been maintained. India has made a significant and balanced policy framework, which sustained cotton production and supply system during the pandemic.

Indian Cotton Scenario: 2021-22

The cotton production in India during 2021-22 is estimated to produce 362.18 lakh bales of 170 kg from 120.69 lakh hectares with a productivity of 510 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 decreased to 7.21% compared to last year. Despite the reduction in the area, the production increased to 2.36%, because of productivity enhancement of around 10% in the current year compared to last year.

During the current year 2021-22, Gujarat, Maharashtra, and Telangana were the major cotton-growing States covering around 68% (82.09 lakh hectare) in the area under cotton cultivation and producing 65.35% (236.69 lakh bales) of cotton in the country. Maharashtra is the leading cotton-producing state with a significant increase in productivity level in the country for the past couple of years. Cotton area of around 17.06 lakh ha (Punjab-3.04, Haryana-6.95 & Rajasthan-7.07) was sown under cotton during 2021-22 in North zone with a decrease of 5.22% compared to last year and the cotton production is undisturbed and produced around 60 lakh bales in North Zone. In Central Zone, the area under cotton is estimated at 68.10 lakh ha with a decrease of 4.46% and the cotton production increased to 1.83% compared to last year. In South Zone, the cotton sown around 33.04 lakh ha which is a 15.21% decrease over last year (38.97 lakh ha) and the cotton production increased to the tune of 3.03% in the current year compared to last year. On the cotton productivity front, Andhra Pradesh and Telangana realised around 32.44 and 28.70% productivity enhancement respectively, compared to last year. Similarly, the States viz., Haryana, Odisha, Gujarat, and Punjab have realised more than 10% productivity enhancement this year.



State-wise Cotton Area (in Lakh ha)

	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Punjab	3.39	2.85	2.91	2.68	2.48	2.52	3.04
Haryana	6.15	5.70	6.65	7.08	7.23	7.40	6.95
Rajasthan	4.48	4.71	5.84	6.29	7.60	8.08	7.07
Gujarat	27.22	23.82	26.24	26.60	26.55	22.70	22.57
Madhya Pradesh	5.63	5.99	6.03	6.14	6.50	5.72	6.16
Maharashtra	42.07	38.00	43.51	42.18	44.91	42.86	39.37
Andhra Pradesh	6.66	4.72	6.46	6.20	6.57	6.06	5.78
Telangana	17.73	14.09	18.97	18.39	21.27	23.59	20.15
Karnataka	6.42	5.10	5.47	7.18	8.17	8.20	6.37
Tamil Nadu	1.42	1.42	1.83	1.33	1.70	1.12	0.74
Odisha	1.25	1.36	1.45	1.57	1.70	1.71	2.00
Others	0.50	0.50	0.50	0.50	0.09	0.11	0.13
All India	122.92	108.26	125.86	126.14	134.77	130.07	120.69

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

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

	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Punjab	7.50	10.31	12.83	12.22	12.06	10.23	13.68
Haryana	9.93	20.41	16.27	20.13	24.84	18.23	20.43
Rajasthan	12.14	14.02	18.93	20.26	27.88	32.07	25.97
Gujarat	94.00	85.75	101.87	62.79	86.17	72.70	80.96
Madhya Pradesh	18.00	20.51	16.20	23.29	16.46	17.83	19.21
Maharashtra	75.00	106.19	60.94	65.93	66.39	95.88	89.86
Andhra Pradesh	18.88	15.64	20.87	14.91	25.08	16.04	20.26
Telangana	36.61	34.44	51.95	38.47	68.33	59.95	65.87
Karnataka	20.00	10.10	18.44	14.00	23.30	23.20	17.24
Tamil Nadu	3.69	3.59	4.45	2.69	4.18	2.50	1.61
Odisha	3.00	3.82	4.08	4.55	5.79	4.99	6.82
Others	1.30	1.00	1.22	1.18	0.17	0.22	0.27
All India	300.05	325.77	328.05	280.42	360.65	353.84	362.18

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



State-wise Cotton Productivity (in kg/ha)

	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Punjab	376	615	750	775	827	690	765
Haryana	274	609	416	483	584	419	500
Rajasthan	461	506	551	548	624	675	624
Gujarat	587	612	660	401	552	544	610
Madhya Pradesh	544	582	457	645	430	530	530
Maharashtra	303	475	238	266	251	380	388
Andhra Pradesh	482	563	549	409	649	450	596
Telangana	351	416	466	356	546	432	556
Karnataka	530	337	573	331	485	481	460
Tamil Nadu	442	430	413	344	418	379	370
Odisha	408	478	478	493	579	496	580
Others	442	340	415	401	321	340	353
All India	415	512	443	378	455	462	510

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	2019-2020*	2020-21 (P)*	2021-22(P)*
SUPPLY							
Opening Stock	66.00	36.44	43.76	42.91	56.52	120.79	73.20
Crop	332.00	345.00	370.00	333.00	365.00	353.84	362.18
Import	22.79	30.94	15.80	35.37	15.50	11.03	10.50
TOTAL SUPPLY	420.79	412.38	429.56	411.28	437.02	485.66	445.88
DEMAND							
Mill Consumption	270.20	262.70	280.11	270.78	233.70	297.45	299.00
S.S.I Consumption	27.08	26.21	26.18	22.43	20.49	22.42	23.00
Non Textile Consumption	18.00	21.50	12.77	18.00	15.00	15.00	16.00
Export	69.07	58.21	67.59	43.55	47.04	77.59	45.00
TOTAL DEMAND	384.35	368.62	386.65	354.76	316.23	412.46	383.00
<i>Closing Stock.</i>	36.44	43.76	42.91	56.52	120.79	73.20	62.88

Note: In lakh bales of 170 kg. Each

* - As estimated by Committee on Cotton Production and Consumption (COCPC) in its meeting held on 12.11.2021

World Cotton Scenario: 2021-22

India remains the leading country in terms of area under cotton cultivation (38% of world cotton area) and raw cotton production in the world in the year 2021-22 (as estimated by ICAC), and the second-largest in terms of raw cotton consumption and beginning and ending stock holding. The USA is the largest exporter of cotton; the second largest cultivator; and the third-largest producer



in the world. China is the largest consumer of raw cotton in the world around 32% of world raw cotton production consumed, and the highest yield was realised in China with 1844 kg/ha. China is the largest stockholder in the world, and it holds around 45% of each of beginning and ending stock of world raw cotton stock holdings. It is to mention that cotton productivity is consistent in Turkey, on average 1690 kg/ha for the past decade, whereas it was on an average 1610, 1590, and 1928 kg/ha respectively, in China, Brazil, and Australia. Though the decadal productivity average of Australia is high but not consistent.

There is a significant upsurge in the import of raw cotton in Pakistan and imports 12 metric tons of cotton due to a slump in domestic cotton productivity. It was an average of 456 kg/ha couple of years, whereas it was on an average around 700 kg/ha last decade. Significant import has been carried out by Turkey in the past three years and imports on an average 11 metric tons of raw cotton, notably to increase the ending stock holding. Turkey holds on average 13.32 metric tons of raw cotton for the past three years. Sustained imports from Bangladesh and Vietnam were recorded with 16.20 and 15.14 metric tons of raw cotton, respectively.

World Cotton Status: 2021-22

	Area	Yield	Prod uction	Beginning Stocks	Imports	Consumption	Exports	Ending Stocks
	'000 ha	kg/ha	'000 metric tonnes					
Argentina	410	850	349	798	0	111	122	914
Australia	496	1226	608	266	0	2	749	123
Bangladesh	46	776	36	553	1688	1660	0	617
Benin	639	519	332	151	0	2	321	159
Brazil	1511	1772	2678	2097	3	700	2064	2014
Burkina Faso	642	413	265	138	0	5	260	138
Cameroon	231	675	156	65	0	2	132	87
Chad	234	260	61	50	0	1	30	80
China	3107	1844	5730	9305	2520	8200	30	9325
Côte d'Ivoire	460	522	240	109	0	3	277	69
Egypt	84	833	70	19	89	103	56	19
India	12650	466	5900	2593	170	5698	816	2148
Indonesia	4	621	3	95	539	514	1	122
Mali	824	413	340	13	0	2	283	68
Mexico	145	1592	231	166	178	303	106	166
Pakistan	2100	467	981	411	1200	2152	9	431
Sudan	180	730	131	57	0	18	127	43
Tajikistan	202	540	109	45	0	15	96	43
Tanzania	641	220	141	63	0	45	96	63
Turkey	480	1735	833	1282	1170	1617	126	1542
Turkmenistan	573	522	299	123	0	144	155	123
USA	4014	987	3963	261	0	544	3375	304
Uzbekistan	945	994	940	528	0	836	14	618
Vietnam	1	1508	2	201	1576	1541	0	238
World	33188	775	2573 3	20349	1015 3	25629	1015 3	2045 8

Source: International Cotton Advisory Committee (ICAC) data portal, 2021-22 projection, accessed on 20:03:2022



List of identified varieties/hybrids during 2021-22

During the Variety Identification Committee meeting of AICRP on Cotton conducted on virtual mode, the following varieties/hybrids were identified for cultivation.

S. No.	Name	Species	Developer	Area of adaptation
1.	PBH 115	<i>G. hirsutum</i>	PAU, Bathinda	North zone
2.	PBH 116	<i>G. hirsutum</i>	PAU, Bathinda	North zone
3.	F 2662	<i>G. hirsutum</i>	PAU, Faridkot	North zone
4.	RHB 1008	H X B	MPKV, Rahuri	Central and South zone
5.	NDLH 2005-4	<i>G. hirsutum</i>	ANGRAU, Nandyal	Central zone
6.	NDLH 2051-1	<i>G. hirsutum</i>	ANGRAU, Nandyal	Central and South zone
7.	CNH 1111	<i>G. hirsutum</i>	CICR, Nagpur	Central zone
8.	CNA 1054	<i>G. arboreum</i>	CICR, Nagpur	Central zone
9.	DB 1701	<i>G. barbadense</i>	UAS, Dharwad	South zone
10.	CCB 143B	<i>G. barbadense</i>	CICR, Coimbatore	South zone
11.	NDLH 2028-2	<i>G. hirsutum</i>	ANGRAU, Nandyal	South zone
12.	CNH 1128	<i>G. hirsutum</i>	CICR, Nagpur	South zone
13.	PA 837	<i>G. arboreum</i>	VNMKV, Parbhani	South zone
14.	DDCC 1	<i>G. arboreum</i>	UAS, Dharwad	South zone
15.	16301 DB	<i>G. hirsutum</i>	CICR, Nagpur	South zone

List of varieties/ hybrids notified during 2021-22

S. No.	Name	Species	Notification no.	Notification date	Area of adaptation
1	KR 111	<i>a x a</i>	S. O. 2689 (E)	20/07/2021	Haryana
2	BS 30	<i>G. hirsutum</i>	S. O. 2689 (E)	20/07/2021	Central and South Zone States
3	Phule Mahi (RHB 1122)	<i>H X B</i>	S. O. 2689 (E)	20/07/2021	Central and South Zone States
4	CICR B Cotton 37 (CCB 51)	<i>G. barbadense</i>	S. O. 2689 (E)	20/07/2021	South Zone States
5	ARBB 1502	<i>G. barbadense</i>	S. O. 8 (E)	24-12-2021	Central Zone States
6	ARBH 1551	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	Central and South Zone States
7	RS 2818	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	North Zone States
8	RS 2827	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	North Zone States



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9	ARBC 1601	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	Central Zone States
10	CPD 1652	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	Central and South Zone States
11	Suvarna Shubhra (AKH-09-5)	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	Central Zone States
12	ARBC 1651	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	Central and South Zone States
13	PA 810	<i>G. arboreum</i>	S. O. 8 (E)	24-12-2021	Central Zone States
14	DB 1601	<i>G. barbadense</i>	S. O. 8 (E)	24-12-2021	South Zone States
15	ARBHB 1602	<i>H X B</i>	S. O. 8 (E)	24-12-2021	South Zone States
16	DSC 1651	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	South Zone States
17	Phule JLA 1110	<i>G. arboreum</i>	S. O. 8 (E)	24-12-2021	South Zone States
18	CO 18 (TCB 37)	<i>G. barbadense</i>	S. O. 8 (E)	24-12-2021	Central Zone States
19	PBH 116	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	North Zone States
20	Nandyal Cotton 22 (NDLH 2005-4)	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	Central Zone States
21	Nandyal Cotton 23 (NDLH 2028-2)	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	South Zone States
22	Nandyal Cotton 24 (NDLH 2051-1)	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	Central Zone States
23	CICR-B Cotton 45 (CCB 143B)	<i>G. barbadense</i>	S. O. 8 (E)	24-12-2021	South Zone States
24	CICR-A Cotton 46 (CNA 1054)	<i>G. arboreum</i>	S. O. 8 (E)	24-12-2021	Central Zone States
25	CICR-H Cotton 47 (CNH 1111)	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	Central Zone States
26	CICR-H Cotton 48 (CNH 1128)	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	South Zone States
27	ICAR-CICR 16301 DB (Vaidehi-1)	<i>G. hirsutum</i>	S. O. 8 (E)	24-12-2021	South Zone States
28	Gujarat Anand Desi Cotton 4 (WagadResham)	<i>G. herbaceum</i>	S. O. 8 (E)	24-12-2021	Gujarat
29	ARBHB 1601	<i>H X B</i>	S. O. 8 (E)	24-12-2021	South Zone States



List of Bt cotton variety / hybrid identified during VIC 2021

S. No.	Name of Variety / hybrid	Species	Name of the Applicant	Zone	Condition
1	Pravir (MC 5403 BG II)	H X H	Rallis India Limited	Haryana	Irrigated
2	SP 7674 BG II	H X H	Bayer Bioscience Pvt Ltd	North	Irrigated
3	ZCH 1439 BG II	H X H	Panchaganga Seeds Pvt. Ltd	Central	Irrigated
4	JBG 3 BG II	H X H	JAU, Junagadh	Central	Irrigated
5	Solar 108 BG II	H X H	Solar Agrotech Pvt Ltd	Central	Irrigated
6	Solar 106 BG II	H X H	Solar Agrotech Pvt Ltd	Central	Irrigated
7	NC 369 Bt2	G. hirsutum	Nuziveedu seeds Pvt Ltd	Central	Rainfed
8	NCS 2778 Bt 2	H X H	Nuziveedu seeds Pvt Ltd	South	Irrigated
9	ICAR-CICR Bt 21	G. hirsutum	CICR, Nagpur	Central	Rainfed
10	ICAR-CICR Bt 25	G. hirsutum	CICR, Nagpur	South	Rainfed

List of Bt cotton variety / hybrid notified during 2021-22

S. No.	Name of Variety / hybrid	Species	Name of the Applicant	Zone	Condition
1	C 363 BG II	H X H	Mahyco Pvt Ltd	Central	Irrigated
2	C 366 BG II	H X H	Mahyco Pvt Ltd	Central	Irrigated
3	C 9333 BG II	H X H	Mahyco Pvt Ltd	Central	Irrigated
4	C 9344 BG II	H X H	Mahyco Pvt Ltd	Central	Irrigated
5	C 352 BG II	H X H	Mahyco Pvt Ltd	North	Irrigated
6	C 9313 BG II	H X H	Mahyco Pvt Ltd	North	Irrigated
7	ARCH 045BG II	H X H	Ankur Seeds Pvt Ltd	Central	Irrigated
8	ARCH 888 BG II	H X H	Ankur Seeds Pvt Ltd	Central	Irrigated
9	C 9391 BG II	H X H	Mahyco Pvt Ltd	Gujarat	Rainfed
10	C 9397 BG II	H X H	Mahyco Pvt Ltd	Gujarat	Rainfed
11	C331 BG II	H X H	Mahyco Pvt Ltd	Gujarat	Rainfed
12	C 344 BG II	H X H	Mahyco Pvt Ltd	Gujarat	Rainfed
13	NHH 44 BG II	H X H	MSSC, Akola	Central	Rainfed
14	Pravir (MC 5403 BG II)	H X H	Rallis India Limited	Haryana	Irrigated
15	G Cot Hy 26 BG II (SorathSwet Kanchan) JBG 3 BG II	H X H	Junagadh Agricultural University, Junagadh	Central	Irrigated
16	Solar 108 BG II	H X H	Solar Agrotech Pvt Ltd	Central	Irrigated
17	Solar 106 BG II	H X H	Solar Agrotech Pvt Ltd	Central	Irrigated
18	NC 369 Bt2	G. hirsutum	Nuziveedu seeds Pvt Ltd	Central	Rainfed
19	NCS 2778 Bt 2	H X H	Nuziveedu seeds Pvt Ltd	South	Irrigated



20	ICAR-CICR Bt 21 (ICAR-H Bt Cotton 51)	G. hirsutum	CICR, Nagpur	Central	Rainfed
21	ICAR-CICR Bt 25 (ICAR-H Bt Cotton 52)	G. hirsutum	CICR, Nagpur	South	Rainfed
22	PAU Bt1	G. hirsutum	PAU, Bathinda	Punjab & Rajasthan	Irrigated
23	ICAR-CICR Bt 9 (SRI 1 Bt) (ICAR-H Bt Cotton 49)	G. hirsutum	CICR, Nagpur	Maharashtra	Rainfed
24	ICAR-CICR Bt 14 (CPT 2) (ICAR-H Bt Cotton 50)	G. hirsutum	CICR, Nagpur	Maharashtra	Rainfed
25	PAU Bt2 (PBH Bt 5)	G. hirsutum	PAU, Bathinda	North Zone	Irrigated
26	YC 7963 Bt 2	G. hirsutum	Yaaganti Seeds	Central Zone	Irrigated

Breeder seed production during 2021-22

S. No.	Centre Name	Variety	DAC Indent (q)	Production (q)
1	PAU, Ludhiana	LD 1019	0.10	0.25
		LD 949	0.10	0.20
		F 2228	1.20	2.50
		F 2383	0.30	1.80
		FDK 124	0.10	1.00
		Total	1.80	5.75
2	CICR, Nagpur	Rajat Bt	0.01	0.50
		Suraj Bt	0.01	0.60
		CCH 4474 (Subiksha)	0.05	1.10
		CCH 12-2 (Suchitra)	0.05	0.00
		CCH-2623	0.10	0.00
		Suvin	0.00	0.90
		CCH 14-1 (Sunantha)	0.00	1.60
		CICR B Cotton 37	0.00	0.30
		Surabhi	0.00	1.70
		Total	0.22	6.70
3	JNKVV, Jabalpur	RVK-11	0.10	0.00
		Total	0.10	0.00
4	NAU, Navsari	G.Cot.20 (GSHV 97/59)	0.10	0.20
		Deviraj	0.00	0.30
		GN.Cot. 22	0.00	0.15
		GN.Cot. 32	0.00	0.20
		G.Cot. 34	0.00	0.20
		G.Cot. 36	0.00	0.20
		G.Cot. 40	0.00	0.30
		G.Cot. 42	0.00	0.30



		G. Cot. 16	0.00	0.50
		G. Cot. 23	0.00	0.40
		GN. Cot. 25	0.00	0.75
		GN. Cot. 26	0.00	0.50
		GN. Cot. 29	0.00	0.40
		Total	0.10	4.40
5	VNMKV, Parbhani	PA 740	0.10	0.10
		Total	0.10	0.10
6	SKRAU, Bikaner	RS 2814	0.00	2.50
		Total	0.00	2.50
		Grand Total	2.32	19.45

ICAR-AICRP on Cotton Grant – in – aid TSP Funds for Rs.19,25,000/-:-

During the year an amount of **Rs. 19,25,000/-** (Rupees Nineteen Lakhs and Twenty Five Thousand Only) was allotted and released in respect of ICAR-AICRP on Cotton Grant- in – aid General TSP funds for the financial year 2021-22 and was effectively utilised by University of Agricultural Science, Raichur Centre (Rs.4,86,000/-), University of Agricultural Science, Bangalore (Rs.4,00,000/-), Acharya N G Ranga Agricultural University, Guntur (Rs.4,00,000/-), Professor Jayashankar Telangana State Agricultural University, Adilabad (Rs.3,00,000/-) and Warangal Centre (Rs.3,25,000/-) and ICAR-AICRP on Cotton PC Cell (Rs. 14,000/-)

ICAR-AICRP on Cotton Grant – in – aid General SCSP Funds distribution for Rs.20,00,000/-:-

During the year an amount of **Rs. 20,00,000/-** (Rupees Twenty Lakhs Only) was allotted under Grant- in-aid General SCSP funds for the financial year 2021-22. Out of total an amount of Rs.10,00,000/- (Rupees Ten Lakhs only) each was allocated and utilised by University of Agricultural Science, Raichur Centre, and University of Agricultural Science, Bangalore, Chamrajnagar Centre, respectively,

ICAR-AICRP on Cotton Grant-in-aid General NEH Funds distribution for an amount of Rs.51,78,000/-:-

During the year an amount of **Rs. 51,78,000/-** (Rupees Fifty One Lakhs and Seventy Eight Thousand Only) was allotted under Cotton Grant – in – aid General SCSP funds for the financial year 2021-22. Out of total an amount of Rs.25,85,000/- (Rupees Twenty Five Lakhs and Eighty Five Thousand only) to Central Agricultural University, Imphal and Rs.25,93,000/- (Rupees Twenty Five Lakhs and Ninety Three Thousand Only) to Assam Agricultural, University, Jorhat was effectively utilised for demonstration and training activities.

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 2021-22, the database on extant cotton varieties and cotton varieties notified under section 5 of the Seeds Act, 1966 has been updated. Data sets of tetraploid and diploid cotton varieties registered under PPV&FRA Act, 2001 were acquired from PPV&FRA, New Delhi. Maintenance breeding and characterization of 130 extant cotton varieties and parental lines were carried out in tetraploid and Diploid cotton viz., 82 in *G. hirsutum*, 7 in *G. barbadense*, 38 in *G. arboreum*, 3 in *G. herbaceum*.

Field trials for the characterization and establishment of Distinctiveness, Uniformity, and Stability were conducted with 8 hybrids in the First-year trial and 48 candidate hybrids along with its corresponding hybrids produced at PPV&FRA center at Shivamoga were accommodated in the second-year trial. Three varieties are also included in the second-year trial. The Bt. Hybrids involved in both the trials as references were 17 recommended for cultivation in the central and south zone. Field sowing was taken up on 16.8.2021 in randomized block design with 3 replications. Germination count at 12 DAS in the 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 color, Flower: Petal spot, Flower: Stigma, Flower: Anther Filament coloration, Flower: Pollen color, Flower: Male Sterility, Boll: Bearing habit, Boll: Colour, Boll: Shape, Boll: Surface, Boll: Prominence of the tip were recorded in 10 plants of all varieties. The data received from participating centers would be compiled and submitted to PPV&FRA for the issue of registration certificates. Monitoring of DUS trials at the participating centers has also been done through online meetings on 16.11.2021 at RRS Bathinda, at CICR, Nagpur and MPKV Rahuri, on 29.12.2021 at CICR Coimbatore, and on 20.1.2022 at UAS Dharwad.

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 which facilitates cotton growers to know about and adopt novel technologies to increase productivity, reduce production costs and increase net profitability in a responsible and sustainable manner. This novel program was implemented in 1996 for the cotton crop to demonstrate cotton production technologies through the networking centers of the Indian Council of Agricultural Research - All India Coordinated Research Project (ICAR-AICRP) on Cotton. Since then ICAR-AICRP on cotton has been conducting FLD on cotton through its network centers and by the ICAR- Central Institute for Cotton Research, Nagpur, and its regional stations in 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 2021-22 under NFSM - Commercial Crops, a total of **530** FLDs on Integrated Crop Management (ICM), **270** Front Line Demonstrations on Desi / ELS cotton / ELS cottonseed production and **165** Front Line Demonstrations on intercropping with cotton were allotted to ICAR-AICRP on Cotton with a budget outlay of **INR 79.90 lakh**. Out of the allotted FLDs, a total of **514** Front Line Demonstrations on Integrated Crop Management on cotton, **217** Front Line Demonstrations on Desi / ELS cotton / ELS cottonseed production, and **145** Front Line Demonstrations on intercropping with cotton were conducted by **nineteen** participating centers of ICAR – AICRP on Cotton.

The center-wise details of FLDs conducted during 2021-22 with the budget outlay and the 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 2021-22

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.)		Total Number of Farmers Benefited
		PT	PA	PT	PA	PT	PA	FT	FA	
1	PAU, Faridkot	25	34	25	17	-	-	4.25	4.25	109
2	CCSHAU, Hisar	30	30	30	30	-	-	5.10	5.10	150
3	SKRAU, Sriganaganagar	30	30	30	30	-	-	5.10	5.10	150
4	ICAR – CICR, Sirsa	60	60	-	-	-	-	4.80	4.80	150
5	NAU, Surat	20	20	10	10	-	-	2.50	2.50	75
6	JAU, Junagadh	40	40	-	-	10	10	4.00	4.00	107
7	PDKV, Akola	20	15	40	38	-	-	5.20	4.62	53
8	MAU, Nanded	40	40	30	15	20	20	7.50	6.15	100
9	MPKV, Rahuri	30	30	-	-	20	20	4.00	4.00	125
10	ICAR-CICR, Nagpur	20	20	10	2	20	20	4.10	3.38	75
11	RVSUVV, Khandwa	20	-	-	-	20	-	3.20	-	-
12	ANGRAU, Guntur	40	40	-	-	20	20	4.80	4.80	60
13	RARS, Nandhyal	25	25	-	-	-	-	2.00	2.00	25
14	PJTSAU, Adilabad	25	25	-	-	20	20	3.60	3.60	112
15	UAS, Dharwad	30	30	20	20	20	20	5.80	5.80	70
16	UAS, Raichur	30	30	20	0	-	-	2.40	2.40	30
17	UAS, Chamrajnagar	30	30	20	20	-	-	4.20	4.20	75
18	TNAU, Coimbatore	15	15	15	15	15	15	3.75	3.75	46
19	ICAR- CICR, Coimbatore	-	-	20	1.80	-	-	1.80	1.80	50
	Total	530	514	270	217	165	145	79.90	72.25	1562



All India Coordinated
Research Project on Cotton

Annual Report:2021-22

Research Highlights



Project Coordinator (Cotton Improvement)
All India Coordinated Research Project on Cotton
(Indian Council of Agricultural Research)
Central Institute for Cotton Research
Regional Station, Coimbatore- 641003
www.cicr.org.in

RESEARCH HIGHLIGHTS

CROP IMPROVEMENT

- In Initial evaluation trials of North Zone, FDK 325 (3032 kg/ha) and CISAA 20-1 (3126 kg/ha) were promising in the respective trials and have been promoted to coordinated trials.
- In North Zone, *hirsutum* genotype F 2743 with a mean yield of 2817 kg/ha was promising. Among *desi* cotton, PBD 88 was promising among varieties and KR 149 was promising hybrid.
- In Initial evaluation trials of Central Zone, the coloured genotype CCH 20452, JLA 1204 were promising in the respective trials and have been promoted to coordinated trials.
- In Central Zone, under irrigated conditions, CNH 17395 and GJHV 566 were promising with good overall yield.
- Under Rainfed conditions in Central Zone, the genotype TVH 007 and CNA 1092 were promising.
- In South Zone trials, CNH 18529 and RAH 1081 were promising under irrigated conditions.
- In Rainfed situations of South Zone, MDL 2674 and DDCC 1901 were promising.
- 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 spacing and nutrient requirement is the pre requisite for releasing of promising genotypes. Hence, agronomic requirements for KR 136 and , KR133 in North Zone, GJHV 522, NDLH – 2035-5, CCB 51-2, RHB 1623, PAIG 379, JLA 1207 and CNA 17522 in Central Zone and RAH 1075, CNH 17395, DHCC 1801, NDLH – 2035-5, RHB 1623, CCB 51-2, DB 1801, PA 806,PAIG 384, DWDa 1802, CNA 1091 and DDCC 1801 in South Zone were worked out.
- Nutrient and geometry requirements were worked out for compact cultures H1530, RHC HD 1438, GISV 312, LHDP 5 and DSC 1851 under High Density Planting System (HDPS).
- In ELS cotton studies at Chamrajnagar, it was found that optimum time of sowing ranged from 2nd fortnight of April to 2nd fortnight of May. Spacing and nutrients trials on ELS Bt cotton hybrid (DCH 32 Bt) revealed that 75% of recommended spacing and application of 125% of recommended nitrogen were optimum at Chamrajnagar. In Coimbatore, recommended spacing with 100 % of recommended nitrogen was optimized for DCH 32 Bt.
- Organic nutrient management package including seed treatment, soil application of recommended bio fertilizers, foliar application of Pink Pigmented Facultative Methylootrops (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 (1164 kg ha⁻¹) , Srivilliputhur (1387 Kg/ha), Junagadh (1613 kg/ha) and Coimbatore (1376 kg/ha). The same package instead of green manuring, intercropping with green gram/black gram/ ground nut/soybean registered significantly higher seed cotton yield at Nandyal (2250 kg/ha) and Raichur (1690 kg/ha).
- Conservation agriculture trial revealed that Permanent bed system + Zero tillage + 100 % residue management observed significantly higher seed cotton equivalent yield (3321 kg/ha) in cotton – wheat rotation at Rahuri. In Chamrajnagar, and Junagadh, conventional tillage with no residue management was at par with permanent bed system with zero tillage and 100 % residue management in cotton – sorghum cropping system. In Srivilliputhur, Zero tillage and 100 % residue management was more economical (Net return Rs 81,849/ha) in cotton – maize cropping system.
- Conservation agriculture in North Zone (first year) found that Conventional tillage with 100 % residue incorporation registered significantly higher seed cotton yield of 3042 and 3644 kg/ha and net return of Rs 1,15,223 and 1,55,255 ha⁻¹ respectively at Faridkot and Bathinda



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- Cost of cultivation per quintal on the basis of Cost C3 was arrived as ₹ 5,317, 6,508 and 6,540 respectively for Faridkot (Bt hybrid), Hisar (Bt hybrid) and Bathinda (arboreum) . The cost of cultivation per quintal on the basis of Cost C3 was arrived as ₹ 5,237, 5,146, 4,497, 7029 , 5,404 and 4,384ha⁻¹ respectively with Akola (Bt hybrid rainfed), Bhawanipatna (non Bt hybrids rainfed), Junagadh (Bt hybrid irrigated), Nanded (Bt hybrid rainfed) Rahuri (Bt hybrid (irrigated) and Surat (Bt hybrid-irrigated).
 - Cost of cultivation per quintal on the basis of Cost C3 was arrived as ₹4,065, 8,350, 3,318, 5,305, 4,790 , 6,528 and 8551 ha⁻¹ respectively with Nandyal (Bt hybrid rainfed),Coimbatore (Bt hybrid HxB irrigated), Raichur (Bt hybrid- irrigated), Srivilliputhur (Bt hybrid-irrigated), Coimbatore (Bt hybrid HxH - irrigated) Chamrajnagar (Bt hybrid(HxB) -rainfed) and LAM (Bt hybrid- rainfed)
 - Formation of Soil crust immediately after cotton sowing is a serious problem, which hampers germination in North Zone and it could be solved practically and economically by application of Farm yard manure @ 3 t/ ha in seed rows/ running of peg /spike tooth weeder (two days after crust)/ application of chopped crop residue @3 t/ha.
 - In Bt agronomy (varieties) trial, PAU Bt 3 registered significantly higher performance in Bathinda and Hissar, PAU 2 Bt in Faridkot, PAU 1 Bt at Sriganganagar in North Zone. Spacing level of 67.5 x 15 cm in Faridkot and Bathinda and , 67.5x 60 cm in Sriganganagar and Hisar were found optimum.
 - In Central Zone, Rajat Bt registered significantly higher performance at Akola (2056 kg ha⁻¹), Junagadh (1825 kg ha⁻¹) and Surat (2314 kg ha⁻¹) . The genotype, PKV 081 Bt (2234 kg ha⁻¹), Suraj Bt (2314 kg ha⁻¹) and GJHV374 Bt (1212 kg ha⁻¹) respectively at Nanded, Rahuri and Khandwa performed significantly higher seed cotton yield. Planting at 60 x 15 cm registered higher seed cotton yield at Akola (2047 kg ha⁻¹), Rahuri(2515 kg ha⁻¹) and Khandwa (1397 kg ha⁻¹) . Planting of 60 x15 cm at Nandyal (848 kg/ha⁻¹) and 90 x30 cm at Dharwad (1109 kg ha⁻¹) were found optimum.
 - In the trials of multitier cropping systems, intercrops were planted between paired row of Bt cotton. Intercropping of two rows of green gram at Akola, two rows of intercrop of Soybean at Junagadh and Rahuri, two rows of Indian bean at Surat and red gram (1/6) at Nanded were found economically promising ; which were calculated with the relative economic efficiency of 41.2, 63.2, 467.9, 30.0 and 15.7 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 Srivilliputtur, Chamrajanagar and Coimbatore and two rows of soybean at Raichur and two rows of red gram at Guntur were found economically promising; which were calculated with the relative economic efficiency of 50.0,73.9, 42.1, 305.4, 16.6 and 57.1 per cent higher than sole Bt hybrid respectively.
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- Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS application registered higher seed cotton yield of Hisar (1819 kg/ha), Raichur (2662 kg/ha), Sriviliputhur (2005 kg/ha) and Coimbatore (1833 kg/ha) which were 17.5, 20.5, 12.2 and 11.8 per cent higher than control respectively. At Akola (2256 kg/ha) and LAM (4837 kg/ha) application of Bio stimulant@4mg/ litre at 30 , 45 and 60 DAS recorded higher seed cotton yield which were 31.6 and 55.8 higher respectively
 - 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 (3310 kg/ha) , Surat (2170 kg/ha) and Dharwad (1577 kg/ha) .In Junagadh application of ethrel @45 ppm at 40DAS (2217 kg/ha) observed higher performance. Application of mepiquatchloride@100ppm at 90 DAS registered higher seed cotton yield at Guntur (1163 kg/ha) Which were 17.1, 18.3, 25.3, 20.6 and 22.5 per cent respectively higher than control with Sirsa, Surat, Dharwad , Junagadh and Guntur.
 - Attempt was made to induce flowering and yield enhancement in late sown arboreum by spraying PGRs and it was found that application of Detopping with Salicylic Acid @ 0.5 mM at 45 & 60 DAS at Junagadh and Dharwad observed higher number of flowers.
 - Moisture stress situation (75 % depletion of soil moisture) is managed successfully by the application of 2 % KNO₃- 4 sprays at weekly intervals which was registered 40 and 35.3 per cent higher seed cotton yield at Dharwad (1564 kg/ha) and Guntur (1256 kg/ha) as compared to control respectively
 - Drought tolerance genotypes viz., H 1529, H 1530, H 1581, H 1553 and H 1564 at Hisar, GJHV-566, G.Cot-16, GJHV-522, NDLH-2035-5 and GISV-323 at Surat, GJHV 566, NDLH-2035-5, JLA-1207 and GJHV 522 at Junagadh and RAH1075, DHCC1801, DB1801, DSC1851, CNA1091 at Dharwad were identified . H 1529 and H 1531 genotype were performed the best under salinity condition at Hisar.
 - CNH1128 exhibited high oil, protein and low gossypol content at Dharwad. Higher oil content in GISV-328 (18.75%), protein content in GISV-332 (20.1%) and gossypol content in GISV-328 (0.857 mg/g tissue) were reported at Junagadh. Higher crude protein (24.0 %) in F 2228 and total gossypol content (0.61 %) in F 2228 was reported at Hisar.
 - Tannin (35.42mg/g of tissue) and gossypol (0.82%) content were found higher in absolute control plot of organic cotton experiment at Surat. Defensive compounds were higher with organic nutrient management package includes Seed treatment and soil application of rec. biofertilizers, foliar application of PPFM@1% at flowering , application Neem cake @ 250 kg/ha and raising of sunnhemp/ intercropping of pulses between rows at Dharwad
 - Investigation of Biochemical basis of **CLCuD** and Tobacco Streak Virus found that tolerant genotypes showed higher phenol, gossypol and tannin content in both sprayed and non-sprayed conditions.
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CROP PROTECTION

ENTOMOLOGY

- ❖ Sucking pests tolerant genotypes were identified from National and Zonal trial of North, Central and South zone and the identified entries are as follows.
 - **Under national trial** 4 entries in North (Arboreum cotton), 1 in hirsutum (colour cotton) & 5 in herbaceum in Central zone were identified as moderately tolerant to leafhopper
 - **Under Zonal trials** 4 entries in North zone, 7 in Central Zone, 2 in South zone & 6 in central zone in colored cotton (Arboreum) were reported to be moderately tolerant to leaf hopper. Similarly, 1 in North zone, 4 in Central zone, 7 in South zone & 2 in Central zone in colored cotton (hirsutum), were identified as moderately tolerant to leaf hopper.
- ❖ Through advance screening of promising entries for sucking pests, 6 entries in North Zone, 4 entries in Central Zone, and 2 entries at South Zone were tolerant to leafhopper in hirsutum cotton.
- ❖ 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
 - **leafhopper** peak activity was during 27th -32th, 34th - 46th and 37th - 46th SMW in North, Central and South zone, respectively in different N-Bt and Bt-genotypes selected for study.
 - Similarly, the peak population of **thrips** was observed during 28th -31st, 34th - 44th and 37th - 43th SMW at North, Central and South zone, respectively.
 - In case of **whitefly** peak activity was observed during 28th - 40th, 39th - 44th and 36th - 52th SMW in North, Centre and South Zone, respectively.
 - In **aphid** population, peak activity was observed in 34th -52nd and 34th -48th SMW in Central and South Zone.
- ❖ **Bollworm (N-Bt cotton)**, population of Spotted bollworm (SBW), American bollworm (ABW) and Tobacco caterpillar (TC) ranged from 0-2.4, 0-1.7 and 0-0.8 (larvae/plant). Green boll damage due to Pink bollworm (PBW) ranged between 0-100 percent. Fruiting body damage due American & Spotted bollworm ranged between 0.00-100 percent. Peak activity of American bollworm was observed during 43rd SMW whereas for spotted bollworm, peak activity was during 39-40th SMW.



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- ❖ **Bollworm (Bt cotton)**, population of SBW, ABW and TC ranged from 0-0.8, 0-0.2 and 0-0.8(larvae/plant), respectively. Green boll damage due to PBW ranged between 0-100 percent. Fruiting body damage due ABW/ SBW ranged between 0.00-93%. Peak activity of ABW was observed during 39th SMW whereas for SBW, peak activity was at 42nd SMW.
 - ❖ Survey for key and emerging pests in farmer's fields for weekly advisory in **North zone** indicated, that out of **1220 locations** whitefly crossed ETL at 84 location, leafhopper at 113 location and thrips at 152 locations. However in the case of bollworm, spotted bollworm crossed ETL at 36 locations and PBW infestation was above ETL at 212 locations.
 - ❖ In **Central Zone** out of **2586 locations**, leafhopper at 290, whitefly at 41, thrips at 169 and Aphid at 355 locations crossed ETL. The hotspot reported for leafhopper in Banswara, for whitefly in Akola, for thrips in Junagarh and for aphid in Rahuri. In the case of PBW out of 2586 locations, 335 locations were above ETL and maximum at Junagarh.
 - ❖ In **South Zone** out of **2980 locations** surveyed, leafhopper at 485, whitefly at 38, thrips at 468 and aphid at 105 locations crossed the ETL. The data indicated that hotspot of leafhopper and whitefly was Srivilliputhur and for thrips & aphid was Dharwad. In the case of PBW out of 2980 locations, 374 locations were above ETL, maximum at Lam Guntur.
 - ❖ In **Central & South Zone** for management of sucking pests in cotton, Flonicamid 50% WG found to be effective against all the sucking insect pests at all the locations. But specifically for **aphid**, Spinetoram 11.7% & Spiromesifen 240 SC; Spinetoram 11.7% against **thrips** whereas Diafenthiuron 50WP & Spiromesifen 240SC against whitefly were reported effective at different locations.
 - ❖ For evaluation of Refuge in bag (role of non Bt seed mixed with Bt seed, in management of resistance development in bollworm against cry protein) various proportion of Non-Bt and Bt seed mixes 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 at few locations damage was deviated among the treatments.
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- Within the RIB treatments (Bt and N-Bt seed mix), maximum yield was obtained in treatment 5% N-Bt + 95% Bt and 10% N-Bt+90% Bt and minimum yield was obtained in standard refuge (20% N-Bt at periphery as structured refuge) 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 at all locations of three zones. Whereas for green boll damage due to PBW, maximum reduction (%) over control was observed in Spinetoram 11.7 SC, Emamectin benzoate 5 SG & Cypermethrin 10% EC, respectively in North, Central and South zone. Minimum open boll and locule damage was observed in Emamectin benzoate 5 SG, Bifenthrin 10 EC & Spinetoram 11.7 SC, respectively in North, Central and South zone. Maximum population of natural enemies observed after control in Chlorantraniliprole 18.5 SC. Highest yield was recorded in Spinetoram 11.7 SC & Chlorantraniliprole 18.5 SC treated plots.
 - ❖ The trial on determination of nymphal based ETL estimation and yield losses for cotton whitefly (*Bemisia tabaci*) in the treatments T₁ (1nymph/leaf) and in T₂ (2 nymphs/leaf) except Sirsa all centres recorded no yield reduction in comparison to standard control treatment (6 adults/leaf). In T₃ (4 red eyed nymphs/leaf) and T₄ (6 red eyed nymphs/leaf) recorded yield reduction (%) 2.70, 3.35 & 2.24, 2.54 & 0.36 in Bathinda, Hisar and Sriganaganagar, respectively as compared to standard control treatment of 6 adults/leaf. The maximum yield reduction was recorded in untreated control in all centers except Faridkot and Sirsa. However in general the incidence of whitefly during the season was low.



CROP PROTECTION

PLANT PATHOLOGY

- ❖ Disease screening trials of AICRP Bt cotton hybrids and varieties were conducted at the research stations in North, Central, South Zones, and compiled data for disease reactions were submitted.
- ❖ The major diseases reported during 2021-22 are cotton leaf curl virus disease (CLCuD) during the mid-and late-season in North Zone; bacterial leaf blight (BLB), and *Alternaria* leaf blight (ALB) during flowering- and boll development stage, grey mildew (GM) during boll development stage in the Central Zone, and ALB, BLB, and GM during flowering and boll development stages in the South zone. Other emerging/remerging diseases i.e., *Corynespora* leaf spot (CoLS) (up to 6.7%) in Junagarh, Rajkot, Amreli during mid-season; CoLS in Guntur, Krishna, Prakasam (up to 21.3%) during early, mid & late season; boll rot in Nanded, Jalna, Aurangabad (upto 7.5%), Dharwad, Belagavi, Haveri, Gadag, Uttar Kannada (upto 13.6) and rust up to 20.8% in Dharwad, Belagavi, Haveri, Gadag, Uttar Kannada and upto 12.8% in Guntur were observed during late season. CoLS was also observed in the North Zone during late season.
- ❖ Cotton leaf curl virus disease (CLCuD) appeared in 25th SMW at Hisar, 26th SMW at Sirsa, 25th SMW at Faridkot & Sriganganagar at station trials. Whereas in farmer fields in all three states, based on the survey conducted under AICRP, the average PDI of 19.2, 12.2 and 11.4, was recorded in Punjab, Haryana and Rajasthan, respectively which was slightly higher than the previous year.
- ❖ The incidence of Tobacco streak virus (TSV) in different hybrids varied from traces to 12.4% at Farmers' fields in Andhra Pradesh and up to 19.6% at Lam- Guntur, while it ranged from 0.5 to 18.5% in Coimbatore districts in Tamil Nadu.
- ❖ A total of 18 National (5) and Zonal trials (13) were conducted for disease screening under field conditions. Resistance of 22 genotypes were confirmed after three or more-year continuous screening (field and artificial screening). RS 2909, F 2687 and RAH 1076 were resistant against CLCuD, whereas GJHV 523, BS2 17, H 1488, RAH 0604 were resistant against *Alternaria* leaf blight, GSHV 329/15, GSHV 829/16, GSHV 797/16, GSHV 780/16 against bacterial leaf blight, GSB 41, DB 16, DB 1302 against grey mildew. GJHV 554, GISV 323, RAH 0603, TSH 325 and GISV 557 were resistant to Bacterial- and *Alternaria* leaf blight and SVA-1118, DB-40, SCS-1206 were resistant to *Alternaria* leaf blight and grey mildew diseases.
- ❖ Three prophylactic sprays of flonicamid, propiconazole, mancozeb, and neem oil showed the least sooty mold development 15 days-after-third spray over control under polyhouse and field conditions in North Zone (whitefly infestation). However, three prophylactic sprays of flonicamid, propiconazole, and neem oil and copper oxychloride @2.25g/l and propiconazole showed the least sooty mold development



15 days-after-third spray over control field conditions (aphid infestation) in Central and South Zone, respectively.

- ❖ Among eight treatments and control, the foliar application of Pyraclostrobin @ 0.1% followed by combined application of *Bacillus aryabhatti* + *Bacillus tequilensis* as seed and soil application showed lower PDI of Alternaria leaf spot and grey mildew disease under field conditions. Seed treatment with (Carboxin 37.5+ Thiram 37.5%WS @ 0.2%) @ 2 gm/kg seed followed by seed treatment and & soil application (30 & 60 DAS) of *Pseudomonas fluorescens* resulted in lowest bacterial leaf blight and foliar application of Pyraclostrobin @ 0.1% and *Bacillus aryabhatti* + *Bacillus tequilensis* as seed and soil application showed lower PDI of grey mildew.
- ❖ Comparatively, the maximum reduction in whitefly nymphs & adult population was recorded in the existing IPM module followed by new IPM module 2, 3 and Biomodule 3. The lowest CLCuD PDI was also recorded in the existing IPM module followed by new IPM modules 1, 3, and Biomodule 2. however, a non-significant difference between IPM and Biomodules was observed.
- ❖ Comparatively, kresoxim-methyl 44.3% SC, azoxystrobin 18.2% W/W + difenoconazole 11.4 w/w SC (T6) and Captan 70% + Hexaconazole 5%WP (T8) were superior in controlling fungal foliar spots (FFS) and in North Zone. However, fluxapyroxad 167 g/l + pyraclostrobin 333g/l SC, Captan 70%+Hexaconazole 5% WP @1.5g/L, Propineb 70%WP @ 2.5g/L, metiram 55% + pyraclostrobin 5% WG were better for management of ALB, BLB. Fluxapyroxad 167 g/l + pyraclostrobin 333g/l SC, Kresoxim-methyl 44.3% SC @ 1 ml/L for GM management and fluxapyroxad 167 g/l + pyraclostrobin 333g/l SC, Captan 70%+Hexaconazole 5% WP @1.5g/L for *Corynespora* management in central and South Zone. Fluxapyroxad 167 g/L + Pyraclostrobin 333 g/L, Metiram 55% + Pyraclostrobin 5% WG @2 g/L and Captan 70%+Hexaconazole 5% WP @1.5g/L were effective in controlling boll rot.
- ❖ Crop loss estimation studies due to CLCuD revealed the average reduction (%) of three locations in seed cotton yield (grade-wise from 1-6) ranged from 6.3 to 59.7, 4.2 to 38.8, 9.2 to 38.8 and 10.9 to 38.0% in Bt hybrids US-51, RCH 773 BG II, NCS 9013 BGII and Bioseed 6688 BG II, respectively. Based on mixed grades it was 29.5, 22.0, 26.6 and 24.8%, respectively in US-51, RCH 773 BG II, NCS 9013 BGII and Bioseed 6688 BG II at Faridkot, Hisar and Sriganganagar.
- ❖ Pooled results of three-year trials (2019-20-2021-22), revealed that the highest reduction of sooty mold caused by whitefly was recorded by 3 sprays at fortnightly interval flonicamid, followed by propiconazole, mancozeb and neem oil under poly house condition at Sirsa. Prophylactic spray of Flonicamid 50 WG @ 3 g/10 and Mancozeb 75 WP twice at an interval of 15 days provided good control of sooty mold due to Aphid.
- ❖ Similarly, in the pooled results of three-year trials, revealed that at Nanded, the lowest *Alternaria* leaf blight, Bacterial leaf blight (BLB) and grey mildew (GM) was recorded with T-7 (Foliar application of Pyraclostrobin @ 0.1%; gm/lit of water) followed by T-6 (Chemical ST (Carboxin 37.5+ Thiram 37.5%WS @ 0.2%); 2 gm/kg seed) and T-3 (ST+ SA of *Bacillus tequilensis* + *Bacillus aryabhatti* ST: each with



10⁸cfu/g @10g per kg of seed at the time of sowing SA: each @ 2.5 kg/ha (30 & 60 DAS) with FYM/compost). At CICR Nagpur, the lowest root rot incidence was recorded with T-3 followed by T-6. The lowest *Corynespora* leaf spot disease severity was recorded with the treatment T-7 followed by T-3 and T-4 (ST+ SA of Commercial product *Bacillus subtilis* SA: 10⁸cfu/g @10g per kg of seed at the time of sowing; Soil application: 2.5 kg/ha (30 & 60 DAS) with FYM/compost). The lowest BLB was recorded with treatment T-3 followed by T-4 and T-2 however, the lowest grey mildew severity was recorded with treatment T-7, T-3 and T-2. At MCRS Surat 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 BLB 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.



All India Coordinated
Research Project on Cotton

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Report of Crop Improvement



Project Coordinator (Cotton Improvement)
All India Coordinated Research Project on Cotton
(Indian Council of Agricultural Research)
Central Institute for Cotton Research
Regional Station, Coimbatore- 641003
www.cicr.org.in

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	Bahtinda	Hisar	Sirsa (CICR)	Mean NZ	Rank
1	101	HD 564	3105	2490	1467	514	1371	1789	12
2	102	PBD 160	3018	3239	2172	1531	3011	2594	8
3	103	RG 868	2808	3889	3041	1012	3550	2860	3
4	104	ZC (FDK 124)	2905	3288	2288	1296	2991	2554	9
5	105	CISA 7	1625	2881	2004	819	2940	2054	11
6	106	FDK 325	2996	4012	3047	1494	3612	3032	1
7	107	RG 888	3028	3621	1858	1593	3343	2689	5
8	108	PBD 156	3344	3395	2838	1543	3359	2896	2
9	109	CISA 33-7	2544	4156	1695	1119	3751	2653	6
10	110	Local Check	2728	3251	2173	1119	3411	2536	10
11	111	FDK 315	2457	3770	3039	1066	3146	2696	4
12	112	HD 562	2615	3004	3004	1103	3246	2594	7
		CD @ 5 %	479	534.5	438	232	329		
		CV %	10	8.8	10.85	12	6		
		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	Bahtinda	Hisar	Sirsa (CICR)	Mean NZ
1	101	HD 564	1006	851	555	198	498	622
2	102	PBD 160	1041	1236	817	645	1103	968
3	103	RG 868	1014	1527	1192	432	1395	1112
4	104	ZC (FDK 124)	991	1185	824	546	1158	941
5	105	CISA 7	523	1004	714	325	1052	724
6	106	FDK 325	1058	1538	1096	599	1383	1135
7	107	RG 888	1011	1316	705	655	1236	985
8	108	PBD 156	1180	1303	1078	674	1331	1113
9	109	CISA 33-7	957	1636	670	488	1485	1047
10	110	Local Check	1023	1276	859	484	1352	999
11	111	FDK 315	862	1381	1102	421	1168	987
12	112	HD 562	915	1094	1151	441	1243	969

Ginning outturn (%)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bahtinda	Hisar	Sirsa (CICR)	Mean NZ
1	101	HD 564	32.4	34.2	37.8	38.4	36.3	35.8
2	102	PBD 160	34.5	38.2	37.7	42.1	36.6	37.8
3	103	RG 868	36.1	39.3	39.2	42.6	39.3	39.3
4	104	ZC (FDK 124)	34.1	36.1	36.0	42.2	38.7	37.4
5	105	CISA 7	32.2	34.9	35.5	39.6	36.6	35.8
6	106	FDK 325	35.3	38.3	36.1	40.2	38.3	37.6
7	107	RG 888	33.4	36.3	37.9	41.1	37.0	37.1
8	108	PBD 156	35.3	38.4	38.0	43.6	39.6	39.0
9	109	CISA 33-7	37.6	39.4	39.5	43.6	39.6	39.9
10	110	Local Check	37.5	39.3	39.7	43.2	39.6	39.9
11	111	FDK 315	35.1	36.6	36.3	39.5	37.1	36.9
12	112	HD 562	35.0	36.5	38.3	40.1	38.3	37.6



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

Bolls/plant

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bahtinda	Hisar	Sirsa (CICR)	Mean NZ
1	101	HD 564	33.0	42.6	51.2	26	32	37.0
2	102	PBD 160	30.0	49.4	42.4	25	27	34.8
3	103	RG 868	26.0	63.0	51.9	30	41	42.3
4	104	ZC (FDK 124)	28.0	50.2	50.9	34	29	38.4
5	105	CISA 7	22.0	47.9	40.3	25	33	33.5
6	106	FDK 325	24.0	55.0	54.9	26	33	38.6
7	107	RG 888	27.0	55.8	47.2	32	28	38.0
8	108	PBD 156	29.0	50.3	51.9	33	25	37.8
9	109	CISA 33-7	26.0	57.6	39.8	32	33	37.6
10	110	Local Check	28.0	45.2	55.3	35	35	39.6
11	111	FDK 315	27.0	53.9	48.0	32	31	38.3
12	112	HD 562	23.0	48.3	49.0	28	32	36.1

Boll weight (g)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bahtinda	Hisar	Sirsa (CICR)	Mean NZ
1	101	HD 564	2.9	3.4	3.1	2.5	3.0	3.0
2	102	PBD 160	2.9	3.2	2.6	2.4	2.8	2.8
3	103	RG 868	2.6	2.9	2.5	2.5	2.5	2.6
4	104	ZC (FDK 124)	2.4	2.7	2.3	2.1	2.0	2.3
5	105	CISA 7	2.4	2.7	2.4	2.1	2.2	2.4
6	106	FDK 325	2.6	2.8	2.5	2.1	2.2	2.4
7	107	RG 888	2.6	3.0	2.7	2.6	2.9	2.8
8	108	PBD 156	2.8	3.2	2.5	2.7	2.7	2.8
9	109	CISA 33-7	2.4	2.9	2.6	2.2	2.4	2.5
10	110	Local Check	2.3	2.9	2.5	2.7	2.3	2.5
11	111	FDK 315	2.2	2.8	2.3	2.2	2.4	2.4
12	112	HD 562	3.0	3.1	3.1	2.5	3.1	3.0



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	121	KR 152	3593	2881	2140	2953	3860	3085	2
2	122	CISAA 20-2	3438	2210	1667	2821	3016	2630	7
3	123	KR 151	2802	1914	2251	2587	4033	2717	6
4	124	CISAA 20-1	3874	2481	2033	3625	3617	3126	1
5	125	AAH 45	3317	1920	1712	3043	3646	2728	5
6	126	Local Check	2558	3000	926	3500	2486	2494	8
7	127	KR 153	3923	2449	1770	3038	3642	2964	3
8	128	AAH 44	2955	1741	1700	2508	2568	2294	9
9	129	ZC (KR 64-NZ)	3891	1967	2342	2513	3374	2817	4
CD @ 5 %			538	374	292	347	532		
CV %			9	9	9	7	9		
Local Checks			RAJ DH. 9	FMDH 9	AAH 1	CICR-2	AAH 1		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Sriganga-nagar	Bathinda	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	121	KR 152	1297	1114	912	1199	1449	1194
2	122	CISAA 20-2	1324	911	732	1151	1171	1058
3	123	KR 151	1068	766	931	1048	1500	1063
4	124	CISAA 20-1	1321	1005	842	1399	1399	1193
5	125	AAH 45	1254	792	759	1224	1384	1083
6	126	Local Check	952	1158	402	1420	947	976
7	127	KR 153	1448	916	747	1173	1377	1132
8	128	AAH 44	1084	651	716	952	982	877
9	129	ZC (KR 64-NZ)	1471	793	1044	1008	1270	1117



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

Ginning outturn (%)

S. No.	Code No.	Entries	Sriganga-nagar	Bathinda	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	121	KR 152	36.1	38.7	42.6	40.6	37.5	39.1
2	122	CISAA 20-2	38.5	41.2	43.9	40.6	38.8	40.6
3	123	KR 151	38.1	40.0	41.4	40.5	37.2	39.4
4	124	CISAA 20-1	34.1	40.4	41.4	38.6	38.7	38.6
5	125	AAH 45	37.8	41.3	44.3	40.2	38.0	40.3
6	126	Local Check	37.2	38.6	43.4	40.6	38.1	39.6
7	127	KR 153	36.9	37.4	42.2	38.6	37.8	38.6
8	128	AAH 44	36.7	37.5	42.1	38.0	38.2	38.5
9	129	ZC (KR 64-NZ)	37.8	40.3	44.6	40.1	37.7	40.1

Bolls/plant

S. No.	Code No.	Entries	Sriganga-nagar	Bathinda	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	121	KR 152	49.0	58.6	40.2	37.1	62.3	49.4
2	122	CISAA 20-2	55.0	61.9	34.5	39.8	44.7	47.2
3	123	KR 151	43.0	58.7	37.9	37.0	64.4	48.2
4	124	CISAA 20-1	64.0	53.4	39.1	37.9	57.5	50.4
5	125	AAH 45	58.0	56.2	48.1	35.3	58.3	51.2
6	126	Local Check	50.0	59.8	35.2	40.9	42.5	45.7
7	127	KR 153	63.0	53.8	37.0	40.8	60.1	50.9
8	128	AAH 44	60.0	49.8	37.9	34.5	42.0	44.8
9	129	ZC (KR 64-NZ)	57.0	50.7	43.5	33.7	61.7	49.3



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

Boll weight (g)

S. No.	Code No.	Entries	Sriganga-nagar	Bathinda	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	121	KR 152	2.4	2.4	2.4	2.5	2.9	2.5
2	122	CISAA 20-2	2.5	2.7	2.6	2.5	2.5	2.6
3	123	KR 151	2.5	2.4	2.5	2.4	3.0	2.6
4	124	CISAA 20-1	2.4	2.2	2.5	2.5	2.4	2.4
5	125	AAH 45	2.3	2.2	2.4	2.4	2.7	2.4
6	126	Local Check	2.1	2.9	2.4	2.6	2.6	2.5
7	127	KR 153	2.4	2.4	2.2	2.3	2.8	2.4
8	128	AAH 44	2.3	2.4	2.7	2.4	2.6	2.5
9	129	ZC (KR 64-NZ)	2.3	2.2	2.5	2.6	2.8	2.5

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	1001	Local Check	2274	3205	2622	1878	2790	2554	6
2	1002	PBH 79	2539	3712	2634	1703	3170	2752	3
3	1003	F 2732	2625	4055	2726	1589	2830	2765	2
4	1004	ZC (F 2228)	2421	3497	2285	1456	3354	2603	4
5	1005	CSH 90	2609	3246	2277	1883	2918	2587	5
6	1006	H 1480	2159	3093	2306	1651	2495	2341	9
7	1007	QC (CSH 3129)	2331	3715	2336	1173	2870	2485	7
8	1008	F 2743	2704	3594	2752	1631	3405	2817	1
9	1009	H 1569	2467	2797	2327	1739	2795	2425	8
CD @ 5 %			346	470	268	234	332		
CV %			8.0	7.4	6.28	8.2	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	1001	Local Check	870	1125	963	653	1007	924
2	1002	PBH 79	955	1249	963	630	1271	1014
3	1003	F 2732	917	1415	987	601	1104	1005
4	1004	ZC (F 2228)	873	1237	750	546	1271	935
5	1005	CSH 90	901	1111	756	713	1153	927
6	1006	H 1480	797	1084	784	622	993	856
7	1007	QC (CSH 3129)	840	1288	774	419	1033	871
8	1008	F 2743	912	1237	1008	610	1287	1011
9	1009	H 1569	901	934	798	617	1135	877

Br 04a – Coordinated Varietal Trial - G. hirsutum (North Zone)**Ginning outturn (%)**

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Sirsa (CICR)	Mean NZ
1	1001	Local Check	38.3	35.1	36.7	34.8	36.1	36.2
2	1002	PBH 79	37.6	33.6	36.5	37.0	40.1	37.0
3	1003	F 2732	35.0	34.9	36.2	37.8	39.0	36.6
4	1004	ZC (F 2228)	36.0	35.4	32.8	37.5	37.9	35.9
5	1005	CSH 90	34.5	34.2	33.2	37.9	39.5	35.9
6	1006	H 1480	36.9	35.0	34.1	37.7	39.8	36.7
7	1007	QC (CSH 3129)	36.0	34.7	33.2	35.7	36.0	35.1
8	1008	F 2743	33.7	34.4	36.6	37.4	37.8	36.0
9	1009	H 1569	36.5	33.4	34.3	35.5	40.6	36.1



Br 04a – Coordinated Varietal Trial - G. hirsutum (North Zone)**Bolls/plant**

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Sirsa (CICR)	Mean NZ
1	1001	Local Check	15.0	47.1	49.3	28.6	30.5	34.1
2	1002	PBH 79	18.0	53.0	49.6	40.2	34.8	39.1
3	1003	F 2732	21.0	56.2	54.4	35.4	29.7	39.3
4	1004	ZC (F 2228)	17.0	52.4	49.7	41.1	32.2	38.5
5	1005	CSH 90	19.0	50.1	43.9	31.2	31.5	35.1
6	1006	H 1480	12.0	55.7	54.3	28.0	34.7	36.9
7	1007	QC (CSH 3129)	15.0	61.0	45.9	37.0	34.2	38.6
8	1008	F 2743	20.0	54.4	56.1	30.0	31.3	38.4
9	1009	H 1569	16.0	45.6	51.2	26.1	31.5	34.1

Boll weight (g)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Sirsa (CICR)	Mean NZ
1	1001	Local Check	3.0	3.8	3.9	3.7	3.2	3.5
2	1002	PBH 79	3.3	3.6	4.1	3.1	3.2	3.5
3	1003	F 2732	2.8	3.6	3.9	3.5	3.5	3.5
4	1004	ZC (F 2228)	2.9	4.0	4.3	3.9	3.8	3.8
5	1005	CSH 90	3.1	3.9	4.1	3.7	3.6	3.7
6	1006	H 1480	3.3	3.7	3.9	3.9	3.4	3.6
7	1007	QC (CSH 3129)	3.0	4.0	3.8	2.7	3.4	3.4
8	1008	F 2743	3.0	3.7	4.7	3.5	4.0	3.8
9	1009	H 1569	3.4	3.5	3.9	2.9	3.2	3.4



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

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Mean NZ	Rank
1	1011	PBD 88	2775	3657	2965	2602	3000	1
2	1012	FDK 124 (ZC)	2434	3204	1977	2054	2417	6
3	1013	FDK 312	2790	4070	2787	1668	2829	4
4	1014	PBD 92	2901	3319	2955	2287	2866	3
5	1015	FDK 324	2905	3628	2864	2106	2876	2
6	1016	Local Check	3197	2872	2084	2738	2723	5
		CD @ 5 %	371	546.1	406	393		
		CV %	9	9.1	8.58	12		
		Local Checks	RG 8	LD 949	LD 949	HD-432		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Mean NZ
1	1011	PBD 88	1038	1451	1151	1080	1180
2	1012	FDK 124 (ZC)	864	1192	723	802	895
3	1013	FDK 312	1030	1614	1096	657	1099
4	1014	PBD 92	1082	1265	1136	893	1094
5	1015	FDK 324	1113	1455	1149	858	1144
6	1016	Local Check	1164	1128	743	1211	1062

Ginning outturn (%)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Mean NZ
1	1011	PBD 88	37.4	39.7	38.9	41.5	39.4
2	1012	FDK 124 (ZC)	35.5	37.3	36.5	39.1	37.1
3	1013	FDK 312	36.9	39.7	39.4	39.4	38.9
4	1014	PBD 92	37.3	38.1	38.5	39.0	38.2
5	1015	FDK 324	38.3	40.1	40.1	40.7	39.8
6	1016	Local Check	36.4	39.2	35.7	44.2	38.9



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

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Mean NZ
1	1011	PBD 88	33.0	45.3	61.7	38.1	44.5
2	1012	FDK 124 (ZC)	38.0	44.1	47.3	34.4	41.0
3	1013	FDK 312	42.0	53.3	60.2	35.1	47.7
4	1014	PBD 92	51.0	43.6	57.9	34.6	46.8
5	1015	FDK 324	53.0	46.3	49.9	40.3	47.4
6	1016	Local Check	48.0	41.7	47.8	38.6	44.0

Boll weight (g)

S. No.	Code No.	Entries	Sriganganagar	Faridkot	Bathinda	Hisar	Mean NZ
1	1011	PBD 88	2.0	3.1	3.0	2.6	2.7
2	1012	FDK 124 (ZC)	2.8	2.8	2.2	2.5	2.6
3	1013	FDK 312	2.6	2.8	2.5	2.4	2.6
4	1014	PBD 92	2.3	3.0	3.1	2.5	2.7
5	1015	FDK 324	2.1	3.2	2.5	2.7	2.6
6	1016	Local Check	2.7	3.0	2.3	2.6	2.7



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	1021	KR 149	3358	2966	3655	2407	2770	4113	3212	1
2	1022	Local Check	2010	3122	3942	1404	2432	2688	2600	6
3	1023	CISAA 19-3	2878	1665	2919	1096	2885	3025	2411	7
4	1024	CISAA 19-4	2749	2237	3121	941	3915	3642	2768	4
5	1025	Zonal Check (KR 64)	3790	1735	3660	2315	2153	3399	2842	3
6	1026	KR 150	3497	2703	3514	2176	2692	4034	3103	2
7	1027	KR 148	2969	1917	3288	1821	2106	3654	2626	5
		CD @ 5 %	388	290	483	266	339	505		
		CV %	9	7	8	10	9	10		
		Local Checks	RAJ DH. 9	FMDH 9	FMDH 9	AAH 1	CISAA 2	CISAA 2		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Faridkot	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	1021	KR 149	1278	1152	1448	966	1103	1545	1249
2	1022	Local Check	674	1202	1520	536	937	1037	984
3	1023	CISAA 19-3	871	625	1085	402	1134	1165	880
4	1024	CISAA 19-4	1077	848	1106	381	1562	1357	1055
5	1025	Zonal Check (KR 64)	1372	668	1490	956	872	1278	1106
6	1026	KR 150	1464	1102	1446	873	1079	1489	1242
7	1027	KR 148	1226	734	1316	741	821	1346	1031



Br 25a/b – Coordinated Hybrid Trial of Desi Hybrid (North Zone)**Ginning outturn (%)**

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Faridkot	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	1021	KR 149	37.1	38.9	39.6	40.1	39.8	37.5	38.8
2	1022	Local Check	32.2	38.6	38.5	38.2	40.6	38.6	37.8
3	1023	CISAA 19-3	33.5	37.5	37.2	36.7	39.3	38.5	37.1
4	1024	CISAA 19-4	37.2	37.9	35.4	40.5	39.9	37.3	38.0
5	1025	Zonal Check (KR 64)	37.5	38.5	40.7	41.3	40.5	37.6	39.4
6	1026	KR 150	36.5	40.8	41.2	40.1	38.6	36.9	39.0
7	1027	KR 148	37.6	38.3	40.0	40.7	39.0	36.8	38.7

Bolls/plant

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Faridkot	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	1021	KR 149	57.0	54.6	55.8	34.8	38.4	66.4	51.2
2	1022	Local Check	49.0	54.9	54.2	28.0	33.7	49.5	44.9
3	1023	CISAA 19-3	40.0	55.1	46.6	31.2	33.2	52.2	43.1
4	1024	CISAA 19-4	49.0	54.0	47.6	32.2	37.9	60.1	46.8
5	1025	Zonal Check (KR 64)	54.0	43.3	54.0	30.5	36.3	62.8	46.8
6	1026	KR 150	68.0	58.3	56.0	35.3	38.3	61.1	52.8
7	1027	KR 148	46.0	59.3	45.4	33.8	41.6	53.9	46.7

Boll weight (g)

S. No.	Code No.	Entries	Sriganganagar	Bathinda	Faridkot	Hisar	Sirsa (CICR)	Arya Nagar (Shakti Vardhak)	Mean NZ
1	1021	KR 149	2.4	2.9	3.1	2.6	2.6	2.9	2.8
2	1022	Local Check	2.2	2.5	3.1	2.9	2.5	2.5	2.6
3	1023	CISAA 19-3	2.8	2.1	2.9	2.7	2.3	2.6	2.6
4	1024	CISAA 19-4	2.5	2.3	3.0	2.6	2.2	2.3	2.5
5	1025	Zonal Check (KR 64)	2.7	2.1	3.1	2.6	2.5	2.8	2.6
6	1026	KR 150	2.3	2.5	3.2	2.4	2.4	2.9	2.6
7	1027	KR 148	2.7	3.1	3.6	2.9	2.5	2.8	2.9



Central Zone Trials

Br 02a/b - Initial Evaluation Trial of Naturally Coloured *G. hirsutum*

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Khandwa (I)	Nagpur (R)	Surat (R)	Mean CZ	Rank
1	131	CNH 21198	462	213	480	385	7
2	132	ZC (Phule Yamuna)	884	771	1041	899	2
3	133	CNH 20449	768	526	1069	788	4
4	134	LHCC 23	616	694	887	732	6
5	135	Local Check	698	612	948	753	5
6	136	CCH 20452	511	680	1509	900	1
7	137	DHCC 2151	430	502	1526	819	3
		CD @ 5 %	109	246	242		
		CV %	11	24	12.8		
		Local Checks	JK 4	AKH 8828	GN.Cot. 22		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Khandwa (I)	Nagpur (R)	Surat (R)	Mean CZ
1	131	CNH 21198	144	60	122	109
2	132	ZC (Phule Yamuna)	297	247	325	290
3	133	CNH 20449	256	205	382	281
4	134	LHCC 23	183	221	179	194
5	135	Local Check	251	210	259	240
6	136	CCH 20452	178	250	495	308
7	137	DHCC 2151	156	151	486	264

Ginning outturn (%)

S. No.	Code No.	Entries	Khandwa (I)	Nagpur (R)	Surat (R)	Mean CZ
1	131	CNH 21198	31.2	28.1	25.7	28
2	132	ZC (Phule Yamuna)	33.6	32.1	31.2	32
3	133	CNH 20449	33.4	38.9	35.8	36
4	134	LHCC 23	29.7	31.8	20.2	27
5	135	Local Check	35.9	34.3	27.3	33
6	136	CCH 20452	34.9	36.7	32.7	35
7	137	DHCC 2151	36.2	30.0	31.9	33



Br 02a/b - Initial Evaluation Trial of Naturally Coloured *G. hirsutum*
Bolls/plant

S. No.	Code No.	Entries	Khandwa (I)	Nagpur (R)	Surat (R)	Mean CZ
1	131	CNH 21198	15.3	14.0	17.3	16
2	132	ZC (Phule Yamuna)	28.0	16.5	23.0	23
3	133	CNH 20449	24.5	11.1	20.7	19
4	134	LHCC 23	19.3	12.1	20.0	17
5	135	Local Check	23.8	13.2	23.3	20
6	136	CCH 20452	18.3	10.5	29.3	19
7	137	DHCC 2151	13.7	9.5	30.3	18

Boll weight (g)

S. No.	Code No.	Entries	Khandwa (I)	Nagpur (R)	Surat (R)	Mean CZ
1	131	CNH 21198	2.0	1.9	3.0	2
2	132	ZC (Phule Yamuna)	2.3	2.9	2.9	3
3	133	CNH 20449	2.3	2.0	3.1	2
4	134	LHCC 23	2.2	2.7	2.9	3
5	135	Local Check	2.6	2.5	2.7	3
6	136	CCH 20452	3.0	3.0	3.2	3
7	137	DHCC 2151	2.5	3.0	3.1	3



Br. 22b – Initial Evaluation Trial of *G. arboreum***Seed Cotton Yield (Kg/ha)**

S. No.	Code No.	Entries	Khandwa	Amreli	Akola	Parbhani	Jaigaon	Nagpur (CICR)	Mean CZ	Rank
1	141	JLA 1204	782	2977	866	1386	1102	1468	1430	1
2	142	PAIG 421	325	3258	771	888	590	995	1138	14
3	143	CNA19086	834	2790	613	905	697	1067	1151	11
4	144	PA 908	724	2870	574	1252	860	1171	1242	6
5	145	ZC (AKA 7)	819	2569	633	936	1036	867	1143	13
6	146	PA 907	687	2906	612	960	838	1021	1171	9
7	147	CNA 1080	388	2420	676	785	625	1088	997	16
8	148	GAM 283	1002	3233	746	1162	641	1191	1329	2
9	149	CNA 1081	346	2223	697	713	419	850	875	18
10	150	QC (PA 255)	567	2769	615	1228	860	-	1208	7
11	151	CNA 1077	498	2023	802	889	737	1259	1035	15
12	152	GAM 276	441	3088	701	1201	542	978	1159	10
13	153	PA 906	871	3086	712	1065	585	1187	1251	5
14	154	AKA 2016-11	315	3495	845	916	767	1379	1286	3
15	155	Local Check	729	3356	745	1075	561	1204	1278	4
16	156	CNA1076	509	2496	855	1129	921	1228	1190	8
17	157	JLA 1440	509	2538	751	1197	713	1178	1148	12
18	158	PAIG 420	457	2492	538	962	646	635	955	17
CD @ 5 %			158	422	79	216	174	287		
CV %			16	9.05	10	13	14	16		
Local Checks			JK 5	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	Akola	Parbhani	Jalgaon	Nagpur (CICR)	Mean CZ
1	141	JLA 1204	261	1089	324	542	364	514	516
2	142	PAIG 421	85	1181	276	352	185	339	403
3	143	CNA19086	261	1009	220	321	228	344	397
4	144	PA 908	252	1052	201	500	275	415	449
5	145	ZC (AKA 7)	282	1014	250	387	366	326	438
6	146	PA 907	210	1039	213	355	260	344	404
7	147	CNA 1080	101	884	249	290	206	357	348
8	148	GAM 283	318	1159	280	442	218	411	471
9	149	CNA 1081	95	766	246	257	133	275	295
10	150	QC (PA 255)	177	985	244	469	294	-	434
11	151	CNA 1077	163	736	304	348	252	433	373
12	152	GAM 276	138	1118	264	452	179	335	414
13	153	PA 906	291	1167	277	430	205	415	464
14	154	AKA 2016-11	79	1341	335	367	271	502	483
15	155	Local Check	254	1209	296	398	183	442	464
16	156	CNA1076	169	853	314	414	298	413	410
17	157	JLA 1440	168	870	288	432	249	401	401
18	158	PAIG 420	140	854	189	346	205	197	322



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

Ginning outturn (%)

S. No.	Code No.	Entries	Khandwa	Amreli	Akola	Parbhani	Jalgaon	Nagpur (CICR)	Mean CZ
1	141	JLA 1204	33.4	36.5	37.4	39.1	33.0	35.0	35.7
2	142	PAIG 421	26.2	36.2	35.4	39.7	31.3	34.1	33.8
3	143	CNA19086	31.3	36.1	35.8	35.5	32.7	32.2	33.9
4	144	PA 908	34.8	36.6	34.9	40.0	32.0	35.4	35.6
5	145	ZC (AKA 7)	34.5	39.5	39.6	41.4	35.3	37.6	38.0
6	146	PA 907	30.5	35.7	34.8	37.0	31.0	33.7	33.8
7	147	CNA 1080	25.9	36.7	36.8	37.0	33.0	32.8	33.7
8	148	GAM 283	31.7	35.8	37.5	37.9	34.0	34.5	35.2
9	149	CNA 1081	27.5	34.4	35.2	36.1	31.7	32.3	32.9
10	150	QC (PA 255)	31.2	35.7	39.8	38.1	34.2	-	35.8
11	151	CNA 1077	32.6	36.4	38.0	39.1	34.2	34.4	35.8
12	152	GAM 276	31.3	36.2	37.6	37.6	33.0	34.3	35.0
13	153	PA 906	33.4	37.7	38.8	40.4	35.0	35.0	36.7
14	154	AKA 2016-11	25.0	38.4	39.7	40.0	35.3	36.4	35.8
15	155	Local Check	34.8	36.0	39.8	37.0	32.7	36.7	36.2
16	156	CNA1076	33.2	34.2	36.8	36.7	32.3	33.6	34.5
17	157	JLA 1440	33.0	34.2	38.4	36.1	34.9	34.0	35.1
18	158	PAIG 420	30.5	34.3	35.2	36.0	31.7	31.1	33.1



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

Bolls/plant

S. No.	Code No.	Entries	Khandwa	Amreli	Akola	Parbhani	Jaigaon	Nagpur (CICR)	Mean CZ
1	141	JLA 1204	26.1	28.3	14.3	15.1	22.3	24.8	21.8
2	142	PAIG 421	19.5	25.7	12.1	10.5	14.2	24.9	17.8
3	143	CNA19086	27.7	26.1	12.4	11.0	15.4	21.6	19.0
4	144	PA 908	20.1	32.5	12.5	14.1	17.3	25.4	20.3
5	145	ZC (AKA 7)	27.5	26.9	12.7	10.7	21.0	17.4	19.4
6	146	PA 907	28.0	27.0	12.7	11.4	15.6	23.2	19.7
7	147	CNA 1080	21.4	28.7	12.5	9.8	15.9	20.9	18.2
8	148	GAM 283	29.3	30.8	12.0	13.5	17.4	21.1	20.7
9	149	CNA 1081	20.3	32.6	14.0	9.5	14.3	18.9	18.3
10	150	QC (PA 255)	23.9	26.9	11.3	13.4	16.2	-	18.3
11	151	CNA 1077	23.2	24.9	17.0	10.4	11.4	23.1	18.3
12	152	GAM 276	22.0	32.9	15.1	13.8	16.2	17.5	19.6
13	153	PA 906	29.1	31.9	13.2	11.9	16.8	24.5	21.2
14	154	AKA 2016-11	19.1	35.6	18.0	10.5	17.1	26.9	21.2
15	155	Local Check	24.4	37.5	13.2	12.2	16.2	20.7	20.7
16	156	CNA1076	22.9	25.4	14.4	12.6	20.1	21.9	19.6
17	157	JLA 1440	22.7	29.5	14.7	13.0	17.9	20.1	19.7
18	158	PAIG 420	21.1	23.1	11.4	11.1	16.3	25.4	18.1



Br. 22b – Initial Evaluation Trial of *G. arboreum***Boll weight (g)**

S. No.	Code No.	Entries	Khandwa	Amreli	Akola	Parbhani	Jalgaon	Nagpur (CICR)	Mean CZ
1	141	JLA 1204	2.1	2.5	2.0	2.7	2.0	2.7	2.3
2	142	PAIG 421	2.1	2.7	2.0	2.6	2.0	2.8	2.4
3	143	CNA19086	2.1	2.3	1.9	2.6	2.1	2.3	2.2
4	144	PA 908	2.4	2.5	1.9	2.7	1.9	2.9	2.4
5	145	ZC (AKA 7)	2.4	2.6	1.9	2.6	2.0	2.7	2.4
6	146	PA 907	2.1	2.5	2.0	2.5	1.8	2.5	2.2
7	147	CNA 1080	2.3	2.5	1.9	2.5	2.1	2.8	2.4
8	148	GAM 283	2.3	2.5	1.9	2.6	2.1	2.6	2.3
9	149	CNA 1081	2.1	2.4	2.5	2.5	2.1	2.7	2.4
10	150	QC (PA 255)	2.4	2.6	1.9	2.6	2.3	-	2.4
11	151	CNA 1077	2.2	2.4	1.8	2.4	2.3	2.5	2.3
12	152	GAM 276	2.4	2.8	2.0	2.7	2.5	2.5	2.5
13	153	PA 906	2.5	2.3	1.9	2.4	2.0	2.6	2.3
14	154	AKA 2016-11	2.1	2.7	2.1	2.5	2.2	3	2.4
15	155	Local Check	2.4	2.2	1.9	2.4	2.3	2.9	2.4
16	156	CNA1076	2.4	2.5	2.1	2.5	1.9	2.6	2.3
17	157	JLA 1440	2.2	2.7	2.1	2.6	2.0	2.9	2.4
18	158	PAIG 420	2.4	2.4	2.0	2.6	2.1	2.6	2.4



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

Seed Cotton Yield (Kg/ha)

S. No.	Code No.	Entries	Surat	Bharuch	Bharuch (CSSRI)	Viramgam	Dhanduka	Mean CZ	Rank
1	171	GShv 831/17	1093	1475	955	973	1207	1141	5
2	172	GVhv 1014	887	1054	777	1292	1325	1067	7
3	173	GShv 807/17	1106	1255	1080	1328	1172	1188	3
4	174	GVhv 1028	795	954	544	1375	1594	1052	8
5	175	ZC (G Cot 23)	1106	1117	1512	1210	1282	1245	2
6	176	GVhv 1172	766	1055	988	1334	1377	1104	6
7	177	GShv 810/17	1183	1321	1357	1373	1357	1318	1
8	178	Local Check	1098	1233	1056	1166	1241	1159	4
CD @ 5 %			213	262	232	207	158		
CV %			12	12	13	9	7		
Local Checks			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)	Viramgam	Dhanduka	Mean CZ
1	171	GShv 831/17	339	527	307	374	474	404
2	172	GVhv 1014	323	399	290	516	517	409
3	173	GShv 807/17	379	424	348	467	416	407
4	174	GVhv 1028	237	291	173	499	622	364
5	175	ZC (G Cot 23)	385	412	539	457	489	456
6	176	GVhv 1172	277	410	354	491	550	416
7	177	GShv 810/17	358	458	449	438	512	443
8	178	Local Check	366	456	362	484	529	439



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

Ginning outturn (%)

S. No.	Code No.	Entries	Surat	Bharuch	Bharuch (CSSRI)	Viramgam	Dhanduka	Mean CZ
1	171	GShv 831/17	31.0	35.8	32.2	38.5	39.2	35.3
2	172	GVhv 1014	36.4	37.9	37.5	39.9	39.0	38.1
3	173	GShv 807/17	34.3	33.8	32.2	35.0	35.5	34.2
4	174	GVhv 1028	29.9	30.5	31.7	36.4	39.0	33.5
5	175	ZC (G Cot 23)	34.8	36.9	35.6	37.8	38.1	36.6
6	176	GVhv 1172	36.1	38.8	35.8	36.9	39.9	37.5
7	177	GShv 810/17	30.1	34.7	33.2	32.0	37.7	33.5
8	178	Local Check	33.3	37.0	34.3	41.5	42.6	37.7

Bolls/plant

S. No.	Code No.	Entries	Surat	Bharuch	Bharuch (CSSRI)	Viramgam	Dhanduka	Mean CZ
1	171	GShv 831/17	25.7	38.0	41	48	38.0	38.1
2	172	GVhv 1014	25.0	35.3	43	44	42.3	37.9
3	173	GShv 807/17	30.7	32.7	39	51	36.0	37.8
4	174	GVhv 1028	21.7	33.7	29	63	49.0	39.3
5	175	ZC (G Cot 23)	29.3	32.3	48	47	40.7	39.5
6	176	GVhv 1172	21.3	30.7	34	39	43.0	33.7
7	177	GShv 810/17	29.3	38.7	35	56	42.7	40.3
8	178	Local Check	26.3	34.0	40	49	40.0	37.9

Boll weight (g)

S. No.	Code No.	Entries	Surat	Bharuch	Bharuch (CSSRI)	Viramgam	Dhanduka	Mean CZ
1	171	GShv 831/17	2.4	2.4	2.8	1.7	1.9	2.2
2	172	GVhv 1014	2.2	2.0	2.5	2.0	2.0	2.1
3	173	GShv 807/17	2.1	2.5	2.5	1.7	1.8	2.1
4	174	GVhv 1028	2.2	1.7	2.2	2.0	2.3	2.1
5	175	ZC (G Cot 23)	2.3	2.3	2.9	1.7	2.0	2.2
6	176	GVhv 1172	2.5	2.3	2.2	2.5	2.2	2.3
7	177	GShv 810/17	2.2	2.2	2.3	1.8	2.1	2.1
8	178	Local Check	2.5	2.7	2.3	1.8	1.9	2.2



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	1111	CNH 19480	488	740	914	827	7
2	1112	ZC (Phule Yamuna)	981	798	821	810	8
3	1113	CNH 18529	830	1076	1070	1073	2
4	1114	DHCC 1901	947	1090	859	975	3
5	1115	Local Check	903	968	702	835	6
6	1116	CNH 19325	842	1129	738	934	4
7	1117	CNH 17395	729	1506	748	1127	1
8	1118	CNH 18528	666	993	743	868	5
		CD @ 5 %	162	253	278		
		CV %	11	14	19		
		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	1111	CNH 19480	164	247	332	290
2	1112	ZC (Phule Yamuna)	334	252	281	267
3	1113	CNH 18529	260	380	387	384
4	1114	DHCC 1901	313	340	290	315
5	1115	Local Check	250	273	259	266
6	1116	CNH 19325	272	335	260	298
7	1117	CNH 17395	190	474	254	364
8	1118	CNH 18528	170	301	267	284

Ginning outturn (%)

S. No.	Code No.	Entries	Khandwa (I)	Surat (R)	Nagpur (R)	Mean CZ
1	1111	CNH 19480	33.5	33.4	36.3	34.9
2	1112	ZC (Phule Yamuna)	34.0	31.6	34.2	32.9
3	1113	CNH 18529	31.3	35.4	36.2	35.8
4	1114	DHCC 1901	33.1	31.2	33.8	32.5
5	1115	Local Check	27.7	28.3	36.9	32.6
6	1116	CNH 19325	32.3	29.7	35.2	32.5
7	1117	CNH 17395	26.0	31.4	34.0	32.7
8	1118	CNH 18528	25.5	30.2	35.9	33.1



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

S. No.	Code No.	Entries	Khandwa (I)	Surat (R)	Nagpur (R)	Mean CZ
1	1111	CNH 19480	21.2	15.7	16.8	16.3
2	1112	ZC (Phule Yamuna)	34.0	17.3	19.2	18.3
3	1113	CNH 18529	28.8	22.3	19.5	20.9
4	1114	DHCC 1901	31.3	21.0	13.3	17.2
5	1115	Local Check	29.2	19.7	15.9	17.8
6	1116	CNH 19325	28.7	21.7	15.5	18.6
7	1117	CNH 17395	26.6	26.7	14.5	20.6
8	1118	CNH 18528	24.6	18.3	15.4	16.9

Boll weight (g)

S. No.	Code No.	Entries	Khandwa (I)	Surat (R)	Nagpur (R)	Mean CZ
1	1111	CNH 19480	2.9	3.2	2.7	3.0
2	1112	ZC (Phule Yamuna)	3.0	3.0	2.6	2.8
3	1113	CNH 18529	2.8	3.1	2.8	3.0
4	1114	DHCC 1901	2.9	3.4	3.1	3.2
5	1115	Local Check	2.9	3.0	2.6	2.8
6	1116	CNH 19325	2.7	3.2	2.7	3.0
7	1117	CNH 17395	2.8	3.4	2.3	2.9
8	1118	CNH 18528	3.4	3.4	2.4	2.9



Br 04a – Coordinated Varietal Trial - G. hirsutum (Central Zone)**Seed Cotton Yield (Kg/ha)**

S. No.	Code No.	Entries	Surat	Junagarh	Anand	Rahuri	Khandwa	Bhawani-patna	Mean CZ	Rank
1	1121	GJHV 568	1116	1697	1932	768	685	1701	1316	6
2	1122	TCH 1941	1952	1783	1467	1833	811	2230	1679	2
3	1123	Quality Check (Suraj)	1701	1552	1128	1173	520	1950	1337	4
4	1124	GJHV 566	2779	2195	1851	1218	982	2384	1902	1
5	1125	ZC (Phule Yamuna)	2510	1818	1286	1164	851	2050	1613	3
6	1126	GJHV 548	1066	1946	1099	1174	487	2164	1323	5
7	1127	Local Check	1401	1535	1476	811	650	1941	1302	7
8	1128	GISV 328	1094	1757	1195	1187	444	2025	1284	8
		CD @ 5 %	358	315	295	279	223	361		
		CV %	12	10	12	14	11	10		
		Local Checks	GN. Cot 32	GN. Cot 32	GN. Cot 32	Phule 688	JK4	Surabhi		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Surat	Junagarh	Anand	Rahuri	Khandwa	Bhawani patna	Mean CZ
1	1121	GJHV 568	385	554	636	256	218	508	426
2	1122	TCH 1941	607	573	464	663	262	660	538
3	1123	Quality Check (Suraj)	547	533	368	428	169	721	461
4	1124	GJHV 566	935	768	627	447	346	843	661
5	1125	ZC (Phule Yamuna)	798	566	368	347	279	627	497
6	1126	GJHV 548	347	662	362	416	159	718	444
7	1127	Local Check	487	549	530	266	207	608	441
8	1128	GISV 328	396	597	427	443	157	613	439



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

Ginning outturn (%)

S. No.	Code No.	Entries	Surat	Junagarh	Anand	Rahuri	Khandwa	Bhawani patna	Mean CZ
1	1121	GJHV 568	34.5	32.7	32.9	33.3	31.8	29.8	32.5
2	1122	TCH 1941	31.2	32.2	31.7	36.1	32.3	29.6	32.2
3	1123	Quality Check (Suraj)	32.0	34.3	32.6	36.5	32.6	37.0	34.2
4	1124	GJHV 566	33.7	35.0	33.9	36.7	35.2	35.4	35.0
5	1125	ZC (Phule Yamuna)	31.8	31.2	28.6	29.8	32.8	30.5	30.8
6	1126	GJHV 548	32.6	34.0	32.8	35.5	32.7	33.2	33.5
7	1127	Local Check	34.7	35.8	35.8	32.8	31.9	31.3	33.7
8	1128	GISV 328	36.3	34.0	35.8	37.3	35.4	30.3	34.8

Bolls/plant

S. No.	Code No.	Entries	Surat	Junagarh	Anand	Rahuri	Khandwa	Bhawani patna	Mean CZ
1	1121	GJHV 568	23.7	31.7	58.5	21.9	24.5	31.8	32.0
2	1122	TCH 1941	27.3	24.1	48.5	36.3	26.9	40.5	33.9
3	1123	Quality Check (Suraj)	25.0	24.3	42.9	25.3	21.2	30.3	28.2
4	1124	GJHV 566	37.3	33.7	49.4	32.4	31.8	41.5	37.7
5	1125	ZC (Phule Yamuna)	39.7	29.0	52.4	37.3	27.1	37.3	37.1
6	1126	GJHV 548	23.7	31.2	53.7	30.8	22.9	34.9	32.9
7	1127	Local Check	21.0	24.2	49.8	28.9	25.6	34.6	30.7
8	1128	GISV 328	21.7	23.4	41.2	35.4	23.3	31.5	29.4

Boll weight (g)

S. No.	Code No.	Entries	Surat	Junagarh	Anand	Rahuri	Khandwa	Bhawani patna	Mean CZ
1	1121	GJHV 568	3.1	3.1	3.9	3.7	2.9	3.7	3.4
2	1122	TCH 1941	4.1	4.3	4.4	3.8	3.7	3.4	3.9
3	1123	Quality Check (Suraj)	4.1	3.9	3.8	3.8	3.1	4.3	3.8
4	1124	GJHV 566	4.3	3.8	4.4	3.9	2.8	3.8	3.8
5	1125	ZC (Phule Yamuna)	3.5	3.7	3.9	3.7	2.9	3.5	3.5
6	1126	GJHV 548	3.3	3.6	3.8	3.8	2.9	3.8	3.5
7	1127	Local Check	4.4	3.8	4.2	3.7	3.5	3.6	3.9
8	1128	GISV 328	4.1	4.4	4.6	3.7	3.4	4.1	4.0



Br 04b – Coordinated Varietal Trial - *G. hirsutum* (Central Zone)**Seed Cotton Yield (Kg/ha)**

S. No.	Code No.	Entries	Banswara	Bharuch	Akola	Nanded	Mean CZ	Rank
1	1131	ZC (NH 615)	2512	2114	1174	1298	1775	5
2	1132	CNH 119	2914	2137	860	870	1695	6
3	1133	Local Check	2313	2784	799	1296	1798	4
4	1134	TVH 007	2740	2338	1188	1178	1861	1
5	1135	RAH 1081	2828	2456	979	938	1800	3
6	1136	AKH 2013-2	2409	2054	1424	795	1671	7
7	1137	Quality Check (Suraj)	2175	2288	945	972	1595	8
8	1138	AKH 2013-3	2823	2280	1481	801	1846	2
		CD @ 5 %	390	115	457	168		
		CV %	17	11	9	9		
		Local Checks	Wagad Kalyan	G Cot 26	AKH 8828	NH 545		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Banswara	Bharuch	Akola	Mean CZ
1	1131	ZC (NH 615)	859	753	454	689
2	1132	CNH 119	1005	751	334	697
3	1133	Local Check	782	872	291	648
4	1134	TVH 007	951	780	452	728
5	1135	RAH 1081	989	726	343	686
6	1136	AKH 2013-2	784	605	487	625
7	1137	Quality Check (Suraj)	717	575	359	550
8	1138	AKH 2013-3	940	615	515	690

Ginning outturn (%)

S. No.	Code No.	Entries	Banswara	Bharuch	Akola	Mean CZ
1	1131	ZC (NH 615)	34.2	35.6	38.7	36.2
2	1132	CNH 119	34.5	35.2	38.9	36.2
3	1133	Local Check	33.7	31.3	36.3	33.8
4	1134	TVH 007	34.7	33.4	38.1	35.4
5	1135	RAH 1081	34.9	29.5	34.9	33.1
6	1136	AKH 2013-2	32.6	29.4	34.2	32.1
7	1137	Quality Check (Suraj)	33.0	25.1	38.0	32.0
8	1138	AKH 2013-3	33.3	27.0	34.9	31.7



Br 04b – Coordinated Varietal Trial - *G. hirsutum* (Central Zone)

Bolls/plant

S. No.	Code No.	Entries	Bharuch	Akola	Nanded	Mean CZ
1	1131	ZC (NH 615)	34.4	17.0	24.0	25.1
2	1132	CNH 119	25.9	12.3	19.4	19.2
3	1133	Local Check	44.5	14.4	25.1	28.0
4	1134	TVH 007	34.4	17.3	22.0	24.6
5	1135	RAH 1081	37.5	12.9	16.8	22.4
6	1136	AKH 2013-2	32.3	20.5	15.9	22.9
7	1137	Quality Check (Suraj)	29.9	15.3	17.5	20.9
8	1138	AKH 2013-3	28.5	21.2	18.1	22.6

Boll weight (g)

S. No.	Code No.	Entries	Banswara	Bharuch	Akola	Nanded	Mean CZ
1	1131	ZC (NH 615)	3.2	3.8	3.3	3.7	3.5
2	1132	CNH 119	4.1	5.1	3.9	4.7	4.5
3	1133	Local Check	3.5	3.7	3.3	3.5	3.5
4	1134	TVH 007	4.1	4.2	3.8	3.8	4.0
5	1135	RAH 1081	4.0	4.0	3.5	4.2	3.9
6	1136	AKH 2013-2	3.2	4.2	3.6	4.3	3.8
7	1137	Quality Check (Suraj)	4.2	4.7	3.1	4.3	4.1
8	1138	AKH 2013-3	4.2	4.8	4.3	5.2	4.6



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	1141	PA 873	2778	633	1066	683	471	1047	1113	8
2	1142	Local Check	3040	840	1007	1004	514	1022	1238	1
3	1143	CNA 1072	2751	741	1134	767	600	1144	1190	2
4	1144	PA 904	2475	636	1051	608	487	920	1030	11
5	1145	GAM 269	2694	815	939	523	459	1069	1083	9
6	1146	QC (PA 255)	2593	972	-	504	732	935	1147	5
7	1147	PAIG 411	2418	457	870	554	454	916	945	14
8	1148	NDLA 3116-3	2800	944	787	646	781	896	1142	6
9	1149	PA 869	2440	423	930	480	468	860	934	16
10	1150	JLA-1430	2755	648	1162	848	602	1071	1181	3
11	1151	CNA 1075	-	637	-	-	361	445	481	17
12	1152	NDLA 3104-4	2632	710	916	792	939	902	1149	4
13	1153	GAM 266	2929	639	769	597	577	876	1065	10
14	1154	PAIG 410	2808	423	857	605	551	927	1029	12
15	1155	CNA 1071	2344	407	781	562	498	1061	942	15
16	1156	ZC (AKA 7)	2360	546	676	583	677	952	966	13
17	1157	AKA 2013-8	2813	506	1074	623	686	1099	1134	7
CD @ 5 %			403	112	232	170	105	136		
CV %			9	11	15	12	11	9		
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	1141	PA 873	992	193	362	232	154	386	387
2	1142	Local Check	1095	285	365	383	164	372	444
3	1143	CNA 1072	1005	246	383	260	200	419	419
4	1144	PA 904	903	196	357	219	153	352	363
5	1145	GAM 269	1019	257	334	199	162	416	398
6	1146	QC (PA 255)	961	318	-	195	222	349	409
7	1147	PAIG 411	868	134	284	188	144	339	326
8	1148	NDLA 3116-3	1075	337	297	257	281	363	435
9	1149	PA 869	882	148	315	179	209	314	341
10	1150	JLA-1430	1025	208	397	318	167	419	422
11	1151	CNA 1075	-	198	-	-	114	166	159
12	1152	NDLA 3104-4	987	229	321	291	310	335	412
13	1153	GAM 266	1126	217	277	235	206	347	401
14	1154	PAIG 410	1007	136	290	206	182	333	359
15	1155	CNA 1071	856	123	262	194	163	405	334
16	1156	ZC (AKA 7)	926	187	254	222	244	395	371
17	1157	AKA 2013-8	1066	168	396	236	235	439	423



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	1141	PA 873	35.7	30.5	34.0	12.1	32.7	36.9	30.3
2	1142	Local Check	35.9	33.9	36.2	16.0	32.0	36.4	31.7
3	1143	CNA 1072	36.5	33.2	33.8	12.5	33.3	36.6	31.0
4	1144	PA 904	36.5	30.8	34.0	11.1	31.3	38.3	30.3
5	1145	GAM 269	37.8	31.5	35.6	12.3	35.3	39.0	31.9
6	1146	QC (PA 255)	37.1	32.7	-	11.9	30.3	37.3	29.9
7	1147	PAIG 411	35.9	29.4	32.7	12.5	31.7	37.0	29.9
8	1148	NDLA 3116-3	38.4	35.7	37.8	11.4	36.0	40.5	33.3
9	1149	PA 869	36.2	35.0	33.9	11.5	35.7	36.5	31.5
10	1150	JLA-1430	37.2	32.1	34.2	14.0	34.9	39.2	31.9
11	1151	CNA 1075	-	31.0	-	-	31.7	37.3	33.3
12	1152	NDLA 3104-4	37.5	32.3	35.0	12.9	33.0	37.2	31.3
13	1153	GAM 266	38.5	33.9	36.0	11.9	35.7	39.6	32.6
14	1154	PAIG 410	35.8	32.3	33.8	12.4	33.0	35.9	30.5
15	1155	CNA 1071	36.6	30.2	33.6	11.1	32.7	38.2	30.4
16	1156	ZC (AKA 7)	39.3	34.2	37.6	12.7	36.0	41.5	33.6
17	1157	AKA 2013-8	37.8	33.1	36.9	12.5	34.2	39.9	32.4

Bolls/plant

S. No.	Code No.	Entries	Amreli	Khandwa	Nagpur	Akola	Jalgaon	Parbhani	Mean CZ
1	1141	PA 873	32.9	21.9	17.7	34.0	13.9	12.4	22.1
2	1142	Local Check	33.5	24.3	15.5	38.2	14.8	11.6	23.0
3	1143	CNA 1072	30.0	23.9	18.5	33.8	15.2	12.7	22.4
4	1144	PA 904	32.9	22.9	24.7	36.0	12.7	10.6	23.3
5	1145	GAM 269	23.9	24.0	15.8	37.7	12.8	12.0	21.0
6	1146	QC (PA 255)	30.0	27.7	-	38.7	16.3	11.1	24.8
7	1147	PAIG 411	29.3	16.2	20.1	34.0	14.1	11.2	20.8
8	1148	NDLA 3116-3	27.3	25.1	14.5	39.8	19.2	10.9	22.8
9	1149	PA 869	29.0	17.4	16.8	37.1	13.3	9.9	20.6
10	1150	JLA-1430	23.2	22.5	22.5	37.5	15.0	12.4	22.2
11	1151	CNA 1075	-	23.5	-	-	9.8	8.6	14.0
12	1152	NDLA 3104-4	27.7	22.3	17.6	36.7	21.4	11.2	22.8
13	1153	GAM 266	27.8	20.4	15.7	39.3	17.6	11.1	22.0
14	1154	PAIG 410	29.3	15.9	16.4	34.2	13.6	10.8	20.0
15	1155	CNA 1071	29.5	18.4	19.1	34.5	14.2	12.3	21.3
16	1156	ZC (AKA 7)	27.2	20.0	18.6	38.4	16.4	11.4	22.0
17	1157	AKA 2013-8	29.0	21.1	22.8	37.9	17.3	12.3	23.4



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	1141	PA 873	2.5	2.3	2.7	1.9	2.4	2.7	2.4
2	1142	Local Check	2.1	2.6	3.0	2.4	2.4	2.5	2.5
3	1143	CNA 1072	2.6	2.8	2.6	2.5	2.8	2.7	2.7
4	1144	PA 904	2.4	2.3	2.4	1.8	2.6	2.4	2.3
5	1145	GAM 269	2.4	2.6	2.6	1.7	2.2	2.6	2.4
6	1146	QC (PA 255)	2.4	2.5	-	1.9	2.5	2.5	2.4
7	1147	PAIG 411	2.5	2.5	2.6	2.2	2.6	2.5	2.5
8	1148	NDLA 3116-3	2.6	2.5	2.4	2.0	2.3	2.5	2.4
9	1149	PA 869	2.6	2.5	2.7	1.9	2.6	2.4	2.5
10	1150	JLA-1430	2.5	2.4	3.0	1.8	2.3	2.7	2.5
11	1151	CNA 1075	-	2.0	-	-	2.0	2.5	2.2
12	1152	NDLA 3104-4	2.7	2.5	2.7	1.9	2.1	2.5	2.4
13	1153	GAM 266	2.5	2.4	2.7	1.9	2.3	2.4	2.4
14	1154	PAIG 410	2.3	2.4	2.8	1.8	2.5	2.4	2.4
15	1155	CNA 1071	2.4	2.5	2.5	1.7	2.3	2.6	2.3
16	1156	ZC (AKA 7)	2.2	2.3	2.5	1.9	2.3	2.5	2.3
17	1157	AKA 2013-8	2.7	2.6	2.7	2.2	2.4	2.7	2.6

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	1161	CNA 1092	1656	1318	1146	754	989	858	1120	1
2	1162	DDCC 1902	1281	1089	848	664	701	891	912	6
3	1163	CNA 18562	1189	1017	1629	588	817	534	912	6
4	1164	Local Check	1506	1088	1865	747	576	618	962	4
5	1165	CNA 18563	984	983	1132	557	543	539	790	9
6	1166	DDCC 1901	1773	1042	1124	782	837	968	1088	2
7	1167	CNA 19475	1053	1127	1404	623	712	715	939	5
8	1168	DDCC 2001	1386	1178	809	725	822	895	969	3
9	1169	CNA 20402	1261	1265	1211	625	459	457	880	8
10	1170	AKA 7 (Zonal Check)	900	705	1252	522	464	301	691	10
		CD @ 5 %	362	294	295	127	132	158		
		CV %	16.2	16	14	11	11	16		
		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	Parbhani	Jalgaon	Khandwa	Mean CZ
1	1161	CNA 1092	543	440	275	330	264	370
2	1162	DDCC 1902	357	350	232	222	277	288
3	1163	CNA 18562	396	360	216	281	170	288
4	1164	Local Check	465	411	270	200	199	285
5	1165	CNA 18563	302	347	204	185	146	237
6	1166	DDCC 1901	547	334	275	276	304	347
7	1167	CNA 19475	345	394	229	247	202	283
8	1168	DDCC 2001	398	372	244	270	284	314
9	1169	CNA 20402	395	417	218	151	135	263
10	1170	AKA 7 (Zonal Check)	316	278	211	166	94	213

Ginning outturn (%)

S. No.	Code No.	Entries	Surat	Nagpur	Parbhani	Jalgaon	Khandwa	Mean CZ
1	1161	CNA 1092	32.8	33.4	36.6	33.3	30.8	33.4
2	1162	DDCC 1902	27.9	32.1	35.0	31.7	31.1	31.6
3	1163	CNA 18562	33.3	35.4	36.8	34.3	31.9	34.3
4	1164	Local Check	30.9	37.8	36.3	34.7	32.3	34.4
5	1165	CNA 18563	30.7	35.3	36.7	34.0	27.1	32.8
6	1166	DDCC 1901	30.9	32.1	35.2	33.0	31.4	32.5
7	1167	CNA 19475	32.7	35.0	36.7	34.7	28.2	33.5
8	1168	DDCC 2001	28.7	31.6	33.7	32.9	31.8	31.7
9	1169	CNA 20402	31.3	33.0	35.0	33.0	29.5	32.4
10	1170	AKA 7 (Zonal Check)	35.1	39.4	40.5	35.7	31.2	36.4



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

S. No.	Code No.	Entries	Surat	Nagpur	Nanded	Parbhani	Jalgaon	Khandwa	Mean CZ
1	1161	CNA 1092	38.5	25.0	17.1	10.2	16.2	28.0	22.5
2	1162	DDCC 1902	29.0	18.5	18.5	9.2	16.0	28.5	20.0
3	1163	CNA 18562	29.7	23.2	23.7	8.8	15.8	22.6	20.6
4	1164	Local Check	38.7	17.3	26.5	9.8	11.4	25.6	21.6
5	1165	CNA 18563	25.8	13.6	17.9	8.8	9.4	23.3	16.5
6	1166	DDCC 1901	39.3	16.9	17.9	10.6	13.6	29.9	21.4
7	1167	CNA 19475	26.4	20.5	21.0	9.0	10.4	26.0	18.9
8	1168	DDCC 2001	32.9	23.2	18.7	9.5	15.4	27.2	21.2
9	1169	CNA 20402	26.9	21.5	18.8	8.9	9.9	21.6	17.9
10	1170	AKA 7 (Zonal Check)	21.8	20.7	20.3	7.6	10.0	15.4	16.0

Boll weight (g)

S. No.	Code No.	Entries	Surat	Nagpur	Parbhani	Jalgaon	Khandwa	Mean CZ
1	1161	CNA 1092	2.3	2.6	2.7	2.3	2.1	2.4
2	1162	DDCC 1902	2.4	2.7	2.5	2.5	2.4	2.5
3	1163	CNA 18562	2.1	2.5	2.3	2.4	2.0	2.3
4	1164	Local Check	2.1	2.8	2.6	2.3	2.0	2.4
5	1165	CNA 18563	2.2	2.6	2.4	2.5	2.1	2.4
6	1166	DDCC 1901	2.4	2.5	2.6	2.1	2.1	2.3
7	1167	CNA 19475	2.2	2.7	2.5	2.5	2.4	2.5
8	1168	DDCC 2001	2.3	2.7	2.5	2.3	2.1	2.4
9	1169	CNA 20402	2.5	2.9	2.6	2.4	2.2	2.5
10	1170	AKA 7 (Zonal Check)	2.2	2.3	2.3	2.2	2.1	2.2



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)	Coimbatore (I)	Lam (I)	Dharwad (R)	Nandyal (R)	Mean SZ	Rank
1	1211	CCHC 19-2	1473	2359	1985	793	176	1357	6
2	1212	DHCC 2151	2615	2194	2178	844	133	1593	2
3	1213	DHCC 2001	1875	1394	1696	813	90	1174	11
4	1214	Suraj (ZC)	2650	1314	2011	794	244	1403	5
5	1215	DHCC 2002	1906	1354	2369	811	194	1327	8
6	1216	DHCC 1902	1926	1381	2449	829	133	1344	7
7	1217	CNH 18529	3245	1243	2498	825	183	1599	1
8	1218	DHCC 1901	1937	1764	2477	824	144	1429	4
9	1219	Local Check	2759	1466	2175	813	290	1501	3
10	1220	CCHC 19-1	1194	1970	2487	790	145	1317	9
11	1221	LHCC 23	2475	778	1838	787	159	1208	10
CD @ 5 %			210	483	NS	168	35		
CV %			10	21	15	12	12		
Local Checks			BGDS 1063	CCH 2623	Sivanandi	ARBH-813	Sivanandi		



Br 03 – Preliminary Varietal Trial - Coloured *G. hirsutum* (South Zone)**Lint Yield (kg/ha)**

S. No.	Code No.	Entries	Raichur (I)	Coimbatore (I)	Lam (I)	Dharwad (R)	Nandyal (R)	Mean SZ
1	1211	CCHC 19-2	471	753	672	252	42	438
2	1212	DHCC 2151	994	730	731	306	30	558
3	1213	DHCC 2001	643	443	626	284	21	403
4	1214	Suraj (ZC)	957	461	756	298	63	507
5	1215	DHCC 2002	638	394	833	255	46	433
6	1216	DHCC 1902	687	464	854	303	33	468
7	1217	CNH 18529	1222	456	859	309	52	580
8	1218	DHCC 1901	683	603	928	290	36	508
9	1219	Local Check	922	536	810	290	73	526
10	1220	CCHC 19-1	395	543	808	253	34	407
11	1221	LHCC 23	685	169	630	236	36	351

Ginning outturn (%)

S. No.	Code No.	Entries	Raichur (I)	Coimbatore (I)	Lam (I)	Dharwad (R)	Nandyal (R)	Mean SZ
1	1211	CCHC 19-2	32.1	31.9	33.9	31.8	29.9	31.9
2	1212	DHCC 2151	38.1	33.3	33.5	36.3	28.2	33.9
3	1213	DHCC 2001	34.4	31.8	36.9	35.0	29.2	33.5
4	1214	Suraj (ZC)	36.1	35.1	37.6	37.5	32.4	35.8
5	1215	DHCC 2002	33.5	29.1	35.4	31.5	29.4	31.8
6	1216	DHCC 1902	35.7	33.6	34.9	36.5	31.2	34.4
7	1217	CNH 18529	37.7	36.7	34.6	37.5	35.6	36.4
8	1218	DHCC 1901	35.3	34.2	37.5	35.2	31.0	34.6
9	1219	Local Check	33.6	36.5	37.1	35.6	31.3	34.8
10	1220	CCHC 19-1	33.1	27.6	32.4	32.0	29.4	30.9
11	1221	LHCC 23	27.7	21.8	34.2	30.0	28.4	28.4



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

S. No.	Code No.	Entries	Raichur (I)	Coimbatore (I)	Lam (I)	Dharwad (R)	Nandyal (R)	Mean SZ
1	1211	CCHC 19-2	15.3	31.4	38.8	8.3	6.5	20.1
2	1212	DHCC 2151	20.7	29.0	47.6	10.3	5.9	22.7
3	1213	DHCC 2001	16.0	22.4	41.0	7.9	4.3	18.3
4	1214	Suraj (ZC)	21.0	29.4	46.7	7.9	6.5	22.3
5	1215	DHCC 2002	15.0	21.0	50.3	8.1	5.3	19.9
6	1216	DHCC 1902	18.0	25.2	61.3	8.2	5.0	23.5
7	1217	CNH 18529	25.4	35.6	53.0	8.8	5.7	25.7
8	1218	DHCC 1901	17.0	23.8	57.0	8.9	5.1	22.4
9	1219	Local Check	20.3	28.4	45.8	8.1	11.0	22.7
10	1220	CCHC 19-1	16.1	28.5	67.1	7.5	7.5	25.3
11	1221	LHCC 23	19.3	27.0	47.0	7.3	4.8	21.1

Boll weight (g)

S. No.	Code No.	Entries	Raichur (I)	Coimbatore (I)	Lam (I)	Dharwad (R)	Nandyal (R)	Mean SZ
1	1211	CCHC 19-2	4.6	4.3	4.5	3.4	2.0	3.8
2	1212	DHCC 2151	4.0	4.2	4.7	3.6	2.1	3.7
3	1213	DHCC 2001	4.0	3.7	4.6	3.1	1.5	3.4
4	1214	Suraj (ZC)	4.2	4.5	4.7	4.2	2.2	4.0
5	1215	DHCC 2002	4.0	3.7	4.0	3.2	2.0	3.4
6	1216	DHCC 1902	3.5	3.6	5.1	3.2	2.0	3.5
7	1217	CNH 18529	3.9	3.6	4.7	3.8	2.4	3.7
8	1218	DHCC 1901	4.0	3.5	4.4	3.2	2.0	3.4
9	1219	Local Check	4.2	3.8	4.6	3.1	2.7	3.7
10	1220	CCHC 19-1	3.9	4.2	4.5	3.3	2.6	3.7
11	1221	LHCC 23	4.1	4.0	4.6	2.0	2.1	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	1231	TSH 383	1460	2693	1970	1368	1873	11
2	1232	TSH 387	2082	2468	2771	1972	2323	2
3	1233	RAH 1083	2456	2297	2585	1840	2294	4
4	1234	TCH 1941	1454	1988	2305	601	1587	13
5	1235	ZC (Suraj)	2303	2585	1974	1183	2011	10
6	1236	SHSV 14	1383	1928	2039	1106	1614	12
7	1237	CCH 19-2	1842	2326	2929	1147	2061	7
8	1238	RAH 1082	1920	2475	2631	1636	2166	6
9	1239	Local Check	1388	2814	2412	1575	2047	9
10	1240	CPD 1902	2378	2562	2480	1781	2300	3
11	1241	RAH 1046	2076	2319	2888	1541	2206	5
12	1242	RHC 1409	2149	1419	2641	1981	2048	8
13	1243	RAH 1081	2532	2425	2791	1792	2385	1
CD @ 5 %			248	237	593	233		
CV %			8	10	14	9		
Local Checks			ARBH 813	BGDS 1063	NDLH 1938	SVPR 6		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Arabhavi	Raichur	Lam	Srivilliputhur	Mean SZ
1	1231	TSH 383	486	932	709	480	652
2	1232	TSH 387	779	845	1006	642	818
3	1233	RAH 1083	1014	882	842	605	836
4	1234	TCH 1941	553	715	777	193	560
5	1235	ZC (Suraj)	896	932	760	410	750
6	1236	SHSV 14	462	610	741	402	554
7	1237	CCH 19-2	597	739	996	355	672
8	1238	RAH 1082	701	892	928	577	774
9	1239	Local Check	508	914	874	504	700
10	1240	CPD 1902	939	950	896	647	858
11	1241	RAH 1046	780	833	1061	571	811
12	1242	RHC 1409	838	521	886	703	737
13	1243	RAH 1081	1046	944	983	710	921



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

Ginning outturn (%)

S. No.	Code No.	Entries	Arabhavi	Raichur	Lam	Srivilliputhur	Mean SZ
1	1231	TSH 383	33.3	34.6	36.0	35.1	34.7
2	1232	TSH 387	37.4	34.2	36.4	35.1	35.8
3	1233	RAH 1083	41.3	38.4	32.4	35.4	36.9
4	1234	TCH 1941	38.0	35.9	33.7	32.4	35.0
5	1235	ZC (Suraj)	38.9	36.1	38.9	34.7	37.2
6	1236	SHSV 14	33.4	31.7	36.5	36.5	34.5
7	1237	CCH 19-2	32.4	31.7	34.3	30.9	32.3
8	1238	RAH 1082	36.5	35.9	35.2	35.8	35.9
9	1239	Local Check	36.6	32.5	36.4	32.3	34.5
10	1240	CPD 1902	39.5	37.1	36.0	36.3	37.2
11	1241	RAH 1046	37.6	35.9	36.7	35.3	36.4
12	1242	RHC 1409	39.0	36.6	33.4	35.6	36.2
13	1243	RAH 1081	41.3	39.0	35.3	39.7	38.8

Bolls/plant

S. No.	Code No.	Entries	Arabhavi	Raichur	Lam	Srivilliputhur	Mean SZ
1	1231	TSH 383	40.1	24.6	41.7	10.3	29.2
2	1232	TSH 387	44.6	24.1	57.2	14.1	35.0
3	1233	RAH 1083	58.3	19.3	55.2	15.3	37.0
4	1234	TCH 1941	35.4	16.7	56.3	11.7	30.0
5	1235	ZC (Suraj)	51.1	25.2	56.5	12.0	36.2
6	1236	SHSV 14	36.7	19.0	45.3	8.9	27.5
7	1237	CCH 19-2	43.3	23.7	64.6	8.9	35.1
8	1238	RAH 1082	45.8	24.3	45.9	13.0	32.3
9	1239	Local Check	35.7	27.2	61.8	14.7	34.9
10	1240	CPD 1902	54.1	23.9	53.4	13.6	36.3
11	1241	RAH 1046	44.3	22.0	63.6	11.7	35.4
12	1242	RHC 1409	46.4	15.7	56.3	14.7	33.3
13	1243	RAH 1081	57.6	23.7	62.7	17.1	40.3



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

S. No.	Code No.	Entries	Arabhavi	Raichur	Lam	Srivilliputhur	Mean SZ
1	1231	TSH 383	5.4	4.4	4.4	3.9	4.5
2	1232	TSH 387	5.6	5.1	4.6	4.3	4.9
3	1233	RAH 1083	4.1	4.1	4.8	3.6	4.1
4	1234	TCH 1941	5.1	4.6	3.7	3.5	4.2
5	1235	ZC (Suraj)	5.1	4.8	4.7	3.4	4.5
6	1236	SHSV 14	5.2	4.3	4.9	3.7	4.5
7	1237	CCH 19-2	5.3	4.8	4.8	3.8	4.7
8	1238	RAH 1082	4.4	4.0	4.5	3.5	4.1
9	1239	Local Check	4.9	4.4	4.0	3.6	4.2
10	1240	CPD 1902	5.1	4.7	4.5	3.8	4.5
11	1241	RAH 1046	5.5	5.0	4.8	4.8	5.0
12	1242	RHC 1409	5.0	4.1	4.5	3.9	4.4
13	1243	RAH 1081	4.6	4.2	4.6	3.5	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	1251	CCB 29	275	361	571	466	9
2	1252	CCB 26	176	481	605	543	3
3	1253	CCB 51	196	344	638	491	6
4	1254	DB 1901	341	484	617	551	2
5	1255	ZC (Rhcb-011-CZ; Suvin-SZ)	228	-	585	585	1
6	1256	SBSD 5-6	207	361	590	476	7
7	1257	CCB 2	135	481	603	542	4
8	1258	CCB 1	209	344	601	473	8
9	1259	CCB 6	164	484	569	527	5
CD @ 5 %			55	104	42		
CV %			15	14	5		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Rahuri	Dharwad	Coimbatore	Mean SZ
1	1251	CCB 29	93	120	189	155
2	1252	CCB 26	60	168	200	184
3	1253	CCB 51	60	112	221	167
4	1254	DB 1901	98	151	199	175
5	1255	ZC (Rhcb-011-CZ; Suvin-SZ)	77	-	195	195
6	1256	SBSD 5-6	64	119	201	160
7	1257	CCB 2	44	167	202	185
8	1258	CCB 1	68	108	206	157
9	1259	CCB 6	51	167	185	176

Ginning outturn (%)

S. No.	Code No.	Entries	Rahuri	Dharwad	Coimbatore	Mean SZ
1	1251	CCB 29	33.8	33.2	33.1	33.2
2	1252	CCB 26	34.0	34.9	33.1	34.0
3	1253	CCB 51	30.5	32.6	34.6	33.6
4	1254	DB 1901	28.8	31.1	32.4	31.8
5	1255	ZC (Rhcb-011-CZ; Suvin-SZ)	33.9	-	33.3	33.3
6	1256	SBSD 5-6	31.1	33.1	34.1	33.6
7	1257	CCB 2	32.5	34.8	33.6	34.2
8	1258	CCB 1	32.4	31.3	34.4	32.9
9	1259	CCB 6	31.3	34.4	32.4	33.4



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

Bolls/plant

S. No.	Code No.	Entries	Rahuri	Dharwad	Coimbatore	Mean SZ
1	1251	CCB 29	11.7	6.3	15.3	10.8
2	1252	CCB 26	10.9	8.0	13.7	10.9
3	1253	CCB 51	11.6	10.3	16.7	13.5
4	1254	DB 1901	11.5	5.8	15.0	10.4
5	1255	ZC (Rhcb-011-CZ; Suvin-SZ)	13.6	-	16.3	16.3
6	1256	SBSD 5-6	14.4	9.5	17.0	13.3
7	1257	CCB 2	13.0	7.1	17.0	12.1
8	1258	CCB 1	14.6	7.1	17.3	12.2
9	1259	CCB 6	10.8	7.3	15.7	11.5

Boll weight (g)

S. No.	Code No.	Entries	Rahuri	Dharwad	Coimbatore	Mean SZ
1	1251	CCB 29	3.1	3.7	2.8	3.2
2	1252	CCB 26	3.2	3.6	2.8	3.2
3	1253	CCB 51	2.9	3.2	3.1	3.2
4	1254	DB 1901	3.2	3.2	3.0	3.1
5	1255	ZC (Rhcb-011-CZ; Suvin-SZ)	2.3	-	2.6	2.6
6	1256	SBSD 5-6	2.7	3.6	2.6	3.1
7	1257	CCB 2	3.1	3.7	2.9	3.3
8	1258	CCB 1	3.1	3.5	2.8	3.2
9	1259	CCB 6	2.9	3.4	2.6	3.0



Br 04b – Coordinated Varietal Trial - *G. hirsutum* (South Zone)**Seed Cotton Yield (Kg/ha)**

S. No.	Code No.	Entries	Dharwad	Nandyal	Perambalur	Mean SZ	Rank
1	1261	NDLH 2071-2	1001	502	520	674	9
2	1262	RAH 1081	1136	547	768	817	4
3	1263	ZC (Sahana)	1322	369	760	817	4
4	1264	CCH 19-2	1153	400	815	789	6
5	1265	NDLH 2056-4	1178	641	694	838	3
6	1266	Local Check	1702	640	1044	1129	1
7	1267	CNH 119	1078	313	738	710	7
8	1268	QC (Suraj)	1406	396	875	892	2
9	1269	AKH 2013-3	1132	564	425	707	8
		CD @ 5 %	136	116	139		
		CV %	6	14	13		
		Local Checks	ARBH 813	Sivanandi	KC 3		

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Dharwad	Nandyal	Perambalur	Mean SZ
1	1261	NDLH 2071-2	333	159	153	215
2	1262	RAH 1081	382	200	252	278
3	1263	ZC (Sahana)	444	135	263	280
4	1264	CCH 19-2	384	124	224	244
5	1265	NDLH 2056-4	396	194	212	267
6	1266	Local Check	562	214	288	355
7	1267	CNH 119	366	111	257	245
8	1268	QC (Suraj)	471	137	278	295
9	1269	AKH 2013-3	378	169	120	222

Ginning outturn (%)

S. No.	Code No.	Entries	Dharwad	Nandyal	Perambalur	Mean SZ
1	1261	NDLH 2071-2	33.3	31.7	29.5	31.5
2	1262	RAH 1081	33.6	36.6	32.8	34.3
3	1263	ZC (Sahana)	33.6	36.5	34.5	34.9
4	1264	CCH 19-2	33.3	31.1	27.5	30.6
5	1265	NDLH 2056-4	33.6	30.2	30.6	31.5
6	1266	Local Check	33.0	33.5	27.6	31.4
7	1267	CNH 119	34.0	35.4	34.8	34.7
8	1268	QC (Suraj)	33.5	34.6	31.8	33.3
9	1269	AKH 2013-3	33.4	30.0	28.2	30.5



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

Bolls/plant

S. No.	Code No.	Entries	Dharwad	Nandyal	Perambalur	Mean SZ
1	1261	NDLH 2071-2	14.9	10.0	19.2	14.7
2	1262	RAH 1081	11.7	9.5	13.8	11.7
3	1263	ZC (Sahana)	11.7	9.7	14.6	12.0
4	1264	CCH 19-2	12.3	8.1	18.3	12.9
5	1265	NDLH 2056-4	13.6	14.1	14.2	14.0
6	1266	Local Check	11.7	11.3	16.8	13.3
7	1267	CNH 119	11.3	9.1	12.1	10.8
8	1268	QC (Suraj)	11.3	9.1	17.7	12.7
9	1269	AKH 2013-3	11.7	14.1	12.7	12.8

Boll weight (g)

S. No.	Code No.	Entries	Dharwad	Nandyal	Perambalur	Mean SZ
1	1261	NDLH 2071-2	4.8	3.0	5.1	4.3
2	1262	RAH 1081	4.2	2.7	4.3	3.8
3	1263	ZC (Sahana)	4.8	2.7	3.6	3.7
4	1264	CCH 19-2	5.5	2.7	5.5	4.6
5	1265	NDLH 2056-4	4.8	3.3	5.8	4.6
6	1266	Local Check	4.9	3.2	3.8	4.0
7	1267	CNH 119	5.4	2.5	4.5	4.1
8	1268	QC (Suraj)	5.3	2.9	4.7	4.3
9	1269	AKH 2013-3	5.8	3.5	5.1	4.8



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	1271	DWDa 2051	553	357		455	9
2	1272	MDL 2674	652	712		682	1
3	1273	CNA 1072	683	480		582	4
4	1274	PA 887	376	512		444	10
5	1275	ZC (DLSa 17)	553	490		522	6
6	1276	NDLA 3104-4	548	561		555	5
7	1277	PA 888	321	600		461	8
8	1278	CNA 1075	45	249		147	14
9	1279	CNA 2034	622	675		649	2
10	1280	PA 898	446	387		417	12
11	1281	CNA 1071	625	238		432	11
12	1282	PAIG 411	475	348		412	13
13	1283	MDL ABB1	534	505		520	7
14	1284	Local Check	540	736		638	3
CD @ 5 %			142	105.3			
CV %			17	12.8			
Local Checks			AKA 235	Yaganti	K 12		

*Vitiated

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Dharwad	Nandyal	Mean SZ
1	1271	DWDa 2051	198	113	156
2	1272	MDL 2674	277	270	274
3	1273	CNA 1072	240	153	197
4	1274	PA 887	138	162	150
5	1275	ZC (DLSa 17)	198	159	179
6	1276	NDLA 3104-4	209	194	202
7	1277	PA 888	116	188	152
8	1278	CNA 1075	15	84	50
9	1279	CNA 2034	231	233	232
10	1280	PA 898	152	136	144
11	1281	CNA 1071	236	82	159
12	1282	PAIG 411	171	114	143
13	1283	MDL ABB1	228	190	209
14	1284	Local Check	192	249	221



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

Ginning outturn (%)

S. No.	Code No.	Entries	Dharwad	Nandyal	Mean SZ
1	1271	DWDa 2051	35.8	31.6	34
2	1272	MDL 2674	42.5	38.0	40
3	1273	CNA 1072	35.1	32.0	34
4	1274	PA 887	36.7	31.6	34
5	1275	ZC (DLSa 17)	35.7	32.4	34
6	1276	NDLA 3104-4	38.1	34.6	36
7	1277	PA 888	36.2	31.4	34
8	1278	CNA 1075	34.4	33.6	34
9	1279	CNA 2034	37.1	34.6	36
10	1280	PA 898	34.1	35.2	35
11	1281	CNA 1071	37.7	34.3	36
12	1282	PAIG 411	36.0	32.6	34
13	1283	MDL ABB1	42.6	37.6	40
14	1284	Local Check	35.5	33.8	35

Bolls/plant

S. No.	Code No.	Entries	Dharwad	Nandyal	Mean SZ
1	1271	DWDa 2051	6.2	20.1	13.2
2	1272	MDL 2674	6.0	17.7	11.8
3	1273	CNA 1072	5.9	19.7	12.8
4	1274	PA 887	5.9	19.2	12.6
5	1275	ZC (DLSa 17)	6.5	18.0	12.3
6	1276	NDLA 3104-4	6.5	18.4	12.5
7	1277	PA 888	6.9	13.9	10.4
8	1278	CNA 1075	6.0	17.9	12.0
9	1279	CNA 2034	6.0	18.3	12.2
10	1280	PA 898	6.9	16.0	11.5
11	1281	CNA 1071	5.7	16.9	11.3
12	1282	PAIG 411	5.3	17.7	11.5
13	1283	MDL ABB1	6.0	11.9	8.9
14	1284	Local Check	5.9	23.9	14.9



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

S. No.	Code No.	Entries	Dharwad	Nandyal	Mean SZ
1	1271	DWDa 2051	2.7	2.6	2.7
2	1272	MDL 2674	3.3	2.7	3.0
3	1273	CNA 1072	2.9	2.7	2.8
4	1274	PA 887	2.8	2.5	2.7
5	1275	ZC (DLSa 17)	2.6	2.1	2.4
6	1276	NDLA 3104-4	2.7	3.1	2.9
7	1277	PA 888	2.8	2.9	2.9
8	1278	CNA 1075	2.3	2.3	2.3
9	1279	CNA 2034	2.6	1.9	2.3
10	1280	PA 898	3.1	2.6	2.9
11	1281	CNA 1071	2.4	1.7	2.1
12	1282	PAIG 411	2.8	2.7	2.8
13	1283	MDL ABB1	3.9	2.4	3.2
14	1284	Local Check	2.8	2.7	2.8

Br 24 (CC) Coordinated Varietal Trial of Naturally Coloured *G. arboreum***Seed Cotton Yield (Kg/ha)**

S. No.	Code No.	Entries	Kovilpatti*	Dharwad	Nandyal	Mean SZ	Rank
1	1291	DDCC 2151		537	682	609	3
2	1292	DDCC 1 (CC)		538	668	603	4
3	1293	DDCC 2001		517	665	591	6
4	1294	Local Check		487	1055	771	1
5	1295	DDCC 1902		512	695	603	4
6	1296	DDCC 1901		553	694	624	2
		CD @ 5 %		114	142.3		
		CV %		14	12.7		
		Local Checks	K 12	AK-235	Yaganti		

*Vitiated



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

Lint Yield (kg/ha)

S. No.	Code No.	Entries	Dharwad	Nandyal	Mean SZ
1	1291	DDCC 2151	180	235	207
2	1292	DDCC 1 (CC)	181	228	204
3	1293	DDCC 2001	172	168	170
4	1294	Local Check	151	382	266
5	1295	DDCC 1902	172	226	199
6	1296	DDCC 1901	185	235	210

Ginning outturn (%)

S. No.	Code No.	Entries	Dharwad (R)	Nandyal (R)	Mean SZ
1	1291	DDCC 2151	33.5	34.5	34.0
2	1292	DDCC 1 (CC)	33.6	34.1	33.9
3	1293	DDCC 2001	33.3	25.2	29.3
4	1294	Local Check	31.0	36.2	33.6
5	1295	DDCC 1902	33.5	32.5	33.0
6	1296	DDCC 1901	33.5	33.8	33.7

Bolls/plant

S. No.	Code No.	Entries	Dharwad (R)	Nandyal (R)	Mean SZ
1	1291	DDCC 2151	5.2	15.0	10.1
2	1292	DDCC 1 (CC)	5.1	14.0	9.5
3	1293	DDCC 2001	4.9	15.8	10.4
4	1294	Local Check	5.0	19.6	12.3
5	1295	DDCC 1902	4.8	23.5	14.1
6	1296	DDCC 1901	5.7	17.1	11.4

Boll weight (g)

S. No.	Code No.	Entries	Dharwad (R)	Nandyal (R)	Mean SZ
1	1291	DDCC 2151	2.1	2.0	2.0
2	1292	DDCC 1 (CC)	1.7	1.9	1.8
3	1293	DDCC 2001	1.8	2.0	1.9
4	1294	Local Check	2.2	2.1	2.1
5	1295	DDCC 1902	2.1	2.0	2.1
6	1296	DDCC 1901	1.7	1.8	1.7



Report on Pre-Breeding Activities

PAU, Faridkot

The interspecific F_1 hybrids derived from *G. hirsutum* $\times$ *G. armourianum* crosses were screened for CLCuD resistance. CLCuD resistance was observed to be dominant over its susceptibility. Backcrosses with the *hirsutum* parent were attempted and a few BC_1F_1 seeds were obtained.

NAU, Surat

Crosses between available wild species and cultivated diploid and tetraploid cotton species:

{{(G-6 X *G. anomalum*) X *G. tomentosum*} X G.Cot.10 – for Resistance to diseases and jassids, good fiber quality

(Karnugani-1 X *G. stocksii*) X G.Cot.10 - Strong fiber and resistant to leaf curl virus

Above derivatives were 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 2021-22 season.

Progress Report:

Female	Male	Number of Cross attempted	No of bolls set	No. of seeds harvested
{{(G-6 X <i>G. anomalum</i>) X <i>G. tomentosum</i> } X G.Cot.10	G.Cot.10	507	Crosses were not succeed.	-
(Karnugani-1 X <i>G. stocksii</i>) X G.Cot.10 -	G.Cot.10	480	Crosses were not succeed.	-
{{(G-6 X <i>G. anomalum</i>) X <i>G. tomentosum</i> } X G.Cot.10	GN.Cot.22	600	Three bolls were set and picked successfully. To be grown next year	4
(Karnugani-1 X <i>G. stocksii</i>) X G.Cot.10 -	GN.Cot.22	540	Two boll set and picked successfully. To be grown next year	2



Table : Evaluation of Pre Breeding material received from different AICRP Centres for Component traits of Seed Cotton Yield at Surat 2021-22

Sr. No.	Code	Sponsoring Centers	No. of Dibbles Sown	Final Plant Stand	Plant Height (cm)	Seed Cotton Yield (kg/ha)	Boll Weight (g)	No. of Bolls/ Plant	Lint Index (g)	Seed Index (g)	Ginning outturn (%)
1	<i>G. arboreum</i> x <i>G. anomalum</i> (Stable line)	MPKV, Rahuri	612	408	202.2	355	1.3	18.3	3.7	7.5	32.8
2	PAU Bt 3 x <i>G. armourianum</i>	PAU, Faridkot	12	2	89.5	NO Boll set	NO Boll set	NO Boll set	NO Boll set	NO Boll set	NO Boll set
3	F Bt 1904 x <i>G. armourianum</i>	PAU, Faridkot	12	1	60.0	NO Boll set	NO Boll set	NO Boll set	NO Boll set	NO Boll set	NO Boll set
4	G Bt 1908 x <i>G. armourianum</i>	PAU, Faridkot	24	16	118.4	NO Boll set	NO Boll set	NO Boll set	NO Boll set	NO Boll set	NO Boll set
5	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-134-2	ICAR, CICR Nagpur	24	19	132.4	169	2.0	10.8	3.4	7.5	31.5
6	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-115-2	ICAR, CICR Nagpur	24	19	125.4	198	2.1	11.3	4.5	8.5	34.6
7	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-118-1	ICAR, CICR Nagpur	24	19	138.8	201	1.8	12.5	3.9	8.0	33.0
8	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-126-1	ICAR, CICR Nagpur	24	16	141.2	428	2.1	19.5	3.1	7.5	29.5
9	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-113-5	ICAR, CICR Nagpur	24	20	144.0	274	2.1	13.4	3.7	7.5	33.2
10	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-125-2	ICAR, CICR Nagpur	24	19	149.0	552	2.3	20.2	4.5	8.5	34.5
11	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-119-1	ICAR, CICR Nagpur	24	20	144.6	185	1.8	10.6	3.7	7.0	34.4
12	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-122-1	ICAR, CICR Nagpur	24	19	169.0	305	1.9	14.9	4.5	8.0	35.8
13	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-82-2	ICAR, CICR Nagpur	24	22	148.0	241	2.3	11.3	4.0	6.5	38.2
14	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-99-1	ICAR, CICR Nagpur	24	20	185.2	899	2.3	28.4	3.9	7.5	34.1



Table: Evaluation of Pre Breeding material received from different AICRP Centers for Fibre quality traits at Surat 2021-22

Sr. No.	Code	UHML (mm)	UI (%)	Mic (MV)	Tenacity (3.2mm g/t)	Elg %
1	<i>G.arboreum</i> x <i>G.anomalum</i> (Stable line)	25.3	82	6.2	26.0	5.8
2	PAU Bt 3 x <i>G.armourianum</i>	NO Sample	NO Sample	NO Sample	NO Sample	NO Sample
3	F Bt 1904 x <i>G.armourianum</i>	NO Sample	NO Sample	NO Sample	NO Sample	NO Sample
4	G Bt 1908 x <i>G.armourianum</i>	NO Sample	NO Sample	NO Sample	NO Sample	NO Sample
5	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-134-2	24.6	82	6.1	25.9	5.8
6	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-115-2	23.1	80	6.2	23.6	5.5
7	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-118-1	23.7	81	6.1	25.1	5.6
8	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-126-1	22.8	80	6.5	24.1	5.5
9	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-113-5	24.0	82	6.4	26.6	5.8
10	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-125-2	26.3	81	5.4	25.1	5.6
11	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-119-1	25.7	83	5.9	26.0	5.6
12	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-122-1	23.9	80	6.1	25.5	5.6
13	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-82-2	24.4	82	6.2	25.7	5.7
14	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-99-1	24.8	82	6.4	25.4	5.6



Table : Evaluation of Pre Breeding materials against different diseases at Surat (Year 2021-22)

Sr. No.	Entries	Bacterial leaf blight			Corynespora leaf spot		
		PDI	Max Grade	Reaction	PDI	Max Grade	Reaction
1	<i>G.arboreum</i> x <i>G.anomalum</i> (Stable line)	0.00	0	DF	0.00	0	DF
2	PAU Bt 3 x <i>G.armourianum</i>	7.50	1	R	0.00	0	DF
3	F Bt 1904 x <i>G.armourianum</i>	2.00	1	R	0.00	0	DF
4	G Bt 1908 x <i>G.armourianum</i>	27.83	2	MR	0.00	0	DF
5	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-134-2	0.00	0	DF	0.00	0	DF
6	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-115-2	0.00	0	DF	0.00	0	DF
7	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-118-1	0.00	0	DF	0.00	0	DF
8	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-126-1	0.00	0	DF	0.00	0	DF
9	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-113-5	0.00	0	DF	0.00	0	DF
10	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-125-2	0.00	0	DF	0.00	0	DF
11	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-119-1	0.00	0	DF	0.00	0	DF
12	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-122-1	0.00	0	DF	0.00	0	DF
13	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-82-2	0.00	0	DF	0.00	0	DF
14	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-99-1	0.00	0	DF	0.00	0	DF

Interpretations and conclusion:

Total fourteen crosses and entries of pre breeding materials were evaluated in this trial under natural condition from which, one cross *G. Bt 1908* x *G. armourianum* found moderately resistant in the grade 2 and two crosses *i.e.* *PAU Bt 3* x *G. armourianum* and *F Bt 1904* x *G. armourianum* observed as resistant in the grade 1 and remaining all other were disease free from the Bacterial leaf blight infection. In case of *Corynespora* leaf spot disease and *Alternaria* leaf spot disease, all the crosses and entries were disease free from the infection.



Table: Evaluation of pre-breeding materials against insect pests at Surat (2021-22)

Sr. No.	Entry No.	JIG	Leafhopper (Avg. of 3 leaves/plant)	Thrips (Avg. of 3 leaves/plant)	Whitefly (Avg. of 3 leaves/plant)	Aphid (Avg. of 3 leaves/plant)	Natural enemies/plant
		OV	OV	OV	OV	OV	OV
1	<i>G.arboreum</i> x <i>G.anomalum</i> (SL)	I	1.20	4.13	1.47	2.87	0.53
2	PAU Bt 3 x <i>G.armourianum</i>	I	0.27	2.07	1.87	2.33	0.13
3	F Bt 1904 x <i>G.armourianum</i>	I	0.13	2.53	1.60	2.53	0.40
4	G Bt 1908 x <i>G.armourianum</i>	I	1.07	5.67	1.80	2.87	0.53
5	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-134-2	I	1.60	4.47	1.67	2.27	0.47
6	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-115-2	I	1.47	6.40	2.27	3.13	0.53
7	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-118-1	I	1.47	3.73	1.73	2.33	0.33
8	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-126-1	I	1.53	3.67	1.53	3.40	0.40
9	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-113-5	I	1.60	4.47	2.13	2.80	0.20
10	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-125-2	I	1.13	5.27	1.73	2.47	0.40
11	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-119-1	I	1.20	6.80	1.47	2.47	0.40
12	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-122-1	I	1.00	4.33	1.47	3.07	0.00
13	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-82-2	I	1.40	5.00	2.00	2.47	0.07
14	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-99-1	I	1.53	5.13	1.93	3.13	0.07
Mean			1.19	4.55	1.76	2.72	0.32
OV- Original values							



Table : Evaluation of pre-breeding materials against insect pests at Surat (2021-22)

Sr. No.	Entry No.	No. of <i>E. vittella</i> larvae/5 plants	No. of <i>H. armigera</i> larvae/5 plants	No. of <i>S. litura</i> larvae/5 plants	Rosette flower (%) by PBW	% Green bolls damage by HA and SBW	% Green bolls damage by PBW (Based on 10 bolls)	% Open bolls damage/plant	% Locules damage/plant
		OV	OV	OV	OV	OV	OV	OV	OV
1	<i>G. arboreum</i> x <i>G. anomalum</i> (SL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	PAU Bt 3 x <i>G. armourianum</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	F Bt 1904 x <i>G. armourianum</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	G Bt 1908 x <i>G. armourianum</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-134-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-115-2	0.00	0.00	0.00	0.00	1.40	0.00	2.00	1.12
7	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-118-1	0.00	0.00	0.00	0.00	2.00	0.00	4.00	2.15
8	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-126-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-113-5	0.00	0.00	0.00	0.00	2.45	0.00	0.00	0.00
10	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-125-2	0.00	0.00	0.00	0.00	2.67	0.00	0.00	0.00
11	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-119-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-122-1	0.00	0.00	0.00	0.00	2.27	0.00	0.00	0.00
13	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-82-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	<i>G. arboreum</i> x <i>G. longicalyx</i> SP-99-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mean		0.00	0.00	0.00	0.00	0.77	0.00	0.43	0.23
OV- Original values									

Sucking pests and bollworms reaction (Table above) :

The population of sucking pests (leafhopper, aphid, thrips and whitefly) remained below ETL in evaluated pre breeding materials. The jassid injury grade (I) in all screened entries. The incidence of bollworm complex in case of *Helicoverpa* and Spotted bollworm damage were observed in *G. arboreum* x *G. longicalyx* SP-115-2, *G. arboreum* x *G. longicalyx* SP-118-1, *G. arboreum* x *G. longicalyx* SP-113-5, *G. arboreum* x *G. longicalyx* SP-125-2 and *G. arboreum* x *G. longicalyx* SP-122-1 but remained below ETL (<5%). No flower and green boll damage by pink bollworm were observed in any of the tested entries.



MPKV, Rahuri**A) Selfing of segregating material received from ICAR-Central Institute for Cotton Research, Regional Station, Coimbatore**

- Sixteen lines were sown on 05/07/2021 with 8 Rows of 6-meter length, each with 90x60 cm spacing.
- Optimum germination was observed in all the lines, except in two lines.
- In lines F Bt 1904 x *G. armourianum* F₁ and PAU BE 3 x *G. armourianum* F₁, germination was low, and we got only 3 and 4 plants, respectively.
- Flowering was observed in all the sixteen lines, and self-pollination was done in all the lines.
- Optimum seed set was observed in 13 lines, and seeds were collected from selfed flowers.
- In three lines, viz. F Bt 1904 x *G. armourianum* F₁, PAU BE 3 x *G. armourianum* F₁ and F. Bt. 1908 x *G. armourianum* F₁, no seed set was observed.

Details of lines used for selfing is given in the table below

S. No.	Segregating Material	Seed Germination	Seed Set after selfing
1.	<i>G. a</i> x <i>G. r.</i> 99-1	Optimum	Yes
2.	<i>G. a</i> x <i>G. r.</i> 125-2	Optimum	Yes
3.	<i>G. a</i> x <i>G. r.</i> 113-5	Optimum	Yes
4.	<i>G. a</i> x <i>G. r.</i> 126-1	Optimum	Yes
5.	<i>G. a</i> x <i>G. r.</i> 122-1	Optimum	Yes
6.	<i>G. a</i> x <i>G. r.</i> 118-1	Optimum	Yes
7.	<i>G. a</i> x <i>G. r.</i> 115-2	Optimum	Yes
8.	<i>G. a</i> x <i>G. r.</i> 119-1	Optimum	Yes
9.	<i>G. a</i> x <i>G. r.</i> 134-2	Optimum	Yes
10.	<i>G. a</i> x <i>G. r.</i> 82-2	Optimum	Yes
11.	G.N. cot-22(GISV-218)	Optimum	Yes
12.	F. Bt. 1908 x <i>G. armourianum</i> F ₁	Optimum	No
13.	GISV 322x CCH-15-1 (Seg. Line)	Optimum	Yes
14.	F Bt 1904 x <i>G. armourianum</i> F ₁	Low	No
15.	PAU BE 3 x <i>G. armourianum</i> F ₁	Low	No
16.	GISV-316 x BGDS-1033 (Seg. Line)	Optimum	Yes

B) Interspecific hybridization

- Interspecific hybridization was attempted in two crosses (*G. arboreum* x *G. thurberi* and *G. arboreum* x *G. raimondii*); however, no seed set was observed after crossing



CICR, Nagpur

Twenty-five (25) Wild species of *Gossypium* were conserved in the wild species garden. In addition, 21 accessions of 9 different species were received from USDA and efforts are being made to establish them in pots to enrich our existing collection of wild species as mentioned in the table below:

Table: List of wild species received from USDA: October 2021

S. No.	Accession	Species name
1	EC1092748	<i>Gossypium areysianum</i>
2	EC1092749	<i>Gossypium costulatum</i>
3	EC1092750	<i>Gossypium costulatum</i>
4	EC1092751	<i>Gossypium darwinii</i>
5	EC1092252	<i>Gossypium darwinii</i>
6	EC1092253	<i>Gossypium darwinii</i>
7	EC1092255	<i>Gossypium gossypoides</i>
8	EC1092254	<i>Gossypium gossypoides</i>
9	EC1092256	<i>Gossypium gossypoides</i>
10	EC1092257	<i>Gossypium gossypoides</i>
11	EC1092258	<i>Gossypium incanum</i>
12	EC1092260	<i>Gossypium mustelinum</i>
13	EC1092261	<i>Gossypium mustelinum</i>
14	EC1092262	<i>Gossypium mustelinum</i>
15	-	<i>Gossypium nobile</i>
16	EC1092265	<i>Gossypium sturtianum</i>
17	EC1092264	<i>Gossypium sturtianum</i>
18	EC1092263	<i>Gossypium sturtianum</i>
19	EC1092268	<i>Gossypium tomentosum</i>
20	EC1092266	<i>Gossypium tomentosum</i>
21	EC1092267	<i>Gossypium tomentosum</i>

Three wild species namely *G. stocksii* (drought tolerance), *G. capitata virides* (Bacterial Blight tolerance) & *G. davidsonii* (tolerance to sucking pests, salinity & Bacterial blight) were utilised in crossing program with the cultivated species for introgression of the specified traits & F1 hybrid seeds were harvested.

Segregating lines of various centres were received from AICCIP, Coimbatore Centre as listed below vide letter dated 11.06.2021 and were evaluated and utilized in breeding programme:

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



All plants in the segregating material [(PAUBt3 x *G. armourianum* {F1}, F Bt 1904 x *G. armourianum* {F1} and F Bt 1908 x *G. armourianum* {F1}] from PAU, Faridkot were sterile and tolerant to sucking pests. Cuttings of these plants have been established in the green house for further studies.

Stable lines of *G. arboreum* x *G. anomalum* from MPKV, Rahuri were fertile and harvested seed cotton will be evaluated for fibre traits. Segregating line of the cross GISV 322 X CCH 15-1 were found to be Jassid tolerant. Seed cotton harvested from segregating line of the cross GISV 316 x BGDS 1033 was ginned and Ginning Out Turn was recorded as 42%. Notified variety GISV 218 (G. N. Cot. 22) was Jassid tolerant.

TNAU, Coimbatore

Evaluation of pre-breeding lines shared among the centres:

S. No.	Details of the material	Centre	Characters	Status
1	F Bt 1908 x <i>Gossypium armourianum</i>	PAU, Faridkot	Sucking pest tolerance	Crossing was done by using CO 14 ELS cotton) as female parent. The crossed bolls were harvested and to be evaluated during 2022-23
2	PAU Bt 3 x <i>Gossypium armourianum</i>			Cuttings of these F ₁ plants were planted in the wild species garden and to be used for hybridization during 2022-23
3	F Bt 1904 x <i>Gossypium armourianum</i>			
4	<i>Gossypium arboreum</i> x <i>G. anomalum</i> (Stable line)	MPKV, Rahuri	Fibre quality	Selfing had been done and selfed bolls were harvested separately and to be used for hybridization during 2022-23 and for generation advancement
5	Segregating material GISV 322 x CCH 15-1	NAU, Surat	Jassid tolerance	
6	Segregating material GISV 316 x BGDS 1033		High Ginning outturn	
7	GISV 318 (G.N. Cot.22)		Jassid tolerance	
8	F ₅ generation of the cross <i>Gossypium arboreum</i> x <i>Gossypium longicalyx</i> (SP- 88-2, SP- 99-1, SP-113-5, SP-115-2, SP-118-1, SP-119-1, SP-122-1, SP-125-2, SP-126-1, SP-134-2)	ICAR-CICR, Nagpur		



CICR, Coimbatore

Attempting new crosses with wild species: No seed set was found in crosses attempted with *G. aridum*. The sterile triploid lines of the cross *G. hirsutum* x *G. aridum* were pollinated with *hirsutum* in which no seed set were found. The sterile plants are maintained in the wild garden. No seed set was found in the triploid triphyllum when pollinated with *hirsutum* and *barbadense* (more than 250 flowers were pollinated).

Evaluation of pre-breeding lines shared among the centres:

Entries	Plant height (cm)	No. of Sympodia	No. of Bolls/plant	Boll Weight (g)	Single Plant Yield (g)
NDLHxwild Barbadense (F1)	132.6	18	24	5.76	78.96
NDLH x G.armourianum (F1)	142.6	Sterile			
New prebreeding crosses					
GISV 316 X BGDS 1063	150.6	18	21	3.88	30.23
G.N.Cot 22	145.7	16	19	4.53	18.33
FBt 1968 X G.armourianum (F1)	153.3	Sterile			
FBt 1901 X G.armourianum (F1)	132.6	Sterile			
G.arboreum x G.anomalum	148.7	Sterile			
FBt 1904 X G.armourianum (F1)	140.2	Sterile			
GISV 322 x CCH 15-1 (Seg line)	129.2	21	29	2.94	42.98
PAU Bt 3 x G armourianum (F1)	140.7	Sterile			
AICRP Prebreeding crosses					
G.a x G.l (99-1)	109.2	21	17	2.7	19.18
G.a x G.l (115-2)	115.5	20	25	3.2	46.54
G.a x G.l (125-2)	117.5	21	23	2.7	40.79
G.a x G.l (118-1)	116.5	20	12	3.5	12.90
G.a x G.l (119-1)	106.9	21	21	3.7	30.38
G.a x G.l (134-2)	110.8	17	25	3.7	49.61
G.a x G.l (122-1)	105.1	18	37	3.5	86.01
G.a x G.l (82-2)	102.1	19	29	3.7	55.80
G.a x G.l (126-1)	104.3	17	29	4.7	58.74
G.a x G.l (113-5)	109.4	20	32	3.4	59.87



All India Coordinated
Research Project on Cotton

Annual Report:2021-22

Report of Crop Production



Project Coordinator (Cotton Improvement)
All India Coordinated Research Project on Cotton
(Indian Council of Agricultural Research)
Central Institute for Cotton Research
Regional Station, Coimbatore- 641003
www.cicr.org.in

CROP PRODUCTION

AGRONOMY, PHYSIOLOGY AND BIOCHEMISTRY

The following Experiments were undertaken during *Kharif-2021-22* at various centers of AICRP on Cotton.

AGRONOMY

Agronomy IA	Agronomic requirements of promising pre-release/recently released <i>hirsutum</i> / <i>arboreum</i> / <i>barbadense</i> genotypes including compact / hybrids of both interspecific and <i>desi</i> hybrids of cotton
Agronomy 1B	Evaluation of compact culture under HDPS with different nutrient levels.
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 VIII	Strategies to mitigate/minimize soil crust formation in cotton in North zone
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	Large scale testing of proven intervention

PHYSIOLOGY and BIOCHEMISTRY

PHY 1	PGR for optimum morpho- frame and enhanced yield
PHY2	Preparing for climate change - Growth and development of <i>arboreum</i> cotton in response to growth regulators
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 CHEM1A	Screening of cotton genotypes for drought and salinity tolerance
BIO CHEM1B	Estimation of seed oil, gossypol and protein
BIO CHEM 2	Biochemical basis of tolerance/susceptible of pest and disease
BIO CHEM 2A	Evaluation of non Bt genotypes for biochemical basis of susceptible/ tolerance to sucking pests
BIO CHEM 2B	Evaluation of Biochemical basis of resistance against CLCuD
BIO CHEM 2C	Evaluation of Biochemical basis of Tobacco streak virus

The trials conducted zone-wise were as follows:

North zone	Faridkot, Bathinda, Sirsa, Hisar and Sriganaganagar
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⁻¹brids of cotton

Productivity of cotton can considerably be improved by providing an optimum spacing and nutrient requirement. Fulfilment of nutritional requirements of the crop is essential for achieving the higher yields and fiber quality. Among the various agriculture input, nutrients have been found to better responsive to the cotton production. So, adequate nutrients are essential to achieve the potential yield of cotton. It is obvious that the production and productivity of cotton can be improved by introduction of higher yielding genotypes coupled with suitable agronomic practices like maintenance of optimum/ideal plant density.

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

Akola

The results of spacing and nutrient requirement of pre released *hirsutum* genotypes studies revealed that growth parameters viz. plant height, number of sympodia, number of bolls per square meter and seed cotton yield were significantly influenced by *hirsutism* genotypes. Boll weight was found nonsignificant. The seed cotton yield was significantly highest in genotype NDH-2035-5 (2206 kg ha⁻¹) followed by AKH-9-5 (Suvarna Shubhra) (1677 kg ha⁻¹). Plant height, number of bolls per square meter and length of sympodial branches were significantly influenced by plant geometry. The seed cotton yield was significantly highest (2110 kg ha⁻¹) with plant density (0.56 lakh ha⁻¹) i.e., with 60 x 30 cm² spacing which was found significantly superior over wider spacing of 60x45 cm with plant density of 0.37 lakh ha⁻¹(1773 kg ha⁻¹). There was significant response to nitrogen levels in respect of plant height, length of sympodia, number of bolls per square meter and seed cotton yield except sympodial branches, monopodial branches and boll weight. The significantly highest seed cotton yield (2151 kg ha⁻¹) was recorded in 125 % N level and which was found significantly superior over 100 % N (1897 kg ha⁻¹) and 75 % N (1776 kg ha⁻¹) (Table1). The interaction effect was found nonsignificant.



Table 1. Seed cotton yield (kg ha⁻¹) as influenced by genotypes, spacing levels and nutrient levels (NDLH-2035-5)

Treatments	V1-NDLH – 2035-5		V2-AKH 9-5 (Suvarna Shubhra-check)		Grand Mean F		
	S1. 60X30	S2.60 x 45	S1. 60X30	S2.60 x 45			
F1.75% RDN	2082	1967	1649	1407	1776		
F2.100% RDN	2382	1947	1736	1521	1897		
F3.125% RDN	2696	2161	2114	1635	2151		
Interaction (two way)	S1.60X30	S2.60x45	V1-NDLH – 2035-5	V2- AKH 9-5 (Suvarna Shubhra)	Interac tion	V1-NDLH – 2035-5	V2- AKH 9-5 (Suvarna Shubhra)
F1.75% RDN	1866	1687	2025	1528	S1.60X30	2387	1833
F2.100% RDN	2059	1734	2165	1629	S2.60x45	2025	1521
F3.125% RDN	2405	1898	2428	1874		2206	1677
Mean	2110	1773	2206	1677			
ANOVA	Genotype	Spacing	Fertilizers	VXS	VXF	VXSXF	
SE d	26.25	26.25	30.18	37.12	42.69	60.37	
CD (5%)	90.84	90.84	90.50	NS	NS	NS	

Soil parameters: pH value: 7.90, EC (dSm⁻¹): 0.12, O.C.(%) : 0.39, Available N : 234 kg ha⁻¹, P₂O₅ : 16.90 kg ha⁻¹, K₂O : 378 kg ha⁻¹, Recommended spacing: 60X30 cm, Recommended Fertilizer dose :60:30:30 Kg NPKha⁻¹, Environment : Rainfed, Total Rainfall during Cropping period : 1119.4 mm

Surat

The results revealed that seed cotton yield was significantly influenced by genotype and nitrogen levels. Genotype, GJHV 522 (G₁) recorded significantly higher seed cotton yield (1694 kg ha⁻¹) as compared to genotype G. Cot. -40 (1433 kg ha⁻¹). Among nitrogen level N₃ ;125 % RDN recorded significantly higher seed cotton yield (1658 kg ha⁻¹) which was found at par with nitrogen level N₂ (1605 kg ha⁻¹) (Table 2). All the interactions did not show any significant effect on seed cotton yield.



Table 2. Seed cotton yield (kg ha⁻¹) as influenced by genotypes, spacing levels and nutrient levels (GJHV 522)

Treatments	G1 (GJHV 522)		G2 (G. Cot. 40 LC)		Mean (Nitrogen)	ANOVA	SE d	CD (5%)
	S ₁ : 120 x 30 cm	S ₂ : 120 x 45 cm	S ₁ : 120 x 30 cm	S ₂ : 120 x 45 cm				
N1 : 75 % RDN	1565	1535	1295	1309	1426	Genotype	25.8 3	75.7 7
N2 : 100 % RDN	1685	1772	1505	1458	1605	Spacing	25.8 3	NS
N3 : 125 % RDN	1900	1704	1547	1481	1658	G x S	36.5 3	NS
Mean (Genotype)	1694		1433			Nitrogen	31.6 4	92.8 0
Mean (spacing)	S1	1583	S2	1543		G x N	44.7 4	NS
Interaction (Two way)	N1	N2	N3	S1	S2	S x N	44.7 4	NS
G1 (GJHV 522)	1550	1728	1802	1716	1671	G x S x N	63.2 8	NS
G2 (G. Cot. 40 LC)	1302	1482	1514	1449	1416			
S ₁ : 120 x 30 cm	1430	1595	1724					
S ₂ : 120 x 45 cm	1422	1615	1593					

Soil particulars: Vertisol, deep black, clay texture, pH:7.47, EC: 0.63 dS/m, Soil fertility status N: 305 kg ha⁻¹, P₂O₅: 35.07 kg ha⁻¹, K₂O: 588 kg ha⁻¹, O.C: 0.45 %, Recommended nutrient dose: 160:00:00 NPK kg ha⁻¹, Recommended Spacing:120 x 45 cm, Environment: irrigated, Total rainfall received:1318 mm

Agronomy IA: Agronomic requirements of promising pre-release released *Desi* hybrids of cotton in North Zone

Bathinda

The results of agronomic requirement study on pre released desi hybrid found that performance of tested desi cotton hybrid KR 136 varied significantly under different planting geometries and nitrogen levels. KR 136 produced significantly high seed cotton yield under planting geometry of 67.5 x 30 cm (3334 kg ha⁻¹) followed by 67.5 x 45 cm (3250 kg ha⁻¹). Significantly least yield was recorded under 67.5 x 60 cm (2830 kg ha⁻¹). Among the nitrogen levels, the highest seed cotton yield was recorded under 100% RDN (3325 kg ha⁻¹) followed by under 75%RDN (3232 kg ha⁻¹). Further increase in nitrogen to 125% RDN resulted in significant decline in seed cotton yield (2857 kg ha⁻¹) (Table 3). Interaction among the different planting geometries and nitrogen levels was nonsignificant.



Table 3. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nutrient levels (KR 136)

Treatments	S1.67.5 x 30	S2.67.5X 45	S3. 67.5X 60	Mean (Fertilizers)	ANOVA	SE d	CD (5%)
F ₁ . 75% RDN	3415	3381	2899	3232	Spacing	172.1	368
F ₂ . 100% RDN	3477	3484	3015	3325	Fertilizer s	172.1	368
F ₃ . 125% RDN	3110	2884	2576	2857	S x F	298.1	NS
Mean (spacing)	3334	3250	2830				
LD 949 at 67.5 x 45 cm with 100%RDN				3047			

Soil parameters: pH= 8.8, EC=0.19 m mhos/cm, OC (%) = 0.41, Available P_2O_5 =11.4 kg ha^{-1} & Available K_2O = 235 kg ha^{-1} , Recommended nutrients: 75 kg N ha^{-1} , Environment: irrigated

Hisar

The agronomic requirement studies on desi hybrid (KR133) at Hisar revealed that plant height, number of sympodia and boll weight were statistically at par with all three levels of nitrogen and spacings. However, significantly higher number of monopodia was recorded with 125% RDN as compared to other two nitrogen levels. Number of bolls per square metre was significantly higher with spacing of S1 (67.5 x 15 cm) and S2 (67.5 x 45 cm) than S3 (67.5 x 30 cm). The significantly highest seed cotton yield (1488 kg ha^{-1}) was recorded with spacing of S1 (67.5 x 15 cm) (Table 4).

Table 4. Seed cotton yield (kg ha^{-1}) at 160 DAS as influenced by spacing levels and nitrogen levels of Desi hybrid (KR133)

Treatments	F1 75% RDN	F2 100% RDN	F3 125% RDN	Mean (Fertilizers)	ANOVA	SE d	CD (5%)
S1.67.5 x 15	1449	1567	1447	1488	Spacing	33.76	96.23
S2.67.5X 30	1243	1282	1240	1255	Nitrogen dose	73.67	NS
S3.67.5X 45	1569	1459	1380	1469	SXN	127.6	NS
Mean (spacing)	1420	1436	1356		NXS	109.5 3	NS

Soil Particulars:pH:6.7, sandy loam, Soil available N : 144 kg ha^{-1} , P_2O_5 : 13.5 kg ha^{-1} , K_2O : 250 kg ha^{-1} & O.C.(%) : 0.47%, RDF: 90:30;0;25 N:P;Zn kg ha^{-1} , Recommended spacing: 67.5x30 cm, Environment: Irrigated, Total rainfall : 794 mm



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

Dharwad (Coloured cotton)

The data on seed cotton yield as influenced by nitrogen levels and genotypes revealed that among the two genotypes G₂ DHCC-1801 produced significantly higher seed cotton yield (2266 kg ha⁻¹) as compared to G₁ CNH-17395 (1694 kg ha⁻¹). Different planting geometry had produced on par levels of seed cotton yield per hectare. Though the seed cotton yield per plant and no of bolls per plant were differed significantly their inverse relationship of space per plant and yield had resulted to produce on par levels of seed cotton yield. Among the nitrogen levels N₃-125% RDN produced significantly higher seed cotton yield per hectare (2054 kg ha⁻¹) as compared to any other levels (Table 5). None of the interaction effects were significant.

Table 5. Seed cotton yield per hectare (kg) as affected by different planting geometry and nitrogen levels in *G. hirsutum* colour cotton genotypes

Treatments	G ₁ CNH 17395			G ₂ DHCC 1801			Mean N
Nutrients	S1: 60X30 cm	S2: 75X30 cm	s3: 90X30 cm	S1: 60X30 cm	S2: 75X30 cm	s3: 90X30 cm	
N ₁ :75%RDN	1628	1637	1624	2331	2128	2101	1908
N ₂ :100% RDN	1710	1676	1660	2327	2142	2355	1978
N ₃ :125% RDN	1718	1851	1738	2421	2215	2377	2054
Mean	1685	1721	1674	2360	2162	2277	
Interaction	S1: 60X30 CM	S2: 75X30 CM	s3: 90X30 CM		G ₁ CNH 17395	G ₂ DHCC 1801	
N ₁ :75% RDN	1979	1883	1863		1630	2187	1908
N ₂ :100% RDN	2018	1909	2008		1682	2274	1978
N ₃ :125% RDN	2070	2033	2058		1769	2338	2054
Mean S	2022	1942	1976	Mean G	1694	2266	
ANOVA	Genotype	Spacing	Nitrogen	GXS	GXN	SXN	GXSXN
SE d	82	43	36	61	50	62	87
CD at 5%	357	N/A	74	N/A	N/A	N/A	N/A

Soil type: Medium deep black, pH: 7.2, OC %: 0.45, Soil fertility status, N: 230 kg ha⁻¹, P₂O₅: 27.0 kg ha⁻¹, K₂O: 425 kg ha⁻¹, Environment: Rainfed, Recommended Nutrient levels :40:25:25 kg NPKha⁻¹, Total rainfall received: 978.2mm

Nandyal

The results revealed that significantly higher seed cotton yield (825 kg ha⁻¹) was recorded with spacing of 60 cm x 30 cm. Lower seed cotton yield (626 kg ha⁻¹) was recorded with spacing of 90 cm x 60 cm. There was significant effect of different nitrogen levels on seed cotton yield. Higher seed



cotton yield (748 kg ha^{-1}) was recorded in 100% RDN and was on par with 125 % RDN (741 kg ha^{-1}). Significantly lower seed cotton yield (663 kg ha^{-1}) was noticed with 75% RDN (Table 6).

Table 6 . Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nitrogen levels (NDLH-2035-5)

Treatments	N ₁ : 75 % RDN	N ₂ : 100 % RDN	N ₃ : 125 % RDN	Mean	Anova	SE d	SE m $\pm$	CD (5%)
S1:90X60 cm	612	641	625	626	Spacing	31	22	67
S2:90X45 cm	585	735	784	701	Nitrogen levels	31	22	67
S3:60X30 cm	793	868	814	825	S x N	54	38	NS
Mean	663	748	741					

Soil type : Deep black soil, Clay soil, pH: 8.4, OC (%):0.38%, Soil fertility status, N 139 kg ha^{-1} , P_2O_5 : 32 kg ha^{-1} , K_2O : 358 kg ha^{-1} , Environment: Rainfed, Recommended Nutrient levels : 40-20- 20 NPK kg ha^{-1} Genotypes (G): NDLH-2035-5, total rainfall received:836.3mm

Nandyal

The agronomic requirement studies of pre released genotype found that significantly higher seed cotton yield (910 kg ha^{-1}) was recorded with spacing of 60 x 30 cm. Lower seed cotton yield (693 kg ha^{-1}) was recorded with spacing of 90 x 60 cm. There was significant effect of different nitrogen levels on seed cotton yield. Higher seed cotton yield (836 kg ha^{-1}) was recorded with 125% RDN and was on par with 100 % RDN (757 kg ha^{-1}). Significantly the least seed cotton yield (719 kg ha^{-1}) was noticed with 75% RDN (Table 7).

Table 7. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nitrogen levels (RAH 1075)

Treatments	N ₁ : 75 % RDN	N ₂ : 100 % RDN	N ₃ : 125 % RDN	Mean	ANOVA	SE d	SE m $\pm$	CD (5%)
S1:90X60 cm	651	636	793	693	Spacing	29	20	62
S2: 90X45 cm	690	691	744	708	Nitrogen levels	29	20	62
S3: 60X30 cm	816	944	971	910	S x N	51	36	NS
Mean	719	757	836					

Soil type: Deep black soil, Clay soil, pH: 8.4, O.C. (%): 0.38 %, Soil fertility status, N: 130 kg ha^{-1} , P_2O_5 : 29 kg ha^{-1} , K_2O : 362 kg ha^{-1} , Environment: Rainfed Recommended Nutrient levels: 40-20- 20 NPK kg ha^{-1} Genotypes (G): RAH 1075 Total rainfall:836.3 mm



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

Raichur

The experimental results revealed that significantly higher seed cotton yield was recorded with 90 cm x 45 cm (2841 kg ha⁻¹) compared to other spacing. The increase in seed cotton yield was mainly due to increased number of bolls /plant and higher boll weight. Among fertilizer doses, higher seed cotton yield was obtained with 125% recommended nitrogen (2849 kg ha⁻¹) compared to 100% RDN (2560 kg ha⁻¹) and 75% RDN (2502 kg ha⁻¹) (Table 8). Interaction effects were found non-significant.

Table 8. Seed cotton yield (kg ha⁻¹) of RAH 1075 as influenced by spacing levels and nutrient levels

Treatments	RAH 1075			Mean (N levels)
	S1: 75 x 30 cm	S2: 90 x 30 cm	S3: 90 x 45 cm	
F1.75% RDN	2365	2507	2633	2502
F2.100%RDN	2411	2568	2699	2560
F2.125% RDN	2525	2833	3190	2849
Mean (spacing)	2434	2636	2841	
ANOVA	Spacing	N levels	Interaction	
SE d	87	87	150	
CD (5%)	275	275	NS	

Soil: Medium Black soils, Shallow and fine textured, pH:8.10, N : 260 kg ha⁻¹, P₂O₅ : 34 kg ha⁻¹, K₂O: 279 kg ha⁻¹, OC: 0.52%, Recommended :80:40:40 kg NPKha⁻¹, Recommended spacing:90 cm x 30 cm, environment: irrigated

Raichur

The experimental results revealed that significantly higher seed cotton yield was recorded with 90 x 45 cm spacing (3204 kg ha⁻¹) compared to other spacing. The increase in higher seed cotton yield was mainly due to increased number of bolls /plant and higher boll weight. Among fertilizer doses, higher seed cotton yield was obtained with 125% recommended nitrogen (3361 kg ha⁻¹) compared to 100% RDN (3141 kg ha⁻¹) and 75% RDN (3017 kg ha⁻¹). Interaction effect was found non-significant.

Table 9. Seed cotton yield (kg ha⁻¹) of CNH 17395 as influenced by spacing levels and nutrient levels

Treatments	CNH 17395			Mean (N levels)
	S1: 75 x 30 cm	S2: 90 x 30 cm	S3: 90 x 45 cm	
F1.75% RDN	2780	3012	3280	3017
F2.100% RDN	2890	3145	3387	3141
F2.125% RDN	2955	3242	3415	3204
Mean (spacing)	2868	3133	3361	
ANOVA	Spacing	N levels	Interaction	
SE d	7	150	227	
CD (5%)	21	NS	NS	



Soil: Medium Black soils, Shallow and fine textured, pH:8.10, N: 260 kg ha⁻¹, P₂O₅: 34 kg ha⁻¹, K₂O: 279 kg ha⁻¹, OC: 0.52%, Recommended :80:40:40 kg NPKha⁻¹, Recommended spacing:90 cm x 30 cm, environment: irrigated

Raichur

The experimental results revealed that significantly higher seed cotton yield was recorded with 90 x 45 cm (2936 kg ha⁻¹) compared to other spacing. The increase in higher seed cotton yield was mainly due to increased number of bolls /plant and higher boll weight. Among fertilizer doses, significantly higher seed cotton yield was obtained with 125% recommended nitrogen (3069 kg ha⁻¹) compared to 100% RDN (2652kg ha⁻¹) and 75% RDN (2469kg ha⁻¹) (Table 10). Interaction effect was found non-significant.

Table 10. Seed cotton yield (kg ha⁻¹) DB 16301 as influenced by spacing and nitrogen levels

Treatments	DB 16301			Mean (N levels)
	S1: 75 x 30 cm	S2: 90 x 30 cm	S3: 90 x 45 cm	
F1.75% RDN	2313	2447	2647	2469
F2.100% RDN	2484	2670	2801	2652
F2.125% RDN)	2835	3011	3359	3069
Mean (spacing)	2544	2704	2936	
ANOVA	Spacing	N levels	Interaction	
SE d	18	125	216	
CD (5%)	52	275	NS	

Soil: Medium Black soils, Shallow and fine textured, pH:8.10, Soil fertility status N: 260 kg ha⁻¹, P₂O₅: 34 kg ha⁻¹, K₂O: 279 kg ha⁻¹, OC: 0.52%, Recommended :80:40:40 kg NPKha⁻¹, Recommended spacing: 90 cm x 30 cm, Environment: irrigated

Srivilliputtur

The experimental results indicated that spacing exerted significant influence on yield of cotton and nitrogen levels did not influence the yield significantly (Table 11). The recommended spacing of 75 x 30 cm produced significantly higher yield of 1685 kg ha⁻¹ than all the other wider spacings. Regarding fertilizer levels, application of 125 % RDN (100 Kg ha⁻¹) produced though highest seed cotton of 1594 kg ha⁻¹ which was on par with 100 % RDN (1553 kg ha⁻¹) and both were significantly higher than that of another lowest dose of 75 % RDN (1471 kg ha⁻¹). The interaction effect was found to be not significant.



Table 11. Seed cotton yield (kg ha⁻¹) as influenced by spacing levels and nitrogen levels (RAH 1075)

Treatments	S1.75 x30 cm	S2.75 x 45cm	S3.75 x 60 cm	S4.75 x 75cm	Mean	ANOVA	SEd	CD (5%)
F1.75 %RDN	1639	1482	1416	1347	1471	S	35.8	87.6
F2.100% RDN	1675.00	1598.0 0	1499.00	1441.00	1553.25	N	29.9	63.4
F3.125% RDN	1740.00	1632.0 0	1555.00	1448.00	1593.75	SxN	60.5	NS
Mean	1684.67	1570.6 7	1490.00	1412.00	1539.33			

Soil type: Clay loam, pH: 8.26 dSm/m, OC: 0.72%, Soil fertility status: N: 196 (kg ha⁻¹ Low), P₂O₅ :40 kg ha⁻¹ K₂O: 446 kg ha⁻¹. Recommended Nutrient levels: 80: 40: 40 Kg NPK ha⁻¹, Environment: Irrigated

Agronomy IA: Agronomic requirements of promising pre-release *Hirsutum x barbadense* genotypes of cotton in Central Zone (irrigated)

Rahuri

The experiment was conducted under irrigated ecosystem with different spacing and nutrient levels and the results revealed that 90 x 30 cm spacing recorded significantly higher seed cotton yield (1414 kg ha⁻¹) over the rest of spacing's i.e., 90 x 60cm (672 kg ha⁻¹) and 90 x 90cm (529 kg ha⁻¹). Application of 100 % RDN (80:40:40 NPK kg ha⁻¹) recorded significantly higher seed cotton yield (1072 kg ha⁻¹), over the 125 % RDN (810 kg ha⁻¹) and 75% RDN (733 kg ha⁻¹). The interaction effect of cultivation of **CCB 51-2** on 90 x 30 cm and fertilized with 100% RDN recorded significantly higher seed cotton yield (1803 kg ha⁻¹) over the remaining treatment combinations (Table 12).

**Table 12 . Seed cotton yield (kg ha⁻¹) as influenced by spacing levels and nutrient levels
Genotype :CCB-51)**

Treatments	S ₁ - 90 x 30 cm	S ₂ - 90 x 60 cm	S ₃ - 90 x 90 cm	Mean (Nitrogen)	ANOVA	SE d	CD (5%)
N ₁ - 75 % RDN	1165	566	469	733	Spacing	34.53	135.60
N ₂ - 100 % RDN	1803	808	605	1072	Fertilizer	39.15	120.65
N ₃ - 125% RDN	1272	643	514	810	S x N	67.82	208.98
Mean (Spacing)	1414	672	529	872			

Soil type : Medium Black Soil, pH – 7.50, Ec – 0.28, OC – 0.57%, Soil fertility status N : 163 kg ha⁻¹, P₂O₅ : 8.18 kg ha⁻¹, K₂O : 526 kg ha⁻¹, Environment: Irrigated, Genotypes (G): **CCB 51-2**, Recommended 80:40:40 kg NPKha⁻¹



Agronomy IA: Agronomic requirements of promising pre-release *barbadense* of cotton in South Zone (Irrigated)

Coimbatore

The experiment was conducted under irrigated ecosystem in the department of cotton farm, TNAU Coimbatore. All the three factors, genotype, spacing and fertilizer levels had influenced the seed cotton yield significantly. The results revealed that between genotypes, CCB 51-2 genotype recorded significantly higher seed cotton yield (1750 kg ha⁻¹). Amongst fertilizer N applied at the rate of 125% recorded significantly higher seed cotton yield (1709 kg ha⁻¹) (Table 13). The results of different spacings revealed that 105 x 60 cm spacing recorded significantly higher seed cotton yield (1787 kg ha⁻¹). There is no significant results observed among the interactions

Table 13. Seed cotton yield (kg ha⁻¹) as influenced by genotypes, spacing levels and nutrient levels

Treatments	V1. CCB- 51-2			V2. DB 1801			Grand Mean	
	S1. 75 x 60	S2.90 x 60	2.29755	S1. 75 x 60	S2.90 x 60	S3. 105 x 60		
F1. 75 %RDN	1484	1749	1864	1324	1522	1644	1598	
F2. 100%RDN	1556	1837	1886	1499	1532	1670	1663	
F3. 125%RDN	1625	1859	1887	1511	1602	1771	1709	
Interaction (two way)	S1. 75 x 60	S2.90 x 60	S3. 105 x 60	V1. CCB143B	V2. DB 1701	Interaction	V1. CCB143B	V2. DB 1701
F1. 75 %RDN	1404	1635	1754	1699	1496	S1. 75 x 60.	1555	1445
F2. 100%RDN	1527	1685	1778	1760	1567	S2. 90 x 60	1815	1552
F3. 125%RDN	1568	1731	1829	1790	1628	S3. 105 x 60	1879	1695
Mean	1500	1683	1787	1750	1564		1750	1564
ANOVA	Genotype(V)	Spacing(S)	Fertilizers (F)	VXS	SXF	VXF	VXSXF	
SEd	30.7	37.6	37.6	53.2	65.2	53.2	92.1	30.7
CD	62.4	76.5	76.5	NS	NS	NS	NS	62.4

Soil type : Medium Black Soil, pH – 7.50, Ec – 0.28, OC – 0.57%, Soil fertility status N : 163 kg ha⁻¹, P₂O₅ : 8.18 kg ha⁻¹, K₂O : 526 kg ha⁻¹, Environment: Irrigated, Genotypes (G): **CCB 51-2 and DB 1801, Recommended 80:40:40 kg NPKha⁻¹**

Agronomy IA: Agronomic requirements of promising pre-release interspecific hybrid in Central Zone

Rahuri

The results of interspecific hybrid tested at Rahuri found that 90 x 60 cm spacing recorded significantly higher seed cotton yield (1440 kg ha⁻¹) over the remaining spacings i.e., 90cm x 75 cm



(1166 kg ha⁻¹) and 90 x 90cm (1305 kg ha⁻¹). Application of 125 % RDN (125:50:50 NPK kg ha⁻¹) recorded significantly higher seed cotton yield (1439 kg ha⁻¹) and it was observed that 100 % RDN showed at par results with 125 % RDN (1357 kg ha⁻¹) (Table 14). The interaction effect for hybrid **RHB –1623**, sown with distance 90 x 60 cm and fertilized with 125 % RDN recorded significantly higher seed cotton yield (1603 kg ha⁻¹) than the remaining treatments combinations.

Table 14. Seed cotton yield (kg ha⁻¹) as influenced by spacing levels and nutrient levels (Genotype: RHB-1623)

Treatments	S ₁ - 90 x 60 cm	S ₂ - 90 x 75 cm	S ₃ - 90 x 90 cm	Mean (Nitrogen)	ANOVA	SE d	CD (5%)
F ₁ - 75 % RDN	1270	985	1090	1115	Spacing	35.78	140.49
F ₂ - 100 % RDN	1447	1200	1423	1357	Fertilizer	60.13	185.3
F ₃ - 125% RDN	1603	1312	1401	1439	S x N	104.16	NS
Mean (Spacing)	1440	1166	1305	1303			

Soil type : Medium Black Soil, pH – 7.50, Ec – 0.28, OC – 0.57%, Soil fertility status N : 163 kg ha⁻¹, P₂O₅ : 8.18 kg ha⁻¹, K₂O : 526 kg ha⁻¹, Environment: Irrigated, **Recommended** 100:50:50 NPK kg ha⁻¹

Agronomy IA: Agronomic requirements of promising pre-release interspecific hybrid in South Zone

LAM

The results of interspecific hybrid tested at LAM farm revealed that the highest seed cotton yield (4704 kg ha⁻¹) was recorded under closer spacing (S₁: 90cm x45cm) and found significantly superior to rest of the treatments and closely followed by S₃ (4195 kg ha⁻¹), S₂ (3533 kg ha⁻¹) and S₄ (2842 kg ha⁻¹). The maximum boll weight (2.9 g) was found under S₄ (105 cm x 60 cm), followed by S₂, S₃ and S₁.

Among the nutrient levels tested, F₃ recorded the maximum Seed Cotton Yield (4121 kg ha⁻¹) and found significantly superior over F₂ (3883 kg ha⁻¹) and F₁ (3452 kg ha⁻¹) which might be due to a greater number of plants per unit area, more number of sympodia per plant (25.3) and more number of bolls m² (151.8). The lowest growth parameters and seed cotton yield (3452 kg ha⁻¹) was noticed with F₁ treatment (75% RDN) (Table 15). The interaction between different spacing and nutrient levels was found nonsignificant.



Table 15. Seed Cotton yield (kg ha⁻¹) as influenced by spacing levels and fertilizer levels (RHB 1623)

Treatments	F1.75 %RDN	F2.100 %RDN	F3.125%RDN	Mean
S1: 90 x 45 cm	4444	4796	4873	4704
S2: 90 x 60 cm	3113	3615	3871	3533
S3: 105 x 45 cm	3704	4268	4612	4195
S4: 105 x 60 cm	2545	2854	3126	2842
Mean	3452	3883	4121	
ANOVA	Spacing	Fertilizer level	SXF Interaction	
SEd	125.5	108.6	217.3	
CD (0.05)	260.2	225.4	NS	

Soil: Clay soils, pH:8.1, E.C :0.34 d Sm⁻¹, Available N: 211 kg ha⁻¹, OC : 0.41%, Recommended :120:60:60 kg NPKha⁻¹, Recommended spacing:105 x 60 cm for hybrids, Environment: Rainfed

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

Akola

The seed cotton yield was significantly highest in genotype JLA-1207 (1837 kg ha⁻¹) which was found significantly superior over genotype PAIG-379 (1299 kg ha⁻¹) and AKA-8(1490 kg ha⁻¹). Amongst spacing, seed cotton yield was significantly highest (1690 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 cm (1594 kg ha⁻¹) and 60x30cm (1342 kg ha⁻¹) with plant density of 1.11 lakhha⁻¹ and 0.55 lakh ha⁻¹ respectively. The results on nitrogen levels found that the significantly highest seed cotton yield of 1720 kg ha⁻¹ was recorded in 125 % RDN level and which was found significantly superior over 100 % RDN (1503 kg ha⁻¹) and also found significantly superior over dose of 75 % RDN which recorded lower yield of 1402kg ha⁻¹. The interaction effect of genotype, spacing and nitrogen was found significant and the highest seed cotton yield of 1604, 2276 and 1990 kg ha⁻¹ were reported respectively with V1: PAIG 379, V2: JLA-1207 and V3: AKA-8 with spacing of 60x10 cm (plant density of 1.66 lakh ha⁻¹) with nitrogen dose of 125% RDN (Table 16)



Table 16. Seed cotton yield (kg ha⁻¹) as influenced by genotypes, spacing levels and nutrient levels

Treatments	V1: PAIG 379			V2: JLA-1207			V3: AKA-8 (check)			Grand Mean
	S1.60 x 10	S2.60 x 15	S3.60 x 30	S1.60X 10	S2.60X 15	S3.60 x 30	S1.60 x10	S2.60 x 15	S3.60X 30	
F1.75% N	1632	969	1066	1330	1895	1657	1413	1349	1306	1402
F2.100% N	1420	1247	902	2027	1845	1497	1521	1757	1312	1503
F3.125% N	1604	1617	1236	2276	2071	1931	1990	1591	1167	1720
Interaction (two way)	S1.60X10	S2.60x15	S3.60x30	V1: PAIG 379	V2: JLA-1207	V3: AKA-8	Interaction	V1: PAIG 379	V2: JLA-1207	V3: AKA-8
F1.75% N	1458	1405	1343	1222	1627	1356	S1.60 x10	1552	1878	1641
F2.100% N	1656	1617	1237	1189	1790	1530	S2.60 x15	1278	1937	1566
F3.125% N	1957	1760	1445	1486	2093	1583	S3.60 x30	1068	1695	1262
Mean	1690	1594	1342	1299	1837	1490		1299	1837	1490
ANOVA	Genotype	Spacing	Fertilizers	VXS	VXF	SXF	VXSXF			
SE d	31.21	31.21	37.97	54.06	65.76	65.76	113.91			
CD (5%)	93.58	93.58	108.99	162.09	NS	188.76	326.98			

Soil parameters : pH value: 7.9, EC (dSm⁻¹): 0.12, OC : 0.38%, Available N : 228 kg ha⁻¹, P₂O₅ : 17.60 kg ha⁻¹, K₂O : 366 kg ha⁻¹, Recommended spacing: 60X30 cm, Recommended Fertilizer dose : 40:20:20 Kg NPKha⁻¹, Environment : Rainfed, Cotton Species : *arboreum* Cotton, Total Rainfall during Cropping period : 1119.4mm

Nanded

The results revealed that plant height was found increased and number of monopodia were reduced in closer plant geometry. Spacing 45 x 17.5 cm (126984 plants ha⁻¹) recorded highest plant height (113.93 cm) and lowest number of monopodia / plant (0.82). The geometry of 45 x 22.5. cm was at par with 45 x 17.5 cm spacing for height and monopodia. Number of sympodia per plant and boll weight were statistically similar in all spacing. Closer spacing with the highest plant density (45 x 17.5 cm i.e. 126984 plants ha⁻¹) out yielded with significantly highest bolls / m² (85.00) and seed cotton yield (1592 kg ha⁻¹) than other plant geometry (Table 17). The seed cotton yield was the highest in 125% RDN and was at par with 100% RDN. Both these levels were significantly superior over 75% nitrogen level.



Table 17 . Seed cotton yield (kg ha⁻¹) as influenced by spacing levels and nutrient levels (CAN 17522)

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%)
N1 - 75% RDN	1462	1123	913	1166	Spacing	50.31	107.57
N2 - 100% RDN	1661	1275	1016	1317	Nitrogen	50.31	107.57
N3 - 125% RDN	1654	1405	1051	1370	S x N	87.14	N.S.
Mean (spacing)	1592	1268	993				

Initial soil properties: pH – 8.05; EC - 0.27 dSm⁻¹, OC - 0.47%, Soil fertility status: N : 135.12 kg ha⁻¹; P₂O₅ : 12.24 kg ha⁻¹ and K₂O : 478.35 kg ha⁻¹; Rec. Spacing : 45 x 22.5 cm; Rec. NPK : 50:25:25 kg ha⁻¹; Species : *G. arboreum*; Environment : Rainfed; Total rainfall : 1090.2 mm

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

Dharwad

The data on seed cotton yield as influenced by planting geometry and nitrogen levels on different genotypes is presented in table 18. Among the two genotypes tried PA-806 (G₁) recorded numerically higher seed cotton per hectare (1550 kg ha⁻¹) as compared to PA-833 (1360 kg ha⁻¹). However, both genotypes were statistically on par on their yield. Among the three levels of planting geometry tested, S₁:60X30 cm produced significantly higher seed cotton yield (1602 kg ha⁻¹) as compared to other levels. This may be attributed to the significantly higher bolls per square meter with this spacing and also with yield per square meter. Among the three levels of nitrogen attempted, 125% RDN recorded significantly higher seed cotton yield (1506 kg ha⁻¹) as compared to other levels. However, it was on par with 100% RDN. Similar results were also observed with seed cotton yield per plant, number of bolls per plant and single boll weight. Interactions of different factors were not significant.



Table 18. Seed cotton yield kg ha⁻¹ as affected by different planting geometry and nitrogen levels in *G. arboreum* genotypes

Treatments	G ₁ PA 806			G ₂ PA 833			Mean N
Nutrients	S1: 60X30 cm	S2: 75X30 cm	s3: 90X30 cm	S1: 60X30 cm	S2: 75X30 cm	s3:90X30 cm	
N ₁ :75%RD N	1602	1533	1292	1417	1264	1225	1389
N ₂ :100%RD N	1726	1564	1425	1509	1326	1272	1470
N ₃ :125%RD N	1778	1595	1432	1577	1367	1285	1506
mean GXS	1702	1564	1383	1501	1319	1260	
Interaction	S1: 60X30 cm	S2: 75X30 cm	s3: 90X30 cm		G ₁ PA 806	G ₂ PA 833	
N ₁ :75%RD N	1510	1399	1258		1476	1302	1389
N ₂ :100%RD N	1617	1445	1348		1571	1369	1470
N ₃ :125%RD N	1677	1481	1358		1602	1410	1506
Mean S	1602	1442	1322	Mean G	1550	1360	
ANOVA	Genotype	Spacing	Nitrogen	GXS	G ₁ PA 806	G ₂ PA 833	GXSX N
SE. d.	88	35	23	49	33	41	57
CD at 5%	NS	80	48	NS	NS	NS	NS

Soil type : Medium deep black, pH: 7.2 , OC : 0.45%, Soil fertility status , N : 230 kg ha⁻¹, P₂O₅ : 27.0 kg ha⁻¹, K₂O : 425 kg ha⁻¹, Environment: Rainfed, Recommended Nutrient levels :40:25:25 kg NPKha⁻¹, Total rainfall received: 978.2mm

Nandyal

The results of agronomic requirement study conducted under rainfed condition found that significantly higher seed cotton yield (806 kg ha⁻¹) was recorded with spacing of 60 x 15 cm. Lower seed cotton yield (537 kg ha⁻¹) was recorded with spacing of 60 x 30 cm, which was on par with 60 x 20 cm (590 kg ha⁻¹). There was significant effect of different nitrogen levels on seed cotton yield. Higher seed cotton yield (689 kg ha⁻¹) was recorded with 125% RDN and was on par with 100 % RDN (623 kg ha⁻¹). Significantly lower seed cotton yield (611 kg ha⁻¹) was noticed with 75% RDN (Table 19).



Table 19. Seed cotton yield (kg ha⁻¹) as influenced by spacing levels and nitrogen levels (CAN 1091)

Treatments	N ₁ : 75 % RDN	N ₂ : 100 % RDN	N ₃ : 125 % RDN	Mean	ANOVA	SE d	SE m _±	CD (5%)
S1.60X 30 cm	486	563	563	537	Spacing	29	21	63
S2.60X 20 cm	589	554	628	590	Nitrogen levels	29	21	63
S3.60X 15 cm	758	783	876	806	S x N	51	36	NS
Mean	611	633	689					

Soil type : Deep black soil, Clay soil , pH: 8.5, OC : 0.38%, Soil fertility status N : 139 kg ha⁻¹, P₂O₅: 31 kg ha⁻¹, K₂O: 352 kg ha⁻¹, Recommended Nutrient levels : 20-20-0 NPK kg ha⁻¹, Environment: Rainfed

Nandyal

The results of agronomic requirement study conducted under rainfed condition at Nandyal revealed that significantly higher seed cotton yield (1363 kg ha⁻¹) was recorded with spacing of 60 x 15 cm, which was comparable with 60 x 20cm (1284 kg ha⁻¹). The significantly least seed cotton yield (1044 kg ha⁻¹) was recorded with spacing of 60 x 30 cm (Table 20). There was significant effect of different nitrogen levels on seed cotton yield. Among, higher seed cotton yield (1322 kg ha⁻¹) was recorded with 125% RDN. The significantly least seed cotton yield (1168 kg ha⁻¹) was noticed with 75% RDN (Table 20).

Table 20 . Seed cotton yield (kg ha⁻¹) as influenced by spacing levels and nitrogen levels (DDCC 1801)

Treatments	N ₁ : 75 % RDN	N ₂ : 100 % RDN	N ₃ : 125 % RDN	Mean	Anova	SE d	SE m _±	CD (5%)
S1.60X 30 cm	812	1175	1146	1044	Spacing	55	39	117
S2.60X 20 cm	1440	1217	1196	1284	Nitrogen levels	55	39	117
S3.60X 15 cm	1254	1211	1623	1363	S x N	95	67	203
Mean	1168	1201	1322					

Soil type : Deep black soil, Clay soil , pH: 8.5, OC : 0.38%, Soil fertility status N: 139 kg ha⁻¹, P₂O₅ 31kg ha⁻¹, K₂O: 352 kg ha⁻¹, Recommended Nutrient levels : 20-20-0 NPK kg ha⁻¹, Environment: Rainfed

Nandyal

The results of agronomic requirement studies found that there was significant effect by different spacing and nutrient levels. The significantly higher seed cotton yield (743 kg ha⁻¹) was recorded with spacing of 60 x 15 cm .The significantly least seed cotton yield (587 kg ha⁻¹) was recorded with spacing of 60 x 30 cm. There was significant effect of different nitrogen levels on seed cotton yield. The significantly highest seed cotton yield (732 kg ha⁻¹) was recorded with 125% RDN. Significantly lower seed cotton yield (602 kg ha⁻¹) was noticed with 75% RDN (Table 21).



Table 21. Seed cotton yield (kg ha^{-1}) as influenced by spacing levels and nitrogen levels (Dwda 1802)

Treatments	N ₁ : 75 % RDN	N ₂ : 100 % RDN	N ₃ : 125 % RDN	Mean	ANOVA	SE d	SE m _±	CD (5%)
S1.60X 30 cm	533	551	677	587	Spacing	15	10	31
S2.60X 20 cm	587	611	699	633	Nitrogen levels	15	10	31
S3.60X 15 cm	685	723	820	743	S x N	25	18	NS
Mean	602	628	732					

Soil type: Deep black soil, Clay soil, pH: 8.5, OC: 0.38%, Soil fertility status N: 139 kg ha^{-1} , P_2O_5 : 31 kg ha^{-1} , K_2O : 352 kg ha^{-1} , Recommended Nutrient levels : 20-20-0 NPK kg ha^{-1} , Environment: Rainfed

Agronomy 1B: Evaluation of compact cultures under HDPS with different spacing and nutrient levels

Preamble: Cotton is capable of producing acceptable yields in a wide range of plant populations. This is considered as fortunate from a historical perspective as regards the cotton stand establishment observed in the country. However, the general conclusion may not be applicable to all germplasm / situations. High density planting with compact genotypes proved, as high potential system of cotton cultivation in many situations. Many cotton producing countries like Brazil, China, Australia, Spain Uzbekistan, Argentina and Greece tested, proved and adopted narrow row planting system of cotton as tool to achieve higher productivity. Previously, there were no exclusive genotypes for high density planting system. Keeping this in view, development of compact genotypes is prioritised. The agronomic requirement studies are under taken for pre released genotypes in multi-location.

North Zone (irrigated) Faridkot

The compact culture requirement of spacing and nutrient studied found that H1530 produced significantly higher performance under planting geometry of 67.5 x 20 cm resulted in highest seed cotton yield (3206 kg ha^{-1}) followed by 3116 kg ha^{-1} under 67.5 x 15 cm and lowest yield under narrow geometry of 67.5 x 10 cm (2837 kg ha^{-1}). Conventional planting geometry of 67.5 x 60 cm resulted in a seed cotton yield of 2837 kg ha^{-1} . Both 125 % (3251 kg ha^{-1}) and 100 % (3144 kg ha^{-1}) RD of N resulted in significantly higher seed cotton yield than 75 % N (2660 kg ha^{-1}), while statistically 100 % and 125 % RDN remained at par. The interaction results revealed that H1530 recorded the highest yield (3522 kg ha^{-1}) at a spacing level of 67.5 x 20 cm with 125 % of RDN (Table 22). This indicated that this treatment combination is appropriate for newly released genotype under test location.



Table 22. Seed cotton yield (kg ha⁻¹) as influenced by spacing levels and nutrient levels (H1530)

Treatments	S1 67.5 x 10 cm	S2. 67.5 x 15 cm	S3. 67.5 x 20 cm	S4. 67.5 x 60 cm	Mean (Nitrogen)	ANOVA	SE d	CD (5%)
N1: 75% of Rd	2598	2775	2742	2526	2660	Spacing	78	195
N2: 100% of Rd	2880	3217	3354	3125	3144	Nitrogen	119	255
N3: 125% of Rd	3033	3355	3522	3094	3251	S x N		
Mean (spacing)	2837	3116	3206	2915				

Soil parameters: pH=8.5, EC=0.26 m mhos / cm, OC =0.21%, Available P₂O₅=10.2 kg ha⁻¹, Available K₂O= 248kg ha⁻¹, Recommended spacing: 67.5 x 60 cm, Recommended nutrients: 75 kg N and 30 kg P₂O₅ ha⁻¹, Environment: irrigated

Agronomy 1B: Evaluation of compact cultures under HDPS with different spacing and nutrient levels in Central Zone

Surat

The results agronomy requirement of compact culture revealed that seed cotton yield was significantly influenced by spacing and nitrogen levels. The spacing at S₂ (75 x 10 cm) recorded significantly higher SCY (2010 kg ha⁻¹) as compared to normal spacing S₄: 120 x 45 cm (1542 kg ha⁻¹) and S₁:60 x 10 cm (1774 kg ha⁻¹). The treatment S₂ (75 x 10 cm) was found at par with S₃ (1914 kg ha⁻¹). In case of nitrogen levels, N₃ (125 % RDN) and N₂ (100 % RDN) remain at par with each other and both recorded significantly higher SCY (1923 and 1860 kg ha⁻¹, respectively) as compared to N₁ (1647 kg ha⁻¹) (Table 23). The interactions of spacing and nitrogen did not show any significant effect on seed cotton yield.

Table 23. Seed cotton yield (kg ha⁻¹) as influenced by spacing levels and nutrient levels

Treatments	S ₁ : 60 x 10 cm	S ₂ : 75 x 10 cm	S ₃ : 90 x 10 cm	S ₄ : 120 x 45 cm	Mean (Nitrogen)	ANOVA	SE d	CD (5%)
F ₁ :75% RDN	1572	1906	1720	1389	1647	Spacing	74.42	218.27
F ₂ : 100 % RDN	1846	2116	1942	1536	1860	Nitrogen	64.45	189.03
F ₃ : 125 % RDN	1905	2009	2080	1699	1923	S x N	128.9	NS
Mean (spacing)	1774	2010	1914	1542				

Soil: vertisol, deep black, clay texture, pH:7.44, EC: 0.78 dS/m, Soil fertility status N : 242 kg ha⁻¹, P₂O₅ : 35.3 kg ha⁻¹, K₂O : 650 kg ha⁻¹, OC: 0.52 %, Recommended nutrient dose: 225:00:00 NPK kg ha⁻¹ (HDPS), Recommended Spacing:60x15-20 cm, Environment: irrigated: Total rainfall received:1318 mm



Nanded

The results of compact culture studies found that closer plant geometry of 60 x 10 cm (1,66,666 plants ha⁻¹) has reduced number of monopodia/ plant, sympodia / plant and length of sympodia than wider geometry of 60 x 30 cm and 45 x 30 cm. However, number of bolls / m² (76.22) and seed cotton yield (1692 kg ha⁻¹) were significantly increased in closer geometry of 60 x 10 cm (S1) which was significantly higher than recommended conventional spacing of 60 x 30 cm (S4 – 1252 kg ha⁻¹). Statistically, Nitrogen levels didn't affect the plant height and number of branches. However, the sympodial length (18.38 cm), number of bolls / m² (71.25) and seed cotton yield (1614 kg ha⁻¹) were significantly increased in 125% N over lowest level of 75% N and was at par with 100% nitrogen level (Table 24). Interactions of plant geometry x nitrogen level were found non-significant.

Table 24. Seed cotton yield (kg ha⁻¹) as influenced by spacing levels and nutrient levels (GISV 312)

Treatments	S ₁ - 60 x 10 cm	S ₂ - 75 x 10 cm	S ₃ - 45 x 30 cm	S ₄ - 60 x 30 cm	Mean (Nitrogen)	ANOVA	SE d	CD (5%)
N1.75%RDN	1578	1593	1401	1173	1436	Spacing	34.98	87.26
N2.100%RDN	1720	1623	1669	1274	1572	Nitrogen	42.65	91.20
N3.125%RDN	1779	1655	1713	1310	1614	S x N	85.31	N.S.
Mean (spacing)	1692	1624	1595	1252				

Soil properties : pH – 8.05; EC - 0.27 dSm⁻¹, OC - 0.47%, Soil fertility: N : 135.12 kg ha⁻¹; P₂O₅ : 12.24 kg ha⁻¹ and K₂O : 478.35 kg ha⁻¹; Rec. Spacing : 45 x 22.5 cm; Rec. NPK : 50:25:25 kg ha⁻¹; Species : *G. arboreum*; Environment : Rainfed; Total rainfall :1090.2 mm

Agronomy 1B: Evaluation of compact cultures under HDPS with different spacing and nutrient levels in South Zone (rainfed)

Dharwad

The results of compact trial conducted at Dharwad found that different planting geometry did not affect the seed cotton yield. Among the different N levels 125% RDN recorded numerically higher seed cotton yield (1869 kg ha⁻¹) as compared to other levels. However, it was on par with 100% RDN (1733 kg ha⁻¹). (Table 25). Similar trend of numerical superiority observed with respect to number of bolls/ sq m, seed cotton yield/ plant and single boll weight. None of the interactions were significant.



Table 25. Seed cotton yield (kg ha^{-1}) as affected by planting geometry and nitrogen levels in compact cotton DSC 1851

N levels	S1:90x10	S2:60x10	S3:75x10	S4:60x30	MEAN	ANOVA	S. Em	SE(D)	CD
N1:75%RDN	1654	1602	1647	1674	1644	Spacings	80	113	NS
N2:100%RDN	1844	1659	1667	1761	1733	N levels	51	72	153
N3:125%RDN	1938	1950	1820	1766	1869	SXN	139	143	NS
MEAN	1812	1737	1712	1734					

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 :50:25:25 kg NPKha^{-1} , Total rainfall received: 978.2 mm

Agronomy 1B: Evaluation of compact cultures under HDPS with different nutrient levels in South Zone (irrigated)

Raichur

The agronomic requirement studies of compact culture conducted at Raichur found that significantly higher seed cotton yield was recorded with application of 150% recommended nitrogen level (2876 kg ha^{-1}) compared to 100% RDN (2682 kg ha^{-1}) and 125%RDN (2513 kg ha^{-1}) (Table 26). Spacing did not influence seed cotton yield significantly. Interaction effect were found non-significant.

Table 26 . Seed cotton yield (kg ha^{-1}) as influenced by spacing and nitrogen levels

Treatments	S1:60 x 10 cm	S2: 75 x 10 cm	S3: 90 x 10 cm	S4:75 x 30 cm	Mean (N levels)	Anova	SE. d	CD (5%)
F1: 100% RDN	2401	2507	2585	2559	2513	Nitrogen levels	51	146
F2: 125%RDN	2605	2665	2704	2754	2682	Spacing	145	NS
F3: 150% RDN	2796	2814	2873	3022	2876	F x S	252	NS
Mean (spacing)	2601	2661	2720	2778				

Soil: Medium Black soils, Shallow and fine textured, pH:8.10, Soil fertility: N : 260 kg ha^{-1} , P_2O_5 : 34 kg ha^{-1} , K_2O : 279 kg ha^{-1} , OC. : 0.52%, Recommended :80:40:40 kg NPKha^{-1} , Recommended spacing:90 cm x 30 cm, environment: irrigated



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. The rainfall pattern observed is continuous rains from April to December and multi sowing dates are commonly followed by farmers. Hence times of sowing experiment is proposed to find out optimum times of sowing of ELS cotton. In addition to that developing packages of practices for ELS cotton also aimed here.

Chamrajnagar

The experiment was conducted to find out optimum sowing periods of bimodal rainfall region; where sowing of ELS cotton was taken at multi sowing dates by farmers. The experimental results on times of sowing revealed that times of sowing significantly influenced the growth and yield parameters and economics of cotton. Sowing cotton during 1st fortnight of May has recorded significantly higher seed cotton yield (1638 kg ha⁻¹), followed by May 2nd Fortnight (1586 kg ha⁻¹) and April 2nd fortnight (1545 kg ha⁻¹). However, all these above said dates of sowing were found to be on par with each other. The enhanced results may be attributed to better growth and yield parameters recorded during the crop growth period. Delay in sowing has resulted in a reduction in seed cotton yield, the lowest was recorded during sowing on September 1st fortnight. The economics of dates of sowing also followed a similar trend, maximum gross returns (₹147420 ha⁻¹), net returns (₹ 86465 ha⁻¹), and benefit-cost ratio (2.42) were registered by 1st fortnight of May (Table 27).

Table 27. Effective rainfall (mm), Seed cotton yield (kg ha⁻¹), economics as influenced by times of sowing at Chamrajnagar

Treatments	SCY (kg ha ⁻¹)	Effective Rainfall (mm)	Cost of cultivation (₹ ha ⁻¹)	Gross return (₹ ha ⁻¹)	Net return (₹ ha ⁻¹)	B:C Ratio
T1: March-2nd Fortnight	1353	240.1	58080	121770	63690	2.1
T2: April-1st Fortnight	1467	292.9	59330	132000	72670	2.22
T3: April-2nd Fortnight	1545	348.9	59955	139080	79125	2.32
T4: May-1st Fortnight	1638	401.6	60955	147420	86465	2.42
T5: May-2nd Fortnight	1586	466.9	60455	142770	82315	2.36
T6: June-1st Fortnight	1380	467.5	58330	124230	65900	2.13
T7: June- 2nd Fortnight	1326	454.8	57830	119340	61510	2.06
T8: July-1st Fortnight	1220	424.2	56830	109800	52970	1.93
T9: July-2nd Fortnight	1184	386.4	56330	106590	50260	1.89
T10: Aug-11st Fortnight	993	364.6	54580	89370	34790	1.64
T11: Aug- 2nd Fortnight	951	349.2	54080	85620	31540	1.58
T12: September 1st Fortnight	829	316.5	52955	74640	21685	1.41
SEd	62.28		617.95	5605.6	4991.2	0.08
CD (5%)	129.17		1281.6	11625	10351	0.16



Soil: Medium black, clay loam, pH:7.76, Soil fertility status N : 238.2 (kg ha⁻¹), P₂O₅ : 23.6 (kg ha⁻¹) K₂O : 267.2 kg ha⁻¹, OC: 0.29%, Recommended:150: 75: 75 kg NPKha⁻¹, Recommended spacing:90 x 60 cm Environment: Rainfed.

AGR II B Developing Package for inter specific ELS Bt hybrid

Chamrajnagar

The results of comparison of DCH 32 Bt with isogenic lines DCH 32 non Bt found that DCH -32 Bt cotton hybrid has recorded significantly higher number of sympodial branches per plant (18.4), sympodial length (37.7 cm), bolls/m² (94.6) and seed cotton yield (1503 kg ha⁻¹), gross return (₹135292ha⁻¹), net return (₹76381ha⁻¹) and benefit cost ratio (2.28) than DCH-32 non-Bt cotton. While the number of monopodial branches (1.7 per/pant) and plant height (140.4 cm) were maximum with DCH-32 non-Bt cotton. Between the spacings, plant height (142.4 cm), bolls/m² (102.7) and seed cotton yield (1531 kg ha⁻¹), gross return (₹137813ha⁻¹), net return (₹77161ha⁻¹) and benefit cost ratio (2.26) were significantly higher with 75% of recommended spacing (67.5 x 45 cm). Application of 150 % RDN significantly recorded maximum plant height (147.9 cm), monopodial branches (1.9/plant), sympodial branches (21.0/plant), sympodial length (43.2 cm), bolls/m² (111.8), and seed cotton yield (1600 kg ha⁻¹) compared to other nitrogen levels (Table 28). However, all the growth and yield parameters are found to be on par between 150% and 125% RDN. The economic calculation found that gross return (₹143955ha⁻¹), net return (₹ 83101ha⁻¹) and benefit cost ratio (2.36) were higher with 150% of RDN. Boll weight didn't differ between the genotypes, spacing and nitrogen levels. The interaction effect was found to be nonsignificant for all the parameters under the study,

Table 28. Seed cotton yield (kg ha⁻¹) and economics of ELS genotypes influenced by spacing levels and nutrient levels

Genotypes	Seed cotton yield (kg ha ⁻¹)	Cost of cultivation (₹ ha ⁻¹)	Gross return (₹ ha ⁻¹)	Net return (₹ ha ⁻¹)	B:C ratio
G1.DCH 32 Bt	1293	58910	135292	76381	2.28
G2.DCH 32 non Bt	1531	57085	118890	61804	2.07
Mean	1412	57998	127091	69093	2.18
SE d	54	539	4867	4330	0.06
CD (5%)	111	1102	9943	8845	0.13
S1. 90 x 45	1503	55345	116370	61025	2.09
S2.120 x60	1321	60652	137813	77161	2.26
Mean	1412	57999	127092	69093	2.18
SE d	54	539	4867	4330	0.06
CD (5%)	111	1102	9943	8845	0.13
Nutrients					
F0. Control(No N)	1135	53843	102150	48307	1.89
F1.100%N	1371	57562	123345	65783	2.13
F2.125%N	1544	59734	138915	79181	2.31
F3.150%N	1600	60854	143955	83101	2.36
Mean	1413	57998	127091	69093	2.17
SE d	77	763	6884	6123	0.09
CD (5%)	156	1558	14062	12508	0.18



Soil: Medium black, clay loam, pH:7.76, Soil fertility status N : 238.2kg ha⁻¹, P₂O₅ : 23.6kg ha⁻¹, K₂O: 267.2 kg ha⁻¹, OC: 0.29%, Recommended:150: 75: 75 kg NPKha⁻¹, Recommended spacing:90 x 60 cm
Environment: Rainfed, Total rainfall received:491.6 mm

Coimbatore

The experiment was conducted under irrigated ecosystem with ELS Bt hybrid revealed that seed cotton yield DCH 32 Bt variety has recorded higher higher yield than DCH 32 Non Bt .The spacing attempted did not influence seed cotton yield. Application of N applied at the rate of 125% (1778 kg ha⁻¹) produced significantly higher seed cotton yield and on par with other levels of nitrogen except absolute control. The higher gross return (₹134857ha⁻¹), net return (₹ 56542 ha⁻¹) and benefit cost ratio (1.72) was calculated with DCH 32 Bt. The spacing S1.120x 60 cm registered net return (₹ 51982ha⁻¹) and benefit cost ratio (1.68). Amongst nitrogen level 125 % RDN registered higher gross return (₹142247ha⁻¹), net return (₹ 58264ha⁻¹) and benefit cost ratio (1.69) (Table 29).

Table 29. Seed cotton yield (kg ha⁻¹) and economics of ELS genotypes influenced by spacing levels and nutrient levels

Genotypes	Seed cotton yield (kg ha ⁻¹)	Cost of cultivation (₹ ha ⁻¹)	Gross return (₹ ha ⁻¹)	Net return (₹ ha ⁻¹)	B:C ratio
G1.DCH 32 Bt	1686	78314	134857	56542	1.72
G2.DCH 32 non Bt	1535	75711	122838	47126	1.62
Mean	1611	77013	128848	51834	1.67
SE d	67.13				
CD (5%)	136.25				
S1. 90 x 45	1614	77464.5	129152	51686.5	1.67
S2.120 x60	1607	76561.5	128543.5	51982	1.68
Mean	1611	77013	128848	51834	1.67
SE d	47.13				
CD (5%)	NS				
Nutrients					
F0. Control(No N)	1227	55756	98167	42412	1.76
F1.100%N	1703	83589	136247	52658	1.63
F2.125%N	1778	83983	142247	58264	1.69
F3.150%N	1734	84723	138727	54004	1.64
Mean	1611	77013	128847	51835	1.67
SE d	66.65				
CD (5%)	134.6				

Soil: Clay loam, brown, pH:8.3, Soil fertility status N : 222 kg ha⁻¹, P₂O₅ :28 kg ha⁻¹, K₂O : 735 kg ha⁻¹, OC : 0.54%, Recommended :120:60:60 kg NPKha⁻¹, Recommended spacing:120 cm x 60 cm,
Environment: irrigated



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.

Sriganganagar

The field experiment was conducted in the plot which was converted as an organic method of cultivation since last ten years. It was observed that T₃: Recommended of Nutrient through organic based on P equivalent basis gave maximum seed cotton yield (3510 kg ha⁻¹), which was on par with seed treatment and soil application of recommended bio fertilizers and foliar application of PPFM (T₄, 3035 kg ha⁻¹), combined application seed treatment and soil application of recommended bio fertilizers and foliar application of PPFM along with application of neem cake @ 250 kg ha⁻¹ (T₈, 3202 kg ha⁻¹). This treatment of supplying recommended nutrients through organic based on P equivalent basis (T₃) observed higher improvement of organic carbon (0.30%) (Table 30).

Table 30. Seed cotton yield (kg ha⁻¹), and organic carbon (%) as influenced by organic nutrient management

Treatments	Seed cotton Yield (kg ha ⁻¹)	Organic carbon (%)	
		Initial	Final
T ₁ .Absolute control (No organic& inorganic)	1956	0.21	0.21
T ₂ .Control (RDN through inorganic)	2765	0.21	0.22
T ₃ .RD of Nutrient through organic based on P equivalent basis	3510	0.28	0.3
T ₄ .Seed treatment and soil application of recommended bio fertilizers and foliar application of PPFM	3035	0.27	0.27
T ₅ .Neem cake 250 kg ha ⁻¹	2357	0.27	0.29
T ₆ .Raising of Sun hemp / fodder cowpea between rows incorporated before flowering	2148	0.21	0.21
T ₇ .Intercropping with green gram/black gram/ ground nut/soybean	2043	0.21	0.21
T ₈ .T ₄ +T ₅	3202	0.27	0.28
T ₉ .T ₄ +T ₆	2208	0.27	0.28
T ₁₀ .T ₄ +T ₅ +T ₆	2298	0.27	0.28
T ₁₁ .T ₄ + T ₅ + T ₇	2315	0.28	0.28
SEd ±	276.7	0.21	0.21
CD (5%)	542.3	0.21	0.22



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 Rahuri (2728 kg ha⁻¹), Bhawanipatna (1480 kg ha⁻¹), Akola (1627 kg ha⁻¹) and Nanded (893 kg ha⁻¹). The same method realised higher net return of ₹42,423 and 1,33,089 ha⁻¹ and benefit cost ratio of 1.91 and 2.70 at Bhawanipatna and Rahuri respectively. The higher enhanced organic carbon status at Bhawanipatna (0.67%), Nanded (0.62%) and Akola (0.54%) estimated with same package includes application of 100 % RDF of nutrient through organic based on P equivalent basis (T₃) (Table 31).

Soil application of recommended bio fertilizers, foliar application of PPFM at flowering, soil application of neem cake @ 250 kg ha⁻¹ and raising of sunnhemp between rows incorporated before flowering (T₁₀) registered significantly higher seed cotton yield at Surat (1164 kg ha⁻¹) and Junagadh (1613 kg ha⁻¹). The same package (T₁₀) registered enhanced organic carbon status at Junagadh (0.93%), Rahuri (0.64%) (Table 31), net return at Surat (₹ 36468 ha⁻¹) and available nitrogen status at Bhawanipatna (133.8 kg ha⁻¹) (Table 33).

Table 31. Seed cotton yield (kg ha⁻¹) as influenced by organic nutrient management packages in Central Zone

Treatments	Surat	Bhawanipatna	Nanded	Rahuri	Junagadh	Akola
T1. Absolute control (No organic & inorganic)	762	848	656	1044	978	1032
T2. Control (RDN through inorganic)	1293	1553	1617	2209	1694	1685
T3. RD of Nutrient through organic based on P equivalent basis	969	1480	893	2728	1362	1627
T4. Seed treatment and soil application of recommended bio fertilizers and foliar application of PPFM	827	1003	787	1408	1379	1321
T5. Neem cake 250 kg ha ⁻¹	864	1106	860	1787	1432	1540
T6. Raising of Sun hemp between rows incorporated before flowering	928	1054	674	1124	1497	1495
T7. Intercropping with green gram	865	947	750	1048	1414	1410
T8. T4+T5	1061	1340	810	1716	1551	1263
T9. T4+T6	1111	1293	722	1038	1520	1531
T10. T4+T5+T6	1164	1371	712	1256	1613	1597
T11. T4+ T5 + T7	1151	1204	783	1368	1552	1372
SEd	51	57.02	77.64	64.9	112	105.6
CD (5%)	150	118.94	161.96	191.5	331	220.3



Table 32. 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	0.68	0.65	0.38	0.39	0.52	0.51	0.60	0.58
T2.Control (RDN through inorganic)	0.67	0.68	0.76	0.70	0.38	0.38	0.52	0.57	0.60	0.55
T3.RD of Nutrient through organic based on	0.66	0.67	0.80	0.82	0.38	0.54	0.52	0.62	0.60	0.62
T4.Seed treatment and soil application of recommended bio fertilizers and foliar application of PPFM	0.58	0.59	0.75	0.70	0.38	0.43	0.52	0.45	0.60	0.62
T5.Neem cake 250 kg ha ⁻¹	0.62	0.63	0.82	0.84	0.38	0.52	0.52	0.55	0.60	0.63
T6.Raising of Sun hemp between rows incorporated before flowering	0.59	0.60	0.83	0.85	0.38	0.48	0.52	0.54	0.60	0.62
T7.Intercropping with green gram	0.59	0.60	0.82	0.85	0.38	0.48	0.52	0.54	0.60	0.62
T8.T4+T5	0.58	0.59	0.88	0.90	0.38	0.48	0.52	0.49	0.60	0.63
T9.T4+T6	0.62	0.63	0.90	0.91	0.38	0.49	0.52	0.59	0.60	0.63
T10.T4+T5+T6	0.62	0.63	0.91	0.93	0.38	0.54	0.52	0.57	0.60	0.64
T11.T4+ T5 + T7	0.59	0.60	0.86	0.89	0.38	0.49	0.52	0.56	0.60	0.64
SEd	0.02	0.02	0.04	0.03	-	0.03	-	0.04		
CD (5%)	0.05	0.05	0.12	0.10	-	0.07	-	0.12		



Table 33. Net Return (₹ ha⁻¹) and Benefit Cost Ratio as influenced by organic nutrient management packages in Central Zone

Treatments	Surat		Bhawaniapatna		Nanded		Rahuri		Junagadh		Akola	
	Net Return (₹ ha ⁻¹)	BCR	Net Return (₹ ha ⁻¹)	BCR	Net Return (₹ ha ⁻¹)	BCR	Net Return (₹ ha ⁻¹)	BCR	Net Return (₹ ha ⁻¹)	MBCR	Net Return (₹ ha ⁻¹)	MBCR
T1.Absolute control (No organic& inorganic)	16124	1.39	7860	1.18	26111	1.73	22872	1.39	35989	2.54	30038	1.93
T2.Control (RDN through inorganic)	45890	1.90	47297	2.03	105640	3.26	105975	2.62	85953	1.84	62801	2.62
T3.RD of Nutrient through organic (FYM) based on P equivalent basis	17100	1.31	42423	1.91	7549	1.10	133089	2.70	61211	2.08	32464	1.50
T4.Seed treatment and soil application of recommended bio fertilisers and foliar application of PPFM	17472	1.39	16349	1.37	33923	1.84	104499	2.73	67814	1.90	45330	2.32
T5.Neem cake 250 kg ha ⁻¹	18892	1.41	21855	1.49	38514	1.90	100245	2.53	69727	1.92	53576	2.37
T6.Raising of Sun hemp between rows incorporated before flowering	26160	1.60	17990	1.40	22290	1.54	21152	1.32	72469	1.93	54625	2.54
T7.Intercropping with green gram	22676	1.54	12716	1.29	69241	2.95	9111	1.13	67210	1.97	66161	2.79
T8.T4+T5	29216	1.58	35251	1.78	30803	1.67	105659	2.56	77773	1.87	36946	1.94
T9.T4+T6	35532	1.74	31745	1.69	29576	1.77	12391	1.18	72416	1.96	55393	2.50
T10.T4+T5+T6	36468	1.72	35256	1.75	21722	1.48	15097	1.18	75722	1.99	52589	2.21
T11.T4+ T5 + T7	34884	1.68	27600	1.62	68775	2.49	17694	1.20	72284	2.01	59481	2.32
SEd	16124	1.39	3346.34	0.07	7177	0.15			-	-	6359	--
CD (5%)	45890	1.90	6980.35	0.15	14972	0.32			-	-	13265	--



Table 34. Available nutrient status (kg ha⁻¹) as influenced by organic nutrient management packages in Central Zone

Treatments	Bhawanipatna						Akola					
	Initial			Final			Initial			Final		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
T1 : Absolute control (No organics & inorganic)	121.6	38.9	226.2	124.5	37.4	241.9	175.6	15.1	375.4	179.8	15.5	380.2
T2 : Control (RDN through inorganic)	126.9	43.3	242.2	131.5	41.7	248.6	175.6	15.1	375.4	204.6	17.9	399.4
T3 : RD of Nutrient through organic	121.9	42.9	238.8	128.8	41.3	247.7	175.6	15.1	375.4	234.7	26.5	427.9
T4 : Seed treatment bio fertilisers and foliar application of PPFM at flowering and Boll Development Stage	119.9	36.4	231.6	129.6	35.7	234.9	175.6	15.1	375.4	204.6	21.8	398.4
T5 : Neem cake 250 kg ha ⁻¹	121.7	39.5	223.2	128.8	37.4	229.6	175.6	15.1	375.4	214.8	23.6	405.1
T6 : Raising of Sun hemp between rows incorporated before flowering (2.5-3.0 tha ⁻¹)	115.9	37.6	232.5	123.5	36.4	205	175.6	15.1	375.4	211.5	21.4	401.8
T7 : Intercropping with black gram and crop residue application after harvest of pods (1.5 tha ⁻¹)	120.9	36.5	238.2	127.1	34.9	244.6	175.6	15.1	375.4	209.6	21.2	402
T8 : T4 + T5	126.3	37.1	233.4	134.5	35.5	243.6	175.6	15.1	375.4	219.3	22.3	408.9
T9 : T4 + T6	122.9	39.4	233.1	130.5	39.6	235.3	175.6	15.1	375.4	221.4	23.7	413.7
T10 : T4 + T5 + T6	125.4	38.4	242	133.8	36.8	244.6	175.6	15.1	375.4	224.6	24.6	415.6
T11 : T4 + T5 + T7	122.3	39.1	226.5	129.1	38	232.9	175.6	15.1	375.4	214.8	22.9	404.8
SE d	3.19	1.24	3.5	4.19	1.51	15.13	-	-	-	2.63	0.28	0.81
C.D.at 5%	6.65	2.58	7.3	8.74	3.15	31.56	-	-	-	7.6	0.82	2.38



Table 35. Available nutrient status (kg ha⁻¹) as influenced by organic nutrient management packages in Central Zone

Treatments	Junagadh						Rahuri					
	Initial			Final			Initial			Final		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
T1 : Absolute control(No organics & inorganic)	323	54.89	274	269	37.75	249	163	7.21	582	323	54.89	274
T2 : Control (RDN through inorganic)	343	42.53	283	283	33.88	262	163	7.21	582	343	42.53	283
T3 : RD of Nutrient through organic	286	48.07	246	234	30.24	220	163	7.21	582	286	48.07	246
T4 : Seed treatment bio fertilisers and foliar application of PPFM at flowering and Boll Development Stage	308	40.2	262	252	23.95	232	163	7.21	582	308	40.2	262
T5 : Neem cake 250 kg ha ⁻¹	311	50.5	275	268	32.58	239	163	7.21	582	311	50.5	275
T6 : Raising of Sun hemp between rows incorporated before flowering(2.5-3.0 tha ⁻¹)	278	47.07	270	226	30.01	244	163	7.21	582	278	47.07	270
T7 : Intercropping with black gram and crop residue application after harvest of pods (1.5 tha ⁻¹)	300	49.21	238	233	34.11	214	163	7.21	582	300	49.21	238
T8 : T4 + T5	276	51.04	252	210	38.12	226	163	7.21	582	276	51.04	252
T9 : T4 + T6	293	49.63	261	238	36.83	228	163	7.21	582	293	49.63	261
T10 : T4 + T5 + T6	344	56.64	278	260	40.49	242	163	7.21	582	344	56.64	278
T11 : T4 + T5 + T7	301	53.12	271	239	37.15	235	163	7.21	582	301	53.12	271
SE d	21.28	3.94	13.55	19	3.37	12				21.28	3.94	13.55
C.D.at 5%	NS	NS	NS	NS	NS	NS				NS	NS	NS

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 (T₁₁) had registered significantly higher seed cotton yield at Raichur (1690 kg ha⁻¹) and Nandyal (2250 kg ha⁻¹) (Table 36). The same method (T₁₁) had been estimated higher net return of ₹ 62,622 and 1,27,627 ha⁻¹ and benefit cost ratio of 3.25 and 5.3 at Raichur and Nandyal respectively (Table 37) and high organic carbon (0.58 %) at Raichur. The same treatment was estimated higher available nitrogen of 222 and 217 kg ha⁻¹, P₂O₅ of 27.0 and 32.8 and potassium of 217 and 364 kg ha⁻¹ respectively at Coimbatore and Raichur. The nutrient management method, application of recommended dose of nutrients through organics, based on P equivalent basis (T₃) recorded significantly higher seed cotton yield at Dharwad (1289 kg ha⁻¹). Seed treatment and soil application of recommended bio fertilisers and foliar application of PPFM, application of neem cake 250 kg ha⁻¹ and raising of sunnhemp between rows and incorporated before flowering (T₁₀) recorded higher yield of 1387 and 1376 kg ha⁻¹ at Srivilliputhur and Coimbatore respectively. The same method (T₁₀) had been estimated higher soil organic carbon content of 0.55 and 0.71% at Coimbatore and Dharwad respectively. The significantly highest available N (232 kg ha⁻¹), P₂O₅ (33.0 kg ha⁻¹) and K₂O (506 kg ha⁻¹) (Table 38).



Table 36. Seed Cotton Yield (kg ha⁻¹) as influenced by organic nutrient management packages in South Zone

Treatments	Srivilliputhur	Raichur	Nandyal	Dharwad	Coimbatore
T1.Absolute control (No organic & Inorganic)	1003	1152	1428	756	1106
T2.Control (RDN through inorganic)	1521	1747	2331	1047	1406
T3.RD of Nutrient through organic based on P equivalent basis	1145	1202	2217	1289	1345
T4. Seed treatment and soil application of rec. bio fertilisers and foliar application of PPFM	1105	1278	1815	860	1145
T5.Neem cake @250 kg ha ⁻¹	1133	1287	1858	927	1172
T6.Raising of .Sunnhemp / fodder cowpea between rows incorporated before flowering	1143	1266	1669	1062	1275
T7.Intercropping with green gram/black gram/ groundnut/soybean	1078	1351	1895	546	1231
T8.T4+T5	1204	1455	1891	929	1205
T9.T4+T6	1308	1489	2042	994	1245
T10.T4+T5+T6	1387	1619	1600	1163	1376
T11: T4+ T5 + T7	1356	1690	2250	570	1235
SEd	70.6	55	192	66.3	80
CD at 5 %	151.6	160	401	194.4	167



Table 37. Net return (₹ ha⁻¹) and Benefit Cost ratio as influenced by organic nutrient management packages in South Zone

Treatment schedule	Srivilliputhur		Raichur		Nandyal		Dharwad		Coimbatore	
	NR (₹ ha ⁻¹)	B:C	NR (₹ ha ⁻¹)	B:C	NR (₹ ha ⁻¹)	B:C	NR (₹ ha ⁻¹)	B:C	NR (₹ ha ⁻¹)	B:C
T1.Absolute control (No organic & Inorganic)	16946	1.26	35825	2.65	73387	3.8	4462	1.11	16946	1.26
T2.Control (RDN through inorganic)	52922	1.74	61785	3.42	133555	5.5	37409	1.64	52922	1.74
T3.RD of Nutrient through organic based on P equivalent basis	6590	1.08	27908	1.87	118417	4.2	22194	1.37	6590	1.08
T4. Seed treatment and soil application of rec. bio fertilisers and foliar application of PPFM	23310	1.35	40655	2.75	99307	4.6	17744	1.34	23310	1.35
T5.Neem cake @250 kg ha ⁻¹	14806	1.19	38408	2.48	101987	4.6	15581	1.28	14806	1.19
T6.Raising of .Sunnhemp / fodder cowpea between rows incorporated before flowering	23226	1.33	39542	2.66	89207	4.2	14977	1.28	23226	1.33
T7.Intercropping with green gram/black gram/ ground nut/soybean	17296	1.24	49275	3.09	104995	4.8	-6218 (37212)	0.86 (1.75)	17296	1.24
T8.T4+T5	18628	1.23	45338	2.65	103235	4.5	15697	1.27	18628	1.23
T9.T4+T6	34756	1.48	49205	2.95	114557	5.0	17119	1.32	34756	1.48
T10.T4+T5+T6	28434	1.33	53938	3.00	82395	3.8	23062	1.41	28434	1.33
T11: T4+ T5 + T7	26792	1.32	62622	3.15	127627	5.3	1223 (47688)	1.02 (1.90)	26792	1.32
SEd			2746				2799.1 (2846)	0.05 (0.05)		
CD at 5 %			7990				8209.4 (8346)	0.16 (0.16)		



Table 38. Organic carbon (%) status as influenced by organic nutrient management packages in South Zone

Treatments	Soil Organic Carbon (%) SOC					
	Raichur		Coimbatore		Dharwad	
	Initial	Final	Initial	Final	Initial	Final
T1 : Absolute control (No organic & inorganic)	0.45	0.42	0.52	0.52	0.60	0.51
T2 : Control (RDN through inorganic)	0.45	0.41	0.52	0.52	0.61	0.55
T3 : RD of Nutrient through organic based on P equivalent basis	0.45	0.54	0.52	0.52	0.62	0.69
T4 : Seed treatment with bio fertilisers and foliar application of PPFM at flowering and Boll Development Stage	0.45	0.51	0.52	0.52	0.58	0.55
T5 : Neem cake 250 kg ha ⁻¹	0.45	0.54	0.52	0.52	0.57	0.66
T6 : Raising of Sun hemp between rows incorporated before flowering	0.45	0.55	0.53	0.53	0.55	0.60
T7 : Intercropping with Green gram and crop residue application after harvest of pods	0.45	0.54	0.53	0.53	0.58	0.65
T8 : T4 + T5	0.45	0.55	0.52	0.52	0.61	0.65
T9 : T4 + T6	0.45	0.56	0.53	0.53	0.58	0.68
T10 : T4 + T5 + T6	0.45	0.57	0.55	0.55	0.54	0.71
T11 : T4 + T5 + T7	0.45	0.58	0.52	0.52	0.61	0.70
SEd	-	-	0.02	0.02	0.02	0.68
CD at 5 %	-	-	NS	NS	NS	0.05



Table 39. Soil available nutrients (kg ha⁻¹) as influenced by organic nutrient management packages in South Zone

Treatments	Coimbatore						Raichur					
	Initial			Final			Initial			Final		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
T1 : Absolute control(No organics & inorganic)	214	18	717	211	17	172	171	23.2	315	214	22.5	300
T2 : Control (RDN through in organic)	221	25	719	223	25	186	189	23	323	221	22.8	323
T3 : RD of Nutrient through organic	215	26	741	215	27	205	208	27.7	348	215	28.6	350
T4 : Seed treatment bio fertilisers and foliar application of PPFM at flowering and Boll Development Stage	213	21	715	214	20	183	188	26.9	349	213	28.7	354
T5 : Neem cake 250 kg ha ⁻¹	214	23	719	218	23	204	209	29.3	350	214	29.1	355
T6 : Raising of Sun hemp between rows incorporated before flowering(2.5-3.0 tha ⁻¹)	215	25	717	217	27	208	212	29.7	351	215	29.6	358
T7 : Intercropping with black gram and crop residue application after harvest of pods (1.5 tha ⁻¹)	216	21	710	221	24	212	214	30.5	349	216	31.6	356
T8 : T4 + T5	213	21	720	217	22	209	213	30.9	352	213	31.7	361
T9 : T4 + T6	213	23	726	218	25	212	217	31.5	351	213	31.9	361
T10 : T4 + T5 + T6	215	23	733	220	23	215	220	31.6	354	215	32.4	365
T11 : T4 + T5 + T7	217	22	723	222	27	217	222	32.1	354	217	32.8	364
SE d	12.3	1.45	54.4	16.9	1.7	6	7	1.5	6	12.3	1.2	13.1
C.D.at 5%	NS	3.03	NS	NS	3.54	18	20	4.4	18	NS	3.4	37.9



Table 40. Soil available nutrients (kg ha⁻¹) as influenced by organic nutrient management packages in South Zone

Treatments	Dharwad					
	Initial			Final		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
T1 : Absolute control (No organics & inorganic)	223.8	33.82	528.4	180.0	24.0	460.0
T2 : Control (RDN through in organic)	224.4	33.71	530.4	228.0	28.0	470.0
T3 : RD of Nutrient through organic	222.5	32.41	522.8	231.0	29.0	478.0
T4 : Seed treatment bio fertilisers and foliar application of PPFM at flowering and Boll Development Stage	220.4	33.45	529.5	198.0	26.0	480.0
T5 : Neem cake 250 kg ha ⁻¹	219.4	30.80	520.6	210.0	29.0	495.0
T6 : Raising of Sun hemp between rows incorporated before flowering (2.5-3.0 tha ⁻¹)	226.4	31.45	515.8	226.0	31.0	498.0
T7 : Intercropping with black gram and crop residue application after harvest of pods (1.5 tha ⁻¹)	217.5	33.42	522.6	222.0	29.0	495.0
T8 : T4 + T5	220.0	32.45	530.2	206.0	29.0	493.0
T9 : T4 + T6	224.5	31.81	528.4	229.0	32.0	501.0
T10 : T4 + T5 + T6	220.5	30.48	516.4	232.0	33.0	502.0
T11 : T4 + T5 + T7	219.5	28.45	525.4	230.0	33.0	506.0
SE d	3.4	0.65	9.45	10.2	2.8	10.1
C.D. at 5%	NS	NS	NS	30.2	NS	NS

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 experiments results revealed that significant effect among various treatments for most of the recorded parameters including seed cotton yield. The significantly highest seed cotton yield (3042 kg ha⁻¹), gross return (163536 ₹ ha⁻¹), net return (111999 ₹ ha⁻¹) and benefit cost ratio (2.17) were observed under T3: (Conventional tillage with 100 % residue incorporation), while T4 (Zero tillage + No residue management) recorded lowest yield (1775.5 kg ha⁻¹) gross return (97654 ₹ ha⁻¹), net return (55200 ₹ ha⁻¹) and benefit cost ratio (1.3). The highest B:C ratio of 2.21 was evident under T3: Conventional tillage with 100 % residue incorporation (Table 41).



Table 41. Seed cotton yield (kg ha⁻¹), and economics as influenced by conservation treatments at Faridkot

Treatments	Seed cotton yield (kg ha ⁻¹)	Treatment cost (₹ ha ⁻¹)	Cost of cultivation (₹ ha ⁻¹)	Gross returns (₹ ha ⁻¹)	Net returns (₹ ha ⁻¹)	B:C
T1: Conventional tillage + No residue management (complete removal)	2630	5500	48793	144669	95877	1.96
T2: Conventional tillage with residue incorporation (50 % residue management by removal of only loose straw after combine harvesting)	2973	5500	51537	163536	111999	2.17
T3: Conventional tillage with 100 % residue incorporation	3042	5500	52086	167309	115223	2.21
T4: Zero tillage + No residue management (complete removal)	1776	6000	42454	97654	55200	1.3
T5: Zero tillage + 50 % residue management on top soil surface (Removal of only loose straw after combine harvesting)	1986	6000	44134	109200	65066	1.47
T6: Strip tillage (minimum tillage for sowing in cotton rows at 67.5 cm only) + no residue management (complete removal)	2034	6000	44518	111841	67324	1.51
T7: Strip deep tillage (minimum tillage for sowing in cotton rows at 67.5cm only) + 50 % residue management on top soil surface (Removal of only loose straw after combine harvesting)	2234	6000	46120	122860	76739	1.66
S.E. ±	133		1066	7327	6261	0.09
C.D. at 5%	282		2256	15513	13257	0.19

Soil parameters: pH-8.5, EC- 0.33 mmhos/cm, OC -0.30%, Available P₂O₅- 11.75 kg ha⁻¹ & Available K₂O- 397.5kg ha⁻¹, Recommended spacing: 67.5 x 75 cm, Recommended nutrients: 92.5 N kg ha⁻¹ and 30 P₂O₅ kg ha⁻¹, Environment: irrigated;

Bathinda

There was significant variation in cotton crop performance under different conservation treatments at Bathinda. The highest seed cotton yield was recorded under conventional tillage with 100% residue incorporation (3644 kg ha⁻¹) followed by strip tillage with 50% residue management (3360 kg ha⁻¹). There was significant reduction in seed cotton yield with reduction in residue (either 50% or no residue) incorporation in Conventional tillage. Seed cotton yield produced under Strip tillage with 50 % residue management was statistically at par with Conventional tillage with 100% residue incorporation. Whereas Strip tillage and Zero tillage with 50 % residue management were



also statistically at par with Conventional tillage with no and 50% residue incorporation. The lowest cost of cultivation (₹ 43,879ha⁻¹) and net return (₹ 98,123ha⁻¹) were recorded under Zero tillage with no residue. While, the highest cost of cultivation (₹ 56,108ha⁻¹) and net returns (₹1,55,255ha⁻¹) recorded under Conventional tillage with 100 % residue incorporation (Table 42). Cost of cultivation increased significantly with increase in residue incorporation from 0<50<100% in Conventional tillage. There was non-significant differences in cost of cultivation between both Zero tillage treatments. Similarly, Strip tillage was also statistically similar with respect to cost of cultivation. However, B:C ratio was highest under Strip tillage with 50 % residue management (3.0) was statistically at with Zero tillage with 50 % residue (2.83) and Conventional tillage with 100 % residue incorporation (2.76).

Table 42. Seed cotton yield (kg ha⁻¹), and economics as influenced by conservation treatments at Faridkot

Treatments	Seed cotton yield (kg ha ⁻¹)	Treatment cost (₹ ha ⁻¹)	Cost of cultivation (₹ ha ⁻¹)	Gross returns (₹ ha ⁻¹)	Net returns (₹ ha ⁻¹)	B:C
T1: Conventional tillage + No residue management (complete removal)	2984	13352	48346	173083	124738	2.58
T2: Conventional tillage with residue incorporation (50 % residue management by removal of only loose straw after combine harvesting)	3232	15055	51711	187467	135756	2.62
T3: Conventional tillage with 100 % residue incorporation	3644	16692	56108	211363	155255	2.76
T4: Zero tillage + No residue management (complete removal)	2448	12475	43879	142002	98123	2.23
T5: Zero tillage + 50 % residue management on top soil surface (Removal of only loose straw after combine harvesting)	3053	10724	46176	177050	130874	2.83
T6: Strip tillage (minimum tillage for sowing in cotton rows at 67.5 cm only) + no residue management (complete removal)	2927	13000	47609	169751	122142	2.56
T7: Strip tillage (minimum tillage for sowing in cotton rows at 67.5cm only) + 50 % residue management on top soil surface (Removal of only loose straw after combine harvesting)	3360	11249	48758	194856	146098	3
S.E. ±	178	-	1191	10313	9121	0.12
C.D. at 5%	392	-	2624	22718	20093	0.26

Soil parameters: pH- 8.75, EC-0.18 m mhos/cm, OC - 0.27%, Available P₂O₅- 8.5 kg ha⁻¹ & Available K₂O- 270 kg ha⁻¹, Recommended nutrients: 105 kg Nha⁻¹, Environment: irrigated; Total rainfall during cropping period: 501 mm



Sriganganagar

The experiment was conducted on conservation agriculture results of first year revealed that conventional tillage with no residue management (control) gave maximum seed cotton yield (3893 kg ha^{-1}) significantly higher yield over rest of the treatments. However, which was on par with T7: Strip deep tillage with 50 % residue management (3685 kg ha^{-1}), T6: Strip tillage with no residue management (3457 kg ha^{-1}) and T5: Zero tillage with 50 % residue management (3402 kg ha^{-1}) (Table 43). Same trend was observed in rest of the observation like boll weights and number of bolls per plant with treatments. Conventional tillage (T1) with no residue management (Control) gave better results.

Table 43. Growth characters, yield attributes and seed cotton yield (kg ha^{-1}) as influenced by conservation treatments at Sriganganagar

Treatments	Seed cotton Yield (kg ha^{-1})	Boll weight (g)	No Boll /plant	Mono pods /plant	Sym pod /plant
T1: Conventional tillage + No residue management (complete removal)	3893	3.34	79.7	5.9	19.9
T2: Conventional tillage with residue incorporation (50 % residue management by removal of only loose straw after combine harvesting)	2872	3.17	64.7	4.9	16.4
T3: Conventional tillage with 100 % residue incorporation	2926	3.17	70.0	5.0	17.2
T4: Zero tillage + No residue management (complete removal)	2933	3.21	75.4	5.0	17.9
T5: Zero tillage + 50 % residue management on top soil surface (Removal of only loose straw after combine harvesting)	3402	3.26	76.0	5.4	18.4
T6: Strip tillage (minimum tillage for sowing in cotton rows at 67.5 cm only) + no residue management (complete removal)	3457	3.32	76.4	5.4	18.8
T7: Strip deep tillage (minimum tillage for sowing in cotton rows at 67.5cm only) + 50 % residue management on top soil surface (Removal of only loose straw after combine harvesting)	3685	3.32	78.6	5.6	19.1
SEd	266	0.18	5.95	0.5	1.2
CD at 5%	580	0.4	12.96	1.09	2.71



Rahuri

The result of conservation treatments revealed that T₇: Permanent bed system with Zero tillage with 100 % residue management recorded significantly higher seed cotton yield (2516 kg ha⁻¹) and it was followed by T₃: Zero tillage with 50 % residue management (2093 kg ha⁻¹) and T₁: Conventional tillage with No residue management (1961 kg ha⁻¹). The results of rotation crop (wheat) found that T₁: Conventional tillage with No residue management recorded significantly the highest wheat grain yield (2972 kg ha⁻¹) over the remaining treatments and it was at par with the T₇: Permanent bed system with Zero tillage with 100 % residue management (2818 kg ha⁻¹). The economics of cotton-wheat sequence found that T₇: Permanent bed system + Zero tillage + 100 % residue management recorded significantly the highest cotton equivalent yield (3321 kg ha⁻¹) with maximum gross monetary returns (₹ 263953 ha⁻¹) and net monetary returns (₹ 141834 ha⁻¹) and benefit cost ratio (2.16) (Table 44).

Table 44. 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 ⁻¹)	Wheat Grain yield (kg ha ⁻¹)	Cotton equivalent Yield (kg ha ⁻¹)	Gross returns (₹ ha ⁻¹)	Cost of cultivation (₹ ha ⁻¹)	Net returns (₹ ha ⁻¹)	B:C
T ₁ : Conventional tillage + No residue management	1961	2973	2811	223918	147444	76475	1.52
T ₂ : Zero tillage + No residue management	1458	2127	2065	164152	105232	58920	1.56
T ₃ : Zero tillage + 50 % residue management	2093	2304	2752	221062	109298	111764	2.02
T ₄ : Zero tillage + 100 % residue management	1605	2515	2324	184315	112975	71340	1.63
T ₅ : Permanent bed system + Zero tillage + No residue management	1514	2609	2259	178838	116116	62722	1.54
T ₆ : Permanent bed system + Zero tillage + 50 % residue management	1671	2718	2448	193861	118442	75419	1.64
T ₇ : Permanent bed system + Zero tillage + 100% residue management	2516	2818	3321	263953	122119	141834	2.16
S.E. ±	118	36	122	-	-	--	-
C.D. at 5%	365	111	375	-	-	-	-

Soil type :Medium black soil, pH :7.50 , Ec:0.28(dSm⁻¹) ,OC:0.57%,Soil fertility status N : 163 kg ha⁻¹, P₂O₅ : 8.18 kg ha⁻¹, K₂O : 526 kg ha⁻¹ Environment: Irrigated, Recommended Nutrient levels 125 :65:65NPK kg ha⁻¹, Genotypes (G): **Bhakti (Bt. Cotton), Wheat : NIAW-34**



Junagadh

The results of conservation experiment conducted at Junagadh revealed that all conservation practices attempted had expressed equal effect in comparison to conventional tillage with no residue management (T_1). Total weed population per m^{-2} at 60 DAS before second weeding was found significantly higher in treatment permanent bed system with zero tillage with no residue management. Economics was worked out by using current market prices of produce and inputs used. The maximum gross return (₹ 298374 ha^{-1}) and net return (₹ 180467 ha^{-1}) were recorded with treatment of conventional tillage with no residue management (T_1), followed Permanent bed system + Zero tillage+ 100 % residue management treatment (having gross return (₹ 291376 ha^{-1}) and net return (₹ 137301 ha^{-1}) (Table 45).

Table 45. Bulk density, seed cotton yield ($kg\ ha^{-1}$), quantity of residue used, labour used and economics as influenced by conservation treatments

Treatments	Seed cotton Yield ($kg\ ha^{-1}$)	Sorghum grain yield ($kg\ ha^{-1}$)	Cotton Equivalent Yield ($kg\ ha^{-1}$)	Cost of cultivation system ($₹\ ha^{-1}$)	Gross return of system ($₹\ ha^{-1}$)	Net Return of system ($₹\ ha^{-1}$)	BCR
T_1 . Conventional tillage+ No residue management	2419	1991	2957	117907	298374	180467	2.53
T_2 . Zero tillage+ No residue management	1715	1451	2107	104233	213705	109472	2.05
T_3 .Zero tillage+ 50 % residue management	2190	1652	2636	110164	265722	155558	2.41
T_4 .Zero tillage+ 100 % residue management	2127	1533	2542	110074	256789	146715	2.33
T_5 .Permanent bed system + Zero tillage + No residue management	2206	1515	2615	111824	261890	150066	2.34
T_6 .Permanent bed system + Zero tillage+ 50 % residue management	2326	1855	2827	114806	284058	169252	2.47
T_7 .Permanent bed system + Zero tillage+ 100 % residue management	2380	1894	2892	116322	291376	175054	2.50
SEd	164	124	-				
CD (5%)	NS	NS	-				

Soil parameters: pH:8.12, Soil Ec 0.37 dSm^{-1} , OC : 0.87%, Soil fertility: N: 285 $kg\ ha^{-1}$, P_2O_5 :65.16 $kg\ ha^{-1}$, K_2O :314 $kg\ ha^{-1}$, Spacing: 120 x 45cm, Rec.nutrient:240-50-150 $kg\ NPK\ ha^{-1}$, Environment: Irrigated, Total rain fall 1305.10 (mm)

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 was recorded in conventional practice with no residue management (1748 $kg\ ha^{-1}$) which was on par with permanent bed system with zero tillage and 100 % residue management (1697 $kg\ ha^{-1}$) and permanent bed system with zero tillage and 50 % residue management (1538 $kg\ ha^{-1}$). While the lowest seed cotton yield was recorded in zero tillage without residue management (1085 $kg\ ha^{-1}$). The highest seed cotton yield in conventional practice with no residue management and permanent beds with residue



management might be attributed to better growth and yield parameters. The system productivity in terms of seed cotton equivalent yield was maximum in conventional tillage with no residue management (2367 kg ha^{-1}), followed by permanent bed system with zero tillage and 100 % residue management (2238 kg ha^{-1}) and both were on par with each other. Permanent bed system + zero tillage + 100 % residue management recorded significantly lower bulk density (1.37 g/cc) at 0-15 cm depth. While the bulk density at 16-30 cm was found to be non-significant in all the treatment combinations. Significantly higher total gross returns ($\text{₹ } 2,04,429 \text{ ha}^{-1}$) and net returns ($\text{₹ } 1,32,289 \text{ ha}^{-1}$) were recorded in permanent bed system with zero tillage and 100 % residue management (Table 46). The increase in total returns could be attributed to higher seed cotton yield and lower cost of cultivation compared to other treatments.

Table 46 . Bulk density, seed cotton yield (kg ha^{-1}) , grain yield (kg ha^{-1}), and economics as influenced by conservation treatments

Treatments	Bulk density (0-15 cm)	Bulk Density (16-30cm)	Seed Cotton yield (kg ha^{-1})	Sorghum Yield (kg ha^{-1})	Seed Cotton Equivalent yield (kg ha^{-1})	Cost of cultivation (₹ ha^{-1})	Gross Returns (₹ ha^{-1})	Net Returns (₹ ha^{-1})	B:C Ratio
T1. Conventional tillage+ No residue management	1.52	1.57	1748	3712	2367	96321	216372	120051	1.52
T2. Zero tillage+ No residue management	1.57	1.58	1085	2434	1491	60140	135888	75748	1.57
T3. Zero tillage+ 50 % residue management	1.47	1.54	1346	2793	1811	67140	165293	98153	1.47
T4. Zero tillage+ 100 % residue management	1.43	1.55	1467	2841	1941	70140	177030	106890	1.43
T5. Permanent bed system + Zero tillage + No residue management	1.46	1.56	1432	2767	1893	65515	172860	107345	1.46
T6. Permanent bed system + Zero tillage+ 50 % residue management	1.42	1.55	1538	3156	2064	69515	188345	118830	1.42
T7. Permanent bed system + Zero tillage+ 100 % residue management	1.37	1.52	1697	3246	2238	72140	204429	132289	1.37
SEd	0.04	0.02	91.24	215.11	112.3	782	10059	9316	0.04
CD (5%)	0.08	0.04	198.8	468.69	244.67	1704	21918	20298	0.08

Soil: Medium black, clay loam, pH:7.76, Soil fertility status N : 238.2 kg ha^{-1} , P_2O_5 : 23.6 kg ha^{-1} , K_2O : 267.2 kg ha^{-1} , OC : 0.29%, Recommended:150: 75: 75 kg NPK ha^{-1} , Recommended spacing:90 x 60 cm Environment: Rainfed, Total rainfall received:491.6 mm

Srivilliputhur

The results on the seed cotton yield revealed that conventional tillage without residue incorporation (T_1) registered the highest seed cotton yield (1526 kg ha^{-1}), maize grain yield (4468 kg ha^{-1}) and cotton equivalent yield (4689 kg ha^{-1}) which was at par with zero tillage with 100 % residue management(T_4) (Seed cotton yield (1675 kg ha^{-1}), Maize yield (4478 kg ha^{-1}) and seed cotton equivalent yield (2561 kg ha^{-1}) and T_7 Permanent bed system + Zero tillage + 100 % residue management (Seed



cotton yield (1442 kg ha⁻¹), Maize yield (4197 kg ha⁻¹) and seed cotton equivalent yield (2414 kg ha⁻¹) (Table 47). The economic analysis found that conventional tillage without residue incorporation (T₁) registered the highest gross return (₹ 2,10,024 ha⁻¹). However, the highest net return (₹ 81,849 ha⁻¹) and benefit cost ratio (1.83) was registered with zero tillage with 100 % residue management (T₄) (Table 47). The labour use was higher in the conventional tillage system of ridges and furrows methods (317 man days ha⁻¹), where as it was lesser with other conservation treatments.

Table 47. Effect of conservation treatments on yield of cotton and Maize, Seed cotton equivalent yield and economics of maize - cotton cropping system

Treatments	Seed cotton yield (kg ha ⁻¹)	Yield (kg ha ⁻¹) of rotation crop	Seed cotton equivalent yield (kg ha ⁻¹)	Cost of cultivation (₹ ha ⁻¹)	Gross return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	B:C ratio
T1. Conventional tillage+ No residue management	1526	4468	2561	119700	210024	80524	1.75
T2. Zero tillage+ No residue management	1341	4015	2271	106300	186247	70147	1.75
T3. Zero tillage+ 50 % residue management	1420	4106	2371	108300	194454	76354	1.80
T4. Zero tillage+ 100 % residue management	1469	4289	2463	110300	201949	81849	1.83
T5. Permanent bed system + Zero tillage + No residue management	1333	4044	2270	104300	186142	72042	1.78
T6. Permanent bed system + Zero tillage+ 50 % residue management	1387	4081	2333	106400	191273	75073	1.80
T7. Permanent bed system + Zero tillage+ 100 % residue management	1442	4197	2414	108400	197987	79787	1.83
SEd	70.6	161.0					
CD (5%)	141.8	323.4					

Soil type : Clay loam, pH: 8.03 dSm/m, OC : 0.75%, Soil fertility status : N : 182 kg ha⁻¹ (Low), P₂O₅ : 50 kg ha⁻¹ (High) K₂O : 381 kg ha⁻¹ (High), Recommended Nutrient levels : 80 : 40 : 40 Kg NPK ha⁻¹, Environment: Irrigated Genotype: Co17

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 (₹ ha⁻¹), cost of production (₹ q⁻¹) and net returns (₹ ha⁻¹) were calculated. The cost of cultivation (Cost C₃) was arrived as ₹ 92,073, 91,107 and 94,097 ha⁻¹ respectively for Faridkot (Bt hybrid), Hisar (Bt hybrid) and Bathinda (arboreum). The cost of agro inputs was assessed, which was 29.7, 17.6 and 20.4 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 47.0, 30.8 and 51.7 per cent of Cost C₃ of Faridkot (Bt hybrid), Hisar (Bt hybrid) and Bathinda (arboreum) respectively. The mean seed cotton yield of 17.0, 14.0 and 14.4 q ha⁻¹ was attained by survey at Faridkot (Bt hybrid), Hisar (Bt hybrid) and Bathinda (arboreum) respectively (Table 48). The total gross return was ranged ₹ 1,05,403, 1,09,200 and 94,097 ha⁻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 48). The cost of cultivation per quintal on the basis of Cost C3 was arrived as ₹ 5,317, 6,508 and 6,540 respectively for Faridkot (Bt hybrid), Hisar (Bt hybrid) and Bathinda (arboreum) (Table 49). The net return from cotton cultivation was ranged from arrived as ₹13,330, 18,093 and -11,594 ha⁻¹ respectively for Faridkot (Bt hybrid), Hisar (Bt hybrid) and Bathinda (arboreum).

Table 48. Cost of different inputs and labours and their share in cost of cultivation

Centres	Faridkot		Hisar		Bathinda	
Genotypes	Bt hybrid		Bt hybrid		Bt hybrid	
Inputs	Value (₹ ha ⁻¹ .)	%	Value (₹ ha ⁻¹ .)	%	Value (₹ ha ⁻¹ .)	%
i. Seeds	7000	7.6	3650	4.0	610	0.6
ii. Fertilizers	6790	7.4	6755	7.4	5538	5.9
iii. Manures	3875	4.2	0	0.0	1479	1.6
iv. Weedicides	3115	3.4	0	0.0	1168	1.2
v. Plant protection chemicals	5872	6.4	5620	6.2	10267	10.9
vi. Growth regulators/ hormones	738	0.8	0	0.0	163	0.2
Total	27390	29.7	16025	17.6	19225	20.4
B. Cost of labour (₹ ha ⁻¹)		0.0		0.0		0.0
i. Field preparation	4213	4.6	3325	3.6	4907	5.2
ii. Sowing	3273	3.6	1375	1.5	4205	4.5
Total of application charges for input	6502	7.1	12200	13.4	13588	14.4
ix. Weeding	12371	13.4	4400	4.8	9588	10.2
x. Interculture	0	0.0	3300	3.6	3442	3.7
xi. Picking & cleaning	14133	15.3	19250	21.1	9712	10.3
xii. Cotton stalk pulling/cutting	2775	3.0	1100	1.2	3179	3.4
Total	43267	47.0	28050	30.8	48621	51.7
Miscellaneous (₹ ha ⁻¹)	2100	2.3	0	0.0	0	0.0
Other expenses (rent, interest, depreciation, managerial cost & etc.) (₹ ha ⁻¹)	19316	21.0	8150	8.9	26251	27.9
Grand total (₹ ha ⁻¹) (C3)	92073	100	91107	100	94097	100
Seed cotton yield	17.00		14		14.39	
Gross return (₹ ha ⁻¹)	105403		109200		82503	



Table 49. Different type of costs, cost of per quintal of production and net return (₹ ha⁻¹)

Centre	Geno- types	Particulars	Cost A1	Cost A2	Cost B1	Cost B2	Cost C1	Cost C2	Cost C3
Faridkot	Bt hybrids	Total cost of cultivation (₹ ha ⁻¹)	62958	62958	69182	75662	77223	83703	92073
		Cost of production (₹ q ⁻¹)	3634	3634	3993	4367	4459	4833	5317
		Net Return (₹ ha ⁻¹)	42445	42445	36221	29741	28180	21700	13330
Hisar	Bt hybrids	Total cost of cultivation (₹ ha ⁻¹)	69125	87875	77325	77325	82825	82825	91107
		Cost of production (₹ q ⁻¹)	4938	6277	5523	5523	5916	5916	6508
		Net Return (₹ ha ⁻¹)	40075	21325	31875	31875	26375	26375	18093
Bathinda	arboreu m	Total cost of cultivation (₹ ha ⁻¹)	69209	73375	80142	80142	85543	85543	94097
		Cost of production (₹ q ⁻¹)	4810	5100	5570	5570	5946	5946	6540
		Net Return (₹ ha ⁻¹)	13294	9127	2361	2361	-3040	-3040	11594

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 (₹ ha⁻¹), cost of production (₹ q⁻¹) and net returns (₹ ha⁻¹) were calculated. The cost of cultivation (Cost C3) was arrived as ₹ 96,894, 95,711, 99,220, 77,384, 1,50,390 and 96,457 ha⁻¹ respectively for Akola (Bt hybrid rainfed), Bhawanipatna (non Bt hybrids rainfed), Junagadh (Bt hybrid irrigated), Nanded (Bt hybrid rainfed), Rahuri (Bt hybrid irrigated) and Surat (Bt hybrid-irrigated) respectively. The cost of agro inputs was calculated, which was 20.5, 18.0, 34.6, 29.1, 16.8 and 25.3 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), Rahuri (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 39.9, 35.9, 15.5, 27.2 and 27.8 per cent respectively for Akola (Bt hybrid rainfed), Bhawanipatna (non Bt hybrids rainfed), Junagadh (Bt hybrid irrigated), Nanded (Bt hybrid rainfed), Rahuri (Bt hybrid irrigated) and Surat (Bt hybrid-irrigated) respectively (Table 50). The mean seed cotton yield of 18.5, 19.0, 20.0, 11.0 and 27.8 qha⁻¹ were reported by survey at Akola (Bt hybrid rainfed), Bhawanipatna (non Bt hybrids rainfed), Junagadh (Bt hybrid irrigated), Nanded (Bt hybrid rainfed), Rahuri (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 51). The cost of cultivation per quintal on the basis of Cost C3 was arrived as ₹ 5,237, 5,146, 4,497, 7029 and 5,404 ha⁻¹ respectively with Akola (Bt hybrid rainfed), Bhawanipatna (non Bt hybrids rainfed), Junagadh (Bt hybrid irrigated), Nanded (Bt hybrid rainfed), Rahuri (Bt hybrid irrigated) and Surat (Bt hybrid-irrigated). The net return from cotton cultivation was ranged from ₹14,569, 16,354, 96,061, 20,661 and 83,684 ha⁻¹ 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 Rahuri (Bt hybrid irrigated).



Table 50. Cost of different inputs and labours and their share in cost of cultivation in Central zone

Centres	Akola		Bhawanipatna		Junagadh		Nanded		Rahuri		Surat	
Genotypes	Bt hybrid		Non Bt		Bt hybrid		Bt hybrid		Bt hybrid		Bt hybrid	
Inputs	Value (₹ ha ⁻¹ .)	%	Value (₹ ha ⁻¹ .)	%	Value (₹ ha ⁻¹ .)	%	Value (₹ ha ⁻¹ .)	%	Value (₹ ha ⁻¹ .)	%	Value (₹ ha ⁻¹ .)	%
i.Seeds	3800	3.9	2000	2.1	4038	4.1	2768	3.6	2928	1.9	3750	3.9
ii.Fertilizers	4975	5.1	6250	6.5	9150	9.2	8596	11.1	9223.93	6.1	7239	7.5
iii.Manures	3500	3.6	2600	2.7	10000	10.1	1000	1.3	4240	2.8	2989	3.1
iv.Weedicides	2500	2.6	1000	1.0	1800	1.8	748	1.0	3206	2.1	315	0.3
v.Plant protection chemicals	3110	3.2	5000	5.2	9375	9.4	8242	10.7	3172	2.1	4865	5.0
vi.Growth regulators/ hormones	2000	2.1	350	0.4	0	0.0	1153	1.5	540	0.4	0	0.0
Irrigation charges	0	0.0	0	0.0	0	0.0	0	0.0	2010	1.3	0	25.3
Total	19885	20.5	17200	18.0	34363	34.6	22507	29.1	25319.93	16.8	24446	0.0
B. Cost of labour (₹ ha ⁻¹)		0.0		0.0		0.0		0.0		0.0		11.1
i.Field preparation	10000	10.3	3150	3.3	3750	3.8	6212	8.0	8377.95	5.6	10729	1.4
ii.Sowing	3500	3.6	3150	3.3	2438	2.5	1692	2.2	3350	2.2	1350	9.9
Total of application charges for input	7600	7.8	9450	9.9	13375	13.5	3908	5.1	19440	12.9	9531	13.4
ix.Weeding	4400	4.5	3150	3.3	9000	9.1	3520	4.5	7544.2	5.0	12938	2.3
x.Interculture	4000	4.1	3780	3.9	4688	4.7	4567	5.9	3700	2.5	2251	20.7
xi.Picking& cleaning	7200	7.4	15750	16.5	15000	15.1	10812	14.0	37942	25.2	19938	1.0
xii.Cotton stalk pulling/cutting	2000	2.1	3750	3.9	1188	1.2	3145	4.1	2867.6	1.9	992	59.8
Total	38700	39.9	42180	44.1	49438	49.8	33856	43.8	83221.75	55.3	57727	0.0
Miscellaneous (₹ ha ⁻¹)	0	0.0	2000	2.1	0	0.0	0	0.0	0	0.0	0	14.8
Other expenses (rent, interest, depreciation, managerial cost& etc.) (₹ ha ⁻¹)	38309	39.5	34331	35.9	15420	15.5	21021	27.2	41848.32	27.8	14284	100.0
Grand total (₹ ha ⁻¹)(C3)	96894	100	95711	100	99220	100.0	77384	100.0	150390	100.0	96457	3.9
Seed cotton yield	18.5		19		20		11.01		27.83		22	
Gross return (₹ ha ⁻¹)	139358		112065		183768		98045		245075		151166	



Table 51. Different type of costs, cost of per quintal of production and net return (₹ ha⁻¹) Central Zone

Akola	Cost calculation	Cost A1	Cost A2	Cost B1	Cost B2	Cost C1	Cost C2	Cost C3
	Total CC (₹ ha ⁻¹)	58585	58585	73585	80585	81085	88085	96894
	Cost of production (₹ q ⁻¹)	3167	3167	3978	4356	4383	4761	5237
	Net Return (₹ ha ⁻¹)	52878	52878	37878	30878	30378	23378	14569
Bhawani	Total CC (₹ ha ⁻¹)	73510	73510	78510	83010	82510	87010	95711
	Cost of production (₹ q ⁻¹)	3952	3952	4221	4463	4436	4678	5146
	Net Return (₹ ha ⁻¹)	38555	38555	33555	29055	29555	25055	16354
Junagadh	Total CC (₹ ha ⁻¹)	69064	69064	69440	76850	82790	81763	89939
	Cost of production (₹ q ⁻¹)	3453	3453	3472	3843	4140	4088	4497
	Net Return (₹ ha ⁻¹)	116936	116936	116560	109150	103210	104237	96061
Nanded	Total CC (₹ ha ⁻¹)	59710	59710	65687	65814	70222	70349	77384
	Cost of production (₹ q ⁻¹)	5423	5423	5966	5978	6378	6390	7029
	Net Return (₹ ha ⁻¹)	38335	38335	32358	32231	27823	27696	20661
Rahuri	Total CC (₹ ha ⁻¹)	117044	117044	126669	126669	136719	136719	150391
	Cost of production (₹ q ⁻¹)	4206	4206	4552	4552	4913	4913	5404
	Net Return (₹ ha ⁻¹)	128031	128031	118406	118406	108356	98356	83684
Surat	Total CC (₹ ha ⁻¹)	73710	73710	74168	80343	81514	87689	96457
	Cost of production (₹ q ⁻¹)	3350	3350	3371	3652	3705	3986	4384
	Net Return (₹ ha ⁻¹)	77456	77456	76998	70823	69652	63477	54709

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 (₹ ha⁻¹), cost of production (₹ q⁻¹) and net returns (₹ ha⁻¹) were calculated. The cost of cultivation (Cost C3) was arrived as ₹ 90,375, 2,00,392, 87,914, 1,23,079, 1,24,547, 94,749, and 1,52,097 ha⁻¹ respectively for Nandyal (Bt hybrid rainfed), Coimbatore (Bt hybrid HxB irrigated), Raichur (Bt hybrid- irrigated), Srivilliputhur (Bt hybrid-irrigated), Coimbatore (Bt hybrid HxH - irrigated), Chamrajnagar (Bt hybrid(HxB) -rainfed) and LAM (Bt hybrid- rainfed) .The cost of agro inputs was assessed, which was 22.3, 22.7,35.0,14.6,20.2, 25.1 and 39.0 per cent respectively of total cost of cultivation on the basis of Cost C3 for Nandyal (Bt hybrid rainfed), Coimbatore (Bt hybrid HxB irrigated), Raichur



(Bt hybrid- irrigated), Srivilliputhur (Bt hybrid-irrigated), Coimbatore (Bt hybrid HxH - irrigated) Chamrajnagar (Bt hybrid(HxB) -rainfed) and LAM (Bt hybrid- rainfed) (Table 52). The share of labour cost in total cost of cultivation arrived as 46.03,50.5,38.4,64.5,47.5, 48.5 and 58.8 per cent of cost C3 respectively for Nandyal (Bt hybrid rainfed), Coimbatore (Bt hybrid HxB irrigated), Raichur (Bt hybrid- irrigated), Srivilliputhur (Bt hybrid-irrigated), Coimbatore (Bt hybrid HxH - irrigated) Chamrajnagar (Bt hybrid(HxB) -rainfed) and LAM (Bt hybrid- rainfed) . The mean seed cotton yield of 22.0, 24.0,26.5,23.2,26.0, 15.3 and 23.16 q ha⁻¹ was attained by survey at Coimbatore (Bt hybrid HxB irrigated), Raichur (Bt hybrid- irrigated), Srivilliputhur (Bt hybrid-irrigated), Coimbatore (Bt hybrid HxH - irrigated) Chamrajnagar (Bt hybrid(HxB) -rainfed) and LAM (Bt hybrid- rainfed) .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 53). The cost of cultivation per quintal on the basis of Cost C3 was arrived as ₹4,065, 8,350, 3,318, 5,305, 4,790 , 6,528 and 8551 ha⁻¹ respectively with Nandyal (Bt hybrid rainfed),Coimbatore (Bt hybrid HxB irrigated), Raichur (Bt hybrid- irrigated), Srivilliputhur (Bt hybrid-irrigated), Coimbatore (Bt hybrid HxH - irrigated) Chamrajnagar (Bt hybrid(HxB) -rainfed) and LAM (Bt hybrid- rainfed) .



Table 52. Cost of different inputs and labours and their share in cost of cultivation in South zone

Centres	Nandyal		Coimbatore		Raichur		Srivilliputhur		Coimbatore		Chamrajnagar		LAM	
Genotypes	Bt hybrid (rainfed)		Bt hybrid(HxB)		Bt hybrid		Bt hybrid		Bt hybrid(HxH)		ELS Bt hybrid		Bt hybrid	
Inputs	Value (₹ ha ⁻¹ .)	%	Value (₹ ha ⁻¹ .)	%	Value (₹ ha ⁻¹ .)	%	Value (₹ ha ⁻¹ .)	%	Value (₹ ha ⁻¹ .)	%	Value (₹ ha ⁻¹ .)	%	Value (₹ ha ⁻¹ .)	%
i.Seeds	2625	2.9	3800	1.9	3650	4.2	4000	3.2	3000	2.4	3000	3.1	4998	3.3
ii.Fertilizers	6875	7.6	11320	5.6	8122	9.2	5300	4.3	7720	6.2	5715	6.0	13251	8.7
iii.Manures	937.5	1.03	14050	7.0	7500	8.5	0	0.0	5900	4.7	13000	13.6	2272	1.5
iv.Weedicides	0	0	7875	3.9	1625	1.8	0	0.0	4575	3.7	0	0.0	4600	3.0
v.Plant protection chemicals	9006	9.9	7500	3.7	5750	6.5	8650	7.0	3000	2.4	2330	2.4	32295	21.2
vi.Growth regulators/ hormones	750	0.8	1000	0.5	0	0.0	0	0.0	1000	0.8	0	0.0	1906	1.3
vii.Irrigation charges	0	0	0	0.0	4100	4.7	0	0.0	0	0.0	0	0.0	-	0
Total	20194	22.3	45545	22.7	30747	35.0	17950	14.6	25195	20.2	24045	25.1	59322	39.0
B. Cost of labour (₹ ha ⁻¹)				0.0		0.0		0.0		0.0		0.0		
i.Field preparation	6750	7.5	17400	8.7	4800	5.5	12600	10.2	3430	2.8	5000	5.2	19175	12.6
ii.Sowing	2875	3.2	6000	3.0	2650	3.0	4180	3.4	4200	3.4	5000	5.2	3206	2.1
Total of application charges for input	7612.5	8.4	25130	12.5	6650	7.6	9760	7.9	19950	16.0	7400	7.7	15902	10.5
ix.Weeding	5250	5.8	16800	8.4	6750	7.7	24200	19.7	10500	8.4	2000	2.1	7947	5.2
x.Interculture	4091	4.5	7000	3.5	4200	4.8	0	0.0	4900	3.9	5000	5.2	18369	12.1
xi.Picking& cleaning	15025	16.6	22500	11.2	7500	8.5	28600	23.2	12000	9.6	16000	16.7	20546	13.5
xii.Cotton stalk pulling/cutting	0	0	6400	3.2	1200	1.4	0	0.0	4200	3.4	6000	6.3	4237	2.8
Total	41603	46.03	101230	50.5	33750	38.4	79340	64.5	59180	47.5	46400	48.5	89382	58.8
Miscellaneous (₹ ha ⁻¹)	0	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	
Other expenses (rent, interest, depreciation, managerial cost& etc.) (₹ ha ⁻¹)	28577	31.6	53617	26.8	23417	26.6	25789	21.0	40172	32.3	25304	26.4	3392.5	2.2
Grand total (₹ ha ⁻¹)(C3)	90375	100	200392	100.0	87914	100	123079	100	124547	100	95749	100	152097	100
Seed cotton yield (q ha ⁻¹)	22		24		26.5		23.2		26		15.3		23.16	
Gross return (₹ ha ⁻¹)	122265		204000		212000		150800		182000		137700		194234	



Table 53 . Different type of costs, cost of per quintal of production and net return (₹ ha⁻¹) in South Zone

	Cost calculation	Cost A1	Cost A2	Cost B1	Cost B2	Cost C1	Cost C2	Cost C3
Nandyal	Total CC(₹ ha ⁻¹)	57390	57390	57761	81171	58749	82159	90375
	Cost of production(₹ q ⁻¹)	2582	2582	2598	3651	2643	3695	4065
	Net Return(₹ ha ⁻¹)	64875	64875	64504	41094	63516	40106	31890
Coimbatore(HxB)	Total CC(₹ ha ⁻¹)	161925	161925	174425	175175	181425	182175	200392
	Cost of production(₹ q ⁻¹)	6747	6747	7268	7299	7559	7591	8350
	Net Return(₹ ha ⁻¹)	42075	42075	29575	28825	22575	21825	3608
Raichur	Total CC(₹ ha ⁻¹)	57122	57122	57122	77122	125897	79922	87914
	Cost of production(₹ q ⁻¹)	2156	2156	2156	2910	2910	2910	3318
	Net Return(₹ ha ⁻¹)	154878	154878	154878	134878	86103	132078	124086
SVPR	Total CC(₹ ha ⁻¹)	81540	81540	86790	98790	99890	111890	123079
	Cost of production(₹ q ⁻¹)	3515	3515	3741	4258	4306	4823	5305
	Net Return(₹ ha ⁻¹)	67260	67260	62010	50010	48910	36910	25721
Coimbatore(HxH)	Total CC(₹ ha ⁻¹)	95725	95725	107725	108725	112225	113225	124547
	Cost of production(₹ q ⁻¹)	3682	3682	4143	4182	4316	4355	4790
	Net Return(₹ ha ⁻¹)	86275	86275	74275	73275	69775	68775	57453
Chamrajnagar	Total CC(₹ ha ⁻¹)	63545	63545	63545	83545	67045	87045	95749
	Cost of production(₹ q ⁻¹)	4153	4153	4153	5460	4382	5689	6258
	Net Return(₹ ha ⁻¹)	74155	74155	74155	54155	70655	50655	41951
LAM	Total CC(₹ ha ⁻¹)	152097	154937	152363	178298	154092	180027	198029.7
	Cost of production(₹ q ⁻¹)	6567	6690	6579	7699	6653	7773	8551
	Net Return(₹ ha ⁻¹)	42136	39296	41870	15935	40141	14206	-3796.7



Agronomy VIII: Strategies to mitigate/minimize soil crust formation in cotton in North zone

Preamble: Soil aggregates are easily dispersed in soils of low organic matter under the impact of rain drops, thus forcing a thin layer of dispersed soil (clay) on the soil surface which on drying develops high strength and form crust and is common problem in North zone. This reduces the exchange of gases between soil and atmosphere and also injures the tips of emerging seedlings, resulting in drastic reduction in plant population and thus forcing farmers for resowing. The repeated sowing and irrigation favoured for high weed infestation. Hence breaking of soil crust is attempted here

North Zone

The treatments effect is varying with intensity of problem by different centres. The results indicated that amongst treatments, running of peg/spike tooth weeder (two days after crust) observed higher germination percentage of 88.0, 88.9 and 90 and seed cotton yield of 1337, 2951 and 2870 kg ha⁻¹ respectively at Sriganganagar, Faridkot and Hisar. The germination per centage was higher with water spray (88.3 %), T6: Farm yard manure @ 3 t/ ha in seed rows (87.5 %) and T8: Running of peg/spike tooth weeder (two days after crust) (86.7 %). The same method calculated higher net return of ₹ 1,13,989 and 67,742 ha⁻¹ with Faridkot and Hisar respectively. The germination percentage (82.4) counted was highest with application of Chopped crop residue /wheat bhusa @ 3 tha⁻¹ at Bathinda. However, application of FYM @3 t ha⁻¹ registered significantly the highest seed cotton yield of 2853 and 3589 kg ha⁻¹ and net return of ₹ 1,25,673 and 1,15,190 ha⁻¹ (Table 54& 54 A) respectively at Bathinda and Sirsa. The study in North Zone results further interpreted that soil crust could be solved practically and economically by Farm yard manure @ 3 t/ ha in seed rows, and running of peg/spike tooth weeder (two days after crust).



Table 54: Germination percentage, seed cotton yield (kg ha⁻¹) and economics as influenced by soil crust management strategies in North Zone

Treatments	SNGR		Bathinda				Faridkot				Hisar		
	Germination (%)	Yield kg ha ⁻¹	Germination (%)	SCY (kg ha ⁻¹)	Cost of Treatment ha ⁻¹	Net Return (₹ ha ⁻¹)	Germination (%)	SCY (kg ha ⁻¹)	Cost of Treatment ha ⁻¹	Net Return (₹ ha ⁻¹)	Germination (%)	SCY (kg ha ⁻¹)	Net Return (₹ ha ⁻¹)
T ₁ : Absolute control (without soil crust)	100	1661	94.4	3087	0	130365	95.1	3675	0	150482	96	3000	67460
T ₂ : Control (with soil crust)	40	661	18.5	875	0	16893	28.5	927	0	21365	26	1185	-15810
T ₃ : Super Absorbent Polymer @12.5 kg ha ⁻¹ -1	36	705	48.1	1838	6000	60270					40	1630	1375
T ₄ : Super Absorbent Polymer @25 kg ha ⁻¹ -1	36	661	50.9	1980	11625	61953	47.9	2019	15000	57681	41	1889	10229
T ₅ : Super Absorbent Polymer @50 kg ha ⁻¹ -1	52	999	58.3	2267	22875	65401	68.1	2471	30000	63912	61	2259	21304
T ₆ : Farm yard manure @ 3 t/ha in seed rows	79	1293	76.9	2853	3150	115190	52.8	2036	3500	69957	81	2667	40815
T ₇ : Chopped crop residue/wheat bhusa @3 tha ⁻¹	38	1161	82.4	2648	2775	105068	62.5	2158	3000	76214	76	2185	16884
T ₈ : Running of peg/spike tooth weeder (two days after crust))	88	1337	80.6	2504	2250	98183	88.9	2951	2500	113989	90	2870	67742
T ₉ : Gaund Kathira@12.5 kg ha ⁻¹	28	779	33.3	1136	4750	25538					28	1148	-18845
T ₁₀ : Gaund Kathira@25 kg ha ⁻¹	31	647	35.2	1297	9125	29390	45.1	2007	10000	62112	44	1685	3840
T ₁₁ : Gaund Kathira@50 kg ha ⁻¹	25	514	43.5	1378	17875	24795	61.8	2246	20000	63330	40	1519	-6349
SEd	2.46	73	4.7	165	-	8448					9.34	593.19	
CD(5%)	5.15	153	9.7	340	-	17462	-	272	-	26743	4.45	282.38	

Bathinda: Soil parameters: pH- 8.81, EC-0.15 m mhos/cm, OC - 0.31%, Available P₂O₅- 8.3 kg ha⁻¹ & Available K₂O- 210 kg ha⁻¹, Recommended nutrients: 105 kg N ha⁻¹, Environment: irrigated; Total rainfall during cropping period: 501 mm

Faridkot: Soil parameters: pH-8.5, EC-0.26 m mhos/cm, OC-0.41%, Available P₂O₅-10.2 kg ha⁻¹ & Available K₂O- 298kg ha⁻¹, Recommended spacing: 67.5 x 75 cm, Recommended nutrients: 105 kg N and 30 kg P₂O₅ ha⁻¹, Environment: irrigated; Total rainfall during cropping period: 499.8 mm

Hisar: Soil parameters:pH-8.5, EC-0.26 m mhos/cm N : 136 kg ha⁻¹, P₂O₅ : 132 kg ha⁻¹, K₂O : 256 kg ha⁻¹ & OC : 0.48 %, RDF: 175:90; 90;25 N:P;K:Zn kg ha-1 , Recommended spacing: 100 x 45 cm, Total rainfall: 794 mm



Table 54 A: Germination percentage, seed cotton yield (kg ha⁻¹) and economics as influenced by soil crust management at Sirsa

Treatments	Germination (%)	SCY (kg/ha)	Nety Return	B:C ratio
T1: Absolute control (without soil crust)	91.7	3220	110227	1.49
T2: Control (with soil crust)	15	909	-5940	-0.11
T3: Super Absorbent Polymer @ 12.5 kg/ha	22.5	1067	-3,98	-0.06
T4: Super Absorbent Polymer @ 25 kg/ha	29.2	1159	-4942	-0.07
T5: Super Absorbent Polymer @ 50 kg/ha	35	1276	-10311	-0.13
T6: Farm yard manure @ 3 t/ ha in seed rows	87.5	3589	125673	1.56
T7: Chopped crop residue/wheat bhusa 3 t/ha in seed rows	70	3436	118350	1.51
T8: Running of peg/spike tooth weeder (two days after crust)	86.7	3135	103872	1.37
T9: Goond Katira @ 12.5 kg/ha	20.8	957	-7611	-0.13
T10: Goond Katira @ 25 kg/ha	27.5	1012	-8597	-0.14
T11: Goond Katira @ 50 kg/ha	34.2	1107	-11339	-0.15
T12: Water spraying 2-4 days	88.3	3029	97811	1.29
SE (m)	4.35	160	8031	0.099
C.D. (5%)	12.84	472	23707	0.291

Recommended nutrients: 150 kg N ha⁻¹, 30 kg P₂O₅ ha⁻¹ and 25 kg K₂O ha⁻¹; Environment: irrigated; Total rainfall during cropping period: **359.4** mm

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.

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. Among Bt varieties, PAU Bt 2 registered the significantly highest seed cotton yield of 3094 kg ha⁻¹, gross return of ₹ 1,70,172ha⁻¹, net return of ₹ 1,17,842ha⁻¹ and benefit cost of 2.23 at Faridkot. In Bathinda, PAU Bt 3 registered the significantly highest seed cotton yield of 2752 kg ha⁻¹, gross return of ₹ 1,59,620 ha⁻¹, net return of ₹ 1,10,834 ha⁻¹ and benefit cost of 2.27. The comparison of ruling Bt hybrid against high performed Bt variety revealed that Bt



hybrid recorded 39.6 and 14.2 per cent higher seed cotton yield respectively 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. The reduction of seed cotton yield was 32.2 and 25.6 per cent were calculated as compared to high performing narrow geometry respectively at Faridkot, and Bathinda. Among narrow geometries, the spacing level of S2.67.5 x 15 cm registered the highest seed cotton yield 3179 and 2625 kg ha⁻¹, gross return of ₹ 1,74,851 and 1,52,239 and ha⁻¹, net return of ₹1,20,959 and 1,03,393 ha⁻¹ and benefit cost ratio of 2.21 and 2.10 at Faridkot and Bathinda respectively (Table 55). The narrow planted geometries (S1.67.5 x 15 cm, S2.67.5 x 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 55. Seed cotton yield (kg ha⁻¹), Gross Return (₹ ha⁻¹), Net return (₹ ha⁻¹) and Benefit Cost ratio of Bt varieties planted under different spacing levels in North Zone

Genotypes	Faridkot				Bathinda			
	Seed cotton yield (kg ha ⁻¹)	Gross Return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	B:C ratio	Seed cotton yield (kg ha ⁻¹)	Gross Return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	B:C ratio
G1. PAU Bt1	2994	164666	113137	2.17	2236	129665	84339	1.82
G2. PAU Bt2	3094	170172	117842	2.23	2728	158251	109623	2.24
G3. PAU Bt3	2978	163791	112389	2.17	2752	159620	110834	2.27
G4. CICR Bt 6	1949	107199	64029	1.46	1796	104189	61805	1.45
Bt hybrid I	4318	237493	173239	2.69	3143	182294	130486	2.52
SE d	126	6928	5921	0.08	88	5082	4495	0.07
CD (5%)	262	14384	12292	0.16	182	10550	9332	0.15
Spacing								
S1.67.5 x 15 cm	3179	174851	120959	2.21	2625	152239	103393	2.10
S2.67.5 x 30 cm	2890	158921	108596	2.13	2485	144103	97417	2.06
S3.80 x 15 cm	2791	153510	103122	2.01	2450	142109	94953	1.99
S4.67.5 x 60 cm	2155	118546	74719	1.67	1953	113273	70838	1.63
SE d	238	13092	11188	0.15	107	6179	5465	0.09
CD (5%)	594	32658	27908	0.37	266	15412	13632	0.22

Faridkot: Soil parameters: pH- 8.5, EC-0.62 mmhos/cm, OC -0.21%, Available P₂O₅- 16.5 kg ha⁻¹ & Available K₂O- 525kg ha⁻¹, Recommended spacing: 67.5 x 60 cm, Recommended nutrients: 92.5 kg N and 30 kg P₂O₅ha⁻¹, Environment: irrigated; Total rainfall during cropping period: 499.8 mm

Bathinda: Soil parameters: pH- 8.78, EC-0.26 mmhos/cm, OC (%) - 0.29, Available P₂O₅- 11.6 kg ha⁻¹ & Available K₂O- 280 kg ha⁻¹, Recommended nutrients: 92.5 kg N ha⁻¹, Environment: irrigated; Total rainfall during cropping period: 501 mm

Hisar

The agronomy of Bt varieties trial revealed that significantly higher seed cotton yield (2404 kg ha⁻¹) was recorded for RCH 776 Bt hybrid as compared to all other Bt variety except PAU 3 Bt which recorded comparable seed cotton yield (2104 kg ha⁻¹). Planting geometry with 67.5 x 30 cm, 67.5 x 60 cm and 67.5 x 15 cm recorded significantly higher seed



cotton yield as compared to 80 x 15 cm. However 67.5 x 60 cm spacing yielded numerically higher seed cotton yield (2187 kg ha⁻¹) (Table 56).

Table 56. Seed cotton yield (kg ha⁻¹) of Bt varieties as influenced by spacing and nitrogen levels

Treatments	G1.PAU1 Bt	G2.PAU 2 Bt	G3.PAU 3 Bt	G4.CICR 6	G5.RCH 776	Mean	ANOVA	SEd	CD
S1.67.5X15	2153	1742	2058	1577	2304	1967	Spacing	148.67	370.85
S2.67.5X30	2099	2263	2140	1427	2236	2033	Genotype	166.35	340.39
S3.80X15	1192	1308	1956	1238	2273	1613	SXG	332.7	NS
S4.67.5X60	2058	2222	2263	1687	2703	2187	GXS	332.65	NS
Mean	1876	1884	2104	1482	2404				

Soil parameters: pH- 8.6, EC-0.25 m mhos/cm, OC (%) - 0.28%, N : 140 kg ha⁻¹, P₂O₅ : 132 kg ha⁻¹, K₂O : 256 kg ha⁻¹, OC : 0.48 %, RDF: 175:90; 90; 25 N:P:K:Zn kg ha⁻¹ for RCH 773, RDF: 90:30;0;25 N:P:Zn kg ha⁻¹ for Bt varieties, Recommended spacing: 100 x 45 cm for RCH 773, Spacing: 67.5X 30 cm for Bt varieties, Environment: Irrigated, Total rainfall: 794 mm

Sriganganagar

The results of Bt varietal trial of Sriganganagar found that the crop geometry 67.5 x 60 cm gave maximum seed cotton yield (1931 kg ha⁻¹) which was significantly higher over 67.5 x 15, 80 x 15 cm sown crop but at par with 67.5 x 30 cm. In case of genotypes control hybrid (RCH-776) gave maximum seed cotton yield (1948 kg ha⁻¹) which was statistically higher than PAU 2 Bt and CICR 6 (Table 57). Among the tested genotypes PAU 1 Bt and PAU 3Bt gave at par seed cotton yield, this was significantly superior over CICR Bt 6 and PAU 2 Bt genotypes.

Table 57. Seed cotton yield of Bt varieties as influenced by spacing and nitrogen levels

Treatments	G1.PAU1 Bt	G2.PAU 2 Bt	G3.PAU 3 Bt	G4.CICR 6	Mean	ANOVA	SEd	CD
S1.67.5X15cm	1440	1619	1619	1646	1581	Spacing	56.6	163.3
S2.67.5X30 cm	2236	1879	1783	1728	1907	Genotype	50.7	146.1
S3.80X15 cm	1632	1317	1687	1331	1492	SXG	113.3	326.7
S4.67.5X60 cm	2305	1372	2154	1893	1931			
Mean	1903	1547	1811	1650	1728			
RCH 776 BG II					1948			

Central Zone

The agronomic requirement and performance of Bt varieties were assessed under rainfed condition in Central Zone. The trial includes Bt varieties of G1. Suraj Bt, G2. PKV 081 Bt, G3. Rajat Bt, and G4. GJHV374 Bt planted in different spacing levels (S1.60 x 15 cm, S2.60X 30 cm, S3.90 x 15 cm and S4.90 x 60 cm) and compared with ruling Bt hybrids planted with recommended spacing and nutrients of the regions. The results revealed that G3.Rajat Bt registered significantly higher performance at Akola (2056 kg ha⁻¹), Junagadh (1825 kg ha⁻¹), Surat (2314 kg ha⁻¹) as compared to other Bt varieties. The genotype, PKV 081 Bt (2234 kg ha⁻¹), Suraj Bt (2314 kg ha⁻¹) and GJHV374 Bt (1212 kg ha⁻¹) respectively at Nanded, Rahuri and Khandwa performed significantly higher seed



cotton yield (Table 58). The significantly higher gross return of ₹ 1,23,864, 1,70,772 and 1,61,957 ha⁻¹, net return of ₹ 83,686, 1,07,474 and 97,735 ha⁻¹ and Benefit Cost Ratio of 3.08, 2.7 and 2.57 were recorded respectively with Akola, Junagadh and Surat with G3.Rajat Bt. Amongst spacing levels, planting at 60 x 15 cm registered the significantly highest seed cotton yield at Akola (2047 kg ha⁻¹), Rahuri (2515 kg ha⁻¹) and Khandwa (1397 kg ha⁻¹) (Table 59). Different spacing levels, tried did not influence significantly seed cotton yield at Junagadh. The interaction effect were found non-significant in all tested centres. The narrow planting at S1.60 x 15 cm was calculated 15.1, 70.3 and 27.2 per cent higher seed cotton yield as compared to wider spacing of S4.90 x 60 cm spacing respectively at Akola, Rahuri and Khandwa. The results further add that as compared to ruling Bt hybrids, HDPS planting of high performing Bt varieties registered 13.3, 7.0 and 54.7 per cent higher yield at Akola, Nanded and Rahuri respectively.



Table 58. Seed cotton yield (kg ha⁻¹) and economics of Bt varieties as influenced by spacing in central zone

Genotypes	Akola				Nanded				Surat			
	Seed cotton yield (kg ha ⁻¹)	Gross Return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	B:C ratio	Seed cotton yield (kg ha ⁻¹)	Gross Return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	B:C ratio	Seed cotton yield (kg ha ⁻¹)	Gross Return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	B:C ratio
G1. Suraj Bt	1816	110395	71664	2.82	1562	147072	86866	2.43	2075	145279	82725	2.33
G2. PKV 081 Bt	1961	118154	78367	2.97	2234	210356	144774	3.19	2196	153732	90332	2.39
G3. Rajat Bt	2056	123864	83686	3.08	1796	169131	107051	2.72	2314	161957	97735	2.57
G4. GJHV374 Bt	1714	103285	64916	2.69	1606	151207	90650	2.49	1769	123830	63421	2.04
SE d	36	2130	2146	0.06	97.26	9161	8383	0.12	76	5301	4771	0.06
CD (5%)	105	6218	6265	0.17	242.61	22851	20910	0.29	221	15473	13926	0.18
Control (Bt hybrid)	1814				2088	196627	128881	2.9	2368	165760	113866	3.19
Spacing												
S1.60 x 15 cm	2047	124299	83059	2.99	1874	176515	112988	2.76	2252	157611	81580	2.07
S2.60X 30 Cm	1889	113815	74245	2.87	2051	193179	128586	2.97	2570	179929	112815	2.66
S3.90 x 15 cm	1833	110418	71528	2.84	1717	161704	101015	2.66	1824	127645	67949	2.12
S4.90 x 60 cm	1779	107167	69800	2.86	1554	146368	86752	2.44	1709	119613	71868	2.48
SE d	33	2123	2143	0.05	49.67	4678	4280	0.06	98	6885	6196	0.09
CD (5%)	114	7347	7415	NS	103.12	9711	8887	0.12	340	23825	21443	0.3

Akola: Soil parameters: pH value: 7.80, EC (dSm⁻¹): 0.12, OC : 0.38, Available N : 218 kg ha⁻¹, P₂O₅ : 17.20 kg ha⁻¹, K₂O : 356 kg ha⁻¹, Recommended spacing: 60X30 cm, Recommended Fertilizer dose: 60:30:30 Kg NPKha⁻¹, Environment : Rainfed, Total Rainfall during Cropping period : 1119.4 mm

Nanded: Soil properties : pH – 8.03; EC - 0.27 dSm⁻¹, Organic carbon - 0.46%, Av. N : 110.72 kg ha⁻¹; Av. P₂O₅ : 12.32 kg ha⁻¹ and Av. K₂O : 442.16 kg ha⁻¹; Rec. Spacing : 60 x 30 cm; Rec. NPK : 75:37.5:37.5 Kg NPKha⁻¹; Species : *G. hirsutum* BG I; Environment : Rainfed; Total rainfall : 1090.2 mm

Surat: Soil particulars: pH: 8.10, EC: 0.34 dS/m, OC: 0.50%, Soil fertility: N: 339.0 kg/ha, P₂O₅: 21.3 kg ha⁻¹, K₂O: 465.1 kg ha⁻¹, Recommended spacing: 120 x 45 cm, Recommended nutrients: 115-00-00 NPK kg/ha for Bt varieties (For rainfed HDPS), 120-00-00 NPK kg/ha for Bt hybrid (For rainfed), Environment: rainfed, total rainfall : 1318 mm



Table 59 . Seed cotton yield (kg ha^{-1}) and economics of Bt varieties as influenced by spacing in central zone

Genotypes	Rahuri				Junagadh				Khandwa
	Seed cotton yield (kg ha^{-1})	Gross Return (₹ ha^{-1})	Net Return (₹ ha^{-1})	B:C ratio	Seed cotton yield (kg ha^{-1})	Gross Return (₹ ha^{-1})	Net Return (₹ ha^{-1})	B:C ratio	Seed cotton yield (kg ha^{-1})
G1. Suraj Bt	2314.01	161981.2	82148	1.71	1584	148434	87343	2.43	1158
G2. PKV 081 Bt	1641.35	114895.1	58268	1.27	1758	164493	101815	2.62	1182
G3. Rajat Bt	1824.58	127720.7	64773	1.39	1825	170772	107474	2.7	1201
G4. GJHV374 Bt	2200.26	154018.4	78109	1.64	1549	144969	84220	2.38	1212
SE d	61.9				60	5599	5599	0.09	16.2
CD (5%)	123.8				173	16127	16127	NS	46.3
Control (Bt hybrid)	1496	104720	24470	1.3					1391
Spacing									
S1.60 x 15 cm	2515.07	176055.4	75801.6 6	1.74	1669	156220	94360	2.52	1397
S2.60X 30 Cm	1953.74	136762.3	40798.9 9	1.42	1704	159422	97246	2.56	1229
S3.90 x 15 cm	2033.53	142347.1	52155.5 2	1.57	1633	153171	91613	2.48	1190
S4.90 x 60 cm	1477.86	103450.7	22825.1 3	1.27	1709	159853	97634	2.57	1098
SE d	39.9				60	5599	5599	0.09	15.7
CD (5%)	138.2				NS	NS	NS	NS	61.6

Dharwad

The results of Bt varietal trial revealed that seed cotton yield was not significantly affected by different planting geometry. Among the different spacing levels 90X30 cm (S_4) recorded numerically higher seed cotton yield per hectare (1109 kg ha^{-1}) as compared to other spacing levels. Among different N levels 150% N (N_3) produced significantly higher seed cotton yield per hectare (1252 kg ha^{-1}) as compared to any other levels. It was again supported by the number of bolls per plant, yield per plant and single boll weight, which also shows the similar trend. Interaction of planting geometry and N levels significantly affected the seed cotton yield per hectare. Among the different interactions 90X30 cm spacing (S_4) and 150% RDN (N_3) recorded significantly highest seed cotton yield/ ha (1373 kg ha^{-1}) as compared to any other interactions. Seed cotton yield obtained by Ajeet 155 BG II (1346 kg ha^{-1}) was significantly higher than all treatment combinations of bt-variety except S_4N_3 which recorded the on par seed cotton yield per hectare with control (Table 60).



Table 60. Seed cotton yield (kg ha⁻¹) as affected by planting geometries and nitrogen levels in Bt variety CICR 23 Bt

Treatments	S1:60x15 cm	S2:60x30 cm	S3:90x15 cm	S4:90x30 cm	MEAN	ANOVA	S.Em	S.Ed	CD
N1:100%RDN	1078	1099	1099	1188	1116	Spacing	21.4	30.3	N/A
N2:125%RDN	1093	1118	1152	1195	1140	N levels	20.5	29.1	60.3
N3:150%RDN	1158	1204	1271	1373	1252	NXS	42.8	58.1	127.1
N4: control	830	828	775	681	778	SXN	41.5	58.7	128.4
MEAN	1040	1062	1074	1109					
Ajeet 155 BG II					1346		41.0	58.0	119.0

Soil type : Medium deep black with clayey soil, pH: 7.2, OC :0.51%, Soil fertility status : N : 230 kg ha⁻¹, P₂O₅ : 27.0 kg ha⁻¹, K₂O : 425 kg ha⁻¹, Environment: Rainfed Total rainfall received: 978.2mm with 80 rainy days, Recommended Nutrient levels : 60:30:30 kg NPK ha⁻¹, Genotypes (G): CICR 23 Bt

Nandyal

The results of Bt varietal trial conducted at Nandyal found that significantly higher seed cotton yield (848 kg ha⁻¹) was recorded with spacing of 60 x 15 cm. Lower seed cotton yield (610 kg ha⁻¹) was recorded with spacing of 90 x 60 cm. There was significant effect by different nitrogen levels on seed cotton yield. Higher seed cotton yield (777 kg ha⁻¹) was observed in 150% RDN and was on par with 100 % RDN (775 kg ha⁻¹) and 125 % RDN (775 kg ha⁻¹). Significantly lower seed cotton yield (535 kg ha⁻¹) was found in control treatment (Table 61).

Table 61. Seed cotton yield (kg ha⁻¹) as influenced by spacing levels and nitrogen levels (CICR Bt 23)

Treatments	N ₁ : 100 % RDN	N ₂ : 125 % RDN	N ₃ : 150 % RDN	N ₄ : Control (No nitrogen)	Mean	Anova	SE d	SE m±	CD (5%)
S1: 60X15 cm	938	903	863	688	848	Spacing	42	30	87
S2: 60X30 cm	716	708	730	424	644	Nitrogen levels	42	30	87
S3: 90X15 cm	807	825	825	581	760	S x N	85	60	NS
S4: 90X60 cm	641	662	692	448	610				
Mean	775	775	777	535					

Soil: Deep black soil, Clay soil, pH : 8.5, N : 139 kg ha⁻¹, P₂O₅ : 32, K₂O : 358, OC : 0.38%, Environment: rainfed



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 (1962 kg ha^{-1}) was recorded with Sole Bt cotton (T₁) which was on par with Bt cotton intercropped with green gram in 1:1 ratio (T₉, 1916 kg ha^{-1}) and T₂: Paired row planting of Bt cotton with two rows of Green gram(A) (1757 kg ha^{-1}). The seed cotton yield was reduced by multitier intercropping and reduction in yield ranged from 14.5 to 22.5 per cent. Among the systems, paired row Bt cotton with two rows of green gram (T₂) produced higher seed cotton equivalent yield of 2385 kg ha^{-1} . Multitier cropping system enhanced the relative production efficiency (9.73 to 41.21 %), relative economic efficiency (1.23 to 1.53 %), and system profitability (349 to 450 ₹ $\text{ha}^{-1}/\text{day}$). 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, and system profitability. The same system registered significantly highest gross return of ₹1,43,714 ha^{-1} , net return of ₹1,01,164 ha^{-1} and B:C ratio of 3.38 also (Table 62). Multitier cropping system observed with higher availability of nutrient status because of legume inclusion. Significant reduction of weed population was observed by multitier cropping system

Table 62 . Seed Cotton yield (kg ha⁻¹), Seed cotton equivalent yield(kg ha⁻¹) and economics as influenced by multitier cropping system

Treatments	Seed cotton Yield (kg ha ⁻¹)	Seed cotton equivalent yield (kg ha ⁻¹)	Relative Production Efficiency (RPE)%	Relative Economic Efficiency (REE)%	System Profitability (₹ ha ⁻¹ /Day)	Gross return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	BC R
T ₁ : Sole Bt cotton (90x60 cm)	1962	1962	--	--	--	118211	71641	2.54
T ₂ : Paired row planting of Bt cotton with two rows of Green gram(A)	1757	2385	41.21	1.53	450	143714	101164	3.38
T ₃ : Paired row planting of Bt cotton with two rows of Black gram (B)	1617	2137	20.33	1.42	383	128756	86206	3.03
T ₄ : Paired row planting of Bt cotton with two rows of Soybean (C)	1561	2063	9.73	1.23	349	124317	78609	2.72
T ₅ : Paired row planting of Bt cotton with one row of Green gram (A)+one row of Black gram (B)	1660	2232	26.44	1.46	403	134449	90579	3.06
T ₆ : Paired row planting of Bt cotton with one row of Black gram (B) + one rows of Soybean (C)	1521	2086	12.02	1.34	357	125702	80253	2.77
T ₇ : Paired row planting of Bt cotton with one rows of Soybean (C)+one row of Green gram (A)	1678	2273	27.72	1.42	407	136952	91503	3.01
T ₈ : Cotton + Pigeonpea (6:2) (90 x 60 cm)	1617	2247	28.04	1.3	408	135393	91727	3.1
T ₉ : Cotton + Greengram (1:1) (90 x 60 cm)	1916	2357	34.82	1.42	429	141993	96583	3.13
S.E m±	57.66	61.44	--	--	--	3702	3702	--
CD (5%)	211.73	225.60	--	--	--	13593	13593	--

Soil parameters : pH value: 7.80, EC (dSm⁻¹): 0.13, OC :0.4%, Available N : 210 kg ha⁻¹, P₂O₅ : 17.90 kg ha⁻¹, K₂O : 345 kg ha⁻¹, recommended spacing: 90x60 cm, Recommended Fertilizer dose : 60:30:30 Kg NPKha⁻¹, Environment : Rainfed, Cotton Species : PDKV JKAL-116 Bt (BG-II), Total Rainfall during Cropping period : 1119.4 mm



Junagadh

An appraisal of data presented in Table 63 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 produced significantly higher seed cotton yield (2906 kg ha^{-1}) which was statistically at par with treatment T_2, T_3, T_5, T_6 and T_7 . Among the different treatments of multi-tier cropping system, treatment T_3 . Paired row planting of Bt cotton with two rows of intercrop soybean was reported higher in seed cotton equivalent yield 3374 kg ha^{-1} , followed by paired row planting of Bt cotton with two rows of intercrop groundnut (3365 kg ha^{-1}). The treatment T_3 . paired row planting of Bt cotton with two rows of intercrop soybean was found higher relative production efficiency (14.49%) and relative economic efficiency (63.25%). The maximum gross return ($\text{₹ } 314926 \text{ ha}^{-1}$) was also recorded with treatment T_3 . paired row planting of Bt cotton with two rows of intercrop soybean which system having higher net return ($\text{₹ } 2,08,535 \text{ ha}^{-1}$) also and benefit cost ratio (2.96).

Table 63 Seed cotton yield (kg ha^{-1}), intercrop yield, Seed cotton equivalent yield (kg ha^{-1}) and economics as influenced by multitier cropping system

Treatments	Seed cotton Yield (kg ha^{-1})	Intercrop yield (kg ha^{-1})	Seed cotton equivalent yield (kg ha^{-1})	Relative production efficiency (RPE %)	Relative Economic efficiency (REE%)	Gross return (₹ ha^{-1})	Net Return (₹ ha^{-1})	BCR
T ₁ . Sole Bt cotton	2329	00	2329	-	-	217515	127743	2.42
T ₂ . Paired row planting of Bt cotton with two rows of intercrop sesamum	2619	00	2619	11.25	20.09	244657	153409	2.68
T ₃ . Paired row planting of Bt cotton with two rows of intercrop soybean	2844	897	3374	14.49	63.25	314926	208535	2.96
T ₄ . Paired row planting of Bt cotton with two rows of intercrop groundnut	2906	743	3365	14.45	29.28	276882	165145	2.48
T ₅ . Paired row planting of Bt cotton with one rows sesamum + one row soybean	2696	421	2945	12.64	37.49	274908	175637	2.77
T ₆ . Paired row planting of Bt cotton with one row soybean + one row groundnut	2730	501 + 382	3264*	14.02	38.73	285256	177215	2.64
T ₇ . Paired row planting of Bt cotton with one rows sesamum + one row groundnut	2657	331	2861	12.29	17.27	250820	149800	2.48
T ₈ . Farmers practice	2125	00	2125	- 9.12	-17.36	198505	105563	2.14
T ₉ . Recommended intercropping (Bt cotton + one rows sesamum)	2361	00	2361	10.14	4.84	220469	133924	2.55
SEd	139							
CD (5%)	454							

Soil parameters of pH: **8.09**, Soil Ec **0.38 dSm⁻¹**, OC : **0.99%**, Soil fertility : N: **312 kg ha⁻¹**, P₂O₅ : **58.48 kg ha⁻¹**, K₂O: **305 kg ha⁻¹**, Spacing: **120 x 45cm**, Re.nutrient: **240-50-150 kg ha⁻¹**, Cotton species: **G.Cot.Hy.8 BG-II**, Environment: **Irrigated**, Total rain fall **1305.10 (mm)**

Surat

The results of multitier cropping system revealed that seed cotton yield was not affected significantly due to different systems. Among intercropping systems, higher seed cotton equivalent yield was recorded in paired row planting of Bt cotton with two rows of Indian bean T₃ (2553 kg ha^{-1})



¹). Multi-tier cropping system treatments recorded range of relative production efficiency (RPE) from 3.84 to 20.92 %, relative economic efficiency (REE) from 4.6 to 30.0, land equivalent ratio (LER) from 1.53 to 2.10 and diversity index (DI) from 1.31 to 1.88. The intercropping system of paired row planting of Bt cotton with two rows of cowpea T₂ registered the highest weed smothering efficiency of 49.68 %. The maximum gross and net returns were found in the system of paired row planting of Bt cotton with two rows of Indian bean T₃, which were worked out to be ₹. 1,91,450 and ₹. 1,15,772 per hectare, respectively. The highest BCR was found with Bt Cotton hybrid sown at 120 cm x 45 cm spacing with one row of green gram T₉ (2.55) followed by treatment paired row planting of Bt cotton with two rows of Indian bean T₃, (2.53) (Table 64).

Table 64. Seed Cotton yield (kg ha⁻¹), intercrop yield, Seed cotton equivalent yield (kg ha⁻¹) and economics as influenced by multitier cropping system

Treatments	Seed cotton Yield (kg ha ⁻¹)	Seed cotton equivalent yield (kg ha ⁻¹)	Relative production efficiency (RPE %)	Relative Economic efficiency (REE %)	Land equivalent ratio	Gross return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	BCR
T ₁ : Sole Bt Cotton (Paired row planting)	2111	2111	0.00	0.0	1.00	158325	89075	2.29
T ₂ : Paired row planting of Bt cotton with two rows of intercrop (A - Cowpea)	1893	2192	3.84	4.6	1.53	164400	93178	2.31
T ₃ : Paired row planting of Bt cotton with two rows of intercrop (B -Indian bean)	1598	2553	20.92	30.0	2.10	191450	115772	2.53
T ₄ : Paired row planting of Bt cotton with two rows of intercrop (C-Soybean)	1847	2282	8.08	12.1	1.64	171125	99871	2.40
T ₅ : Paired row planting of Bt cotton with one row of intercrop (A) + one row of intercrop (B)	1653	2276	7.80	10.0	1.77	170680	97970	2.35
T ₆ : Paired row planting of Bt cotton with one row of intercrop (B) + one row of intercrop (C)	1612	2307	9.29	12.8	1.83	173030	100448	2.38
T ₇ : Paired row planting of Bt cotton with one row of intercrop (C) + one row of intercrop (A)	1854	2234	5.85	8.3	1.60	167580	96470	2.36
T ₈ : Farmers practices : Bt Cotton hybrid sown at 120 cm x 45 cm spacing + One row of intercrop (Soybean)	1894	2347	11.20	17.2	1.70	176050	104420	2.46
T ₉ : Recommended intercropping : Bt Cotton hybrid sown at 120 cm x 45 cm spacing + One row of intercrop (Green gram)	1977	2420	14.65	23.8	1.72	181525	110281	2.55
SEd	109							
CD (5%)	NS							

Soil: pH -7.82, EC: 0.37 dS/m, OC:0.48%, Available N: 220.6 kg ha⁻¹, P₂O₅: 33.59 kg ha⁻¹, K₂O: 625.52 kg ha⁻¹ and recommended spacing: 120 x 45 cm

Nanded

The results of multitier cropping system revealed that seed cotton yield was significantly reduced in all intercropping except intercropping of two rows of coriander in paired row cotton (T₄, 1841 kg ha⁻¹) and sole cotton in paired row (T₁₀, 1820 kg ha⁻¹). Weed count was lower in



intercropping of coriander treatments. Farmers' practice of Cotton + Pigeon pea (6:1) recorded significantly the highest seed cotton equivalent yield (2224 kg ha^{-1}), gross return ($\text{₹ } 2,09,408 \text{ ha}^{-1}$), net return ($\text{₹ } 1,42,692 \text{ ha}^{-1}$) and B:C ratio (3.14). All other intercropping systems were found to record lower seed cotton equivalent yield, gross return net return and B:C ratio than sole cotton (T_1). Cotton + Green gram with 1:2 row proportion in $120 \times 45 \text{ cm}$ spacing had the highest cost of cultivation ($\text{₹ } 68,327 \text{ ha}^{-1}$). The farmers practice of cotton + pigeon pea (6:1) was the most efficient intercropping treatment in terms of relative production efficiency (8.87%), relative economic efficiency (0.16%), land equivalent ratio (1.27) and diversification index(1.45) whereas, weed smothering efficiency was higher in recommended intercropping of cotton + green gram with 1:2 row proportion in $120 \times 45 \text{ cm}$ spacing.



Table 65. Seed Cotton yield (kg ha⁻¹), intercrop yield, Seed cotton equivalent yield (kg ha⁻¹) and economics as influenced by multitier cropping system

Treatments	Seed cotton Yield (kg ha ⁻¹)	Intercrop yield (kg ha ⁻¹)	Seed cotton equivalent yield (kg ha ⁻¹)	Relative production efficiency (RPE%)	Relative Economic efficiency (REE%)	Land equivalent ratio	Diversification Index	Gross return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	BCR
T ₁ . Sole Bt cotton (120 x 45 cm)	2024	-	2024	0.00	0.00	1.00	1.000	190600	123366	2.83
T ₂ . Paired row planting of Bt cotton with two rows of intercrop (A – Greengram)	1809	139	1886	-7.58	-0.10	1.09	1.085	177582	110674	2.65
T ₃ . Paired row planting of Bt cotton with two rows of intercrop (B – Foxtail millet)	1664	205	1791	-13.39	-0.16	1.06	1.151	168635	103088	2.57
T ₄ . Paired row planting of Bt cotton with two rows of intercrop (C - Coriander)	1841	417	1906	-6.36	-0.09	1.13	1.070	179445	112347	2.67
T ₅ . Paired row planting of Bt cotton with one row (A - Greengram) +one row (B – Foxtail millet)	1610	108 + 216	1802	-12.49	-0.15	1.21	1.243	169721	104507	2.60
T ₆ Paired row planting of Bt cotton with one row (B – Foxtail millet) +one row (C - Coriander)	1747	207 + 250	1913	-6.63	-0.08	1.24	1.192	180138	113866	2.71
T ₇ Paired row planting of Bt cotton with one row (C - Coriander) +one row (A – Green gram)	1679	256 + 105	1776	-13.97	-0.18	1.11	1.117	167254	101424	2.54
T ₈ . Farmers practice (Cotton + Pigeon pea)	1782	697	2224	8.87	0.16	1.27	1.467	209408	142692	3.14
T ₉ . Recommended intercropping (Cotton + Green gram 1:2 in 120 x 45 cm spacing)	1751	332	1934	-5.08	-0.08	1.34	1.207	182084	113757	2.66
T ₁₀ . Sole Bt cotton in paired row planting spacing 150-90 x 45 cm	1820	-	1820	-11.56	-0.14	0.90	1.000	171421	105816	2.61
SEd	96.46	-	102.04	-	-	-	-	9610	8863	0.11
CD (5%)	200.66	-	214.39	-	-	-	-	20189	18621	0.24

Soil properties : pH – 8.07; EC - 0.29 dSm⁻¹, Organic carbon - 0.47%, Soil fertility: N : 112.51 kg ha⁻¹; P₂O₅ : 11.98 kg ha⁻¹ and K₂O : 457.56 kg ha⁻¹; Rec. Spacing : 120 x 45 cm; Rec. NPK : 120:60:60 kg NPK ha⁻¹; Species : *G. hirsutum* BG II; Environment : Rainfed; Total rainfall : 1090.2 mm



Rahuri

The multi intercropping results revealed that sole Bt. cotton recorded the highest growth and yield attributes viz., plant height (136.3cm), number of sympodia (15.0), number of bolls per m² (35.3), and seed cotton yield (1535 kg ha⁻¹) as compared to rest of all treatments. However which was on par with T₂. Paired row planting of Bt cotton with two rows of intercrop green gram (1501 kg ha⁻¹) (Table 66). The economics analysis revealed that, T₂. Paired row planting of Bt cotton with two rows of intercrop (Green Gram) and T₃. Paired row planting of Bt cotton with two rows of intercrop (Soybean) registered higher net return (₹ 42396 ha⁻¹ and ₹ 134520 ha⁻¹), B:C ratio (1.46 and 2.48) and seed cotton equivalent yield (1895.97 kg ha⁻¹ and 3212.03 kg ha⁻¹). The weed smothering effect of Green gram (T₂) is maximum as compared to rest of the treatments at 45 days after sowing (67.54 %)

Table 66. Seed Cotton yield (kg ha⁻¹), intercrop yield, Seed cotton equivalent yield (kg ha⁻¹) and economics as influenced by multitier cropping system

Treatments	Seed cotton Yield (kg ha ⁻¹)	Seed cotton equivalent yield (kg ha ⁻¹)	Relative Production Efficiency (RPE)%	Relative Economic Efficiency (REE)%	Gross return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	BCR
T ₁ . Sole Bt cotton	1535	1535	0.00	0.00	107482	23684	1.28
T ₂ . Paired row planting of Bt cotton with two rows of intercrop (Green Gram)	1501	1896	23.48	79.01	132719	42396	1.46
T ₃ . Paired row planting of Bt cotton with two rows of intercrop (Soybean)	783	3212	109.19	467.97	224843	134520	2.48
T ₄ . Paired row planting of Bt cotton with two rows of intercrop (Pigeonpea)	408	1290	-15.99	-143.92	83410	10402	0.88
T ₅ . Paired row planting of Bt cotton with one rows (Green Gram) +one row (Soybean)	1129	1545	0.61	-78.03	108134	5203	1.05
T ₆ . Paired row planting of Bt cotton with one rows (Soybean) +one row (Pigeonpea)	603	1134	-26.14	-202.94	79386	24380	0.76
T ₇ . Paired row planting of Bt cotton with one rows (Pigeonpea) +one row (Green Gram)	778	1171	-23.74	-192.60	80675	21931	0.78
T ₈ . Paired row planting of Bt cotton with one rows (Green Gram) +one row (Soybean) + one row (Pigeonpea)	819	1234	-19.61	-190.10	85326	21340	0.79
T ₉ . Farmers practice (one row pigeonpea)	1161	1479	-3.69	-96.87	103519	742	1.02
T ₁₀ . Recommended intercropping (one row Green gram)	1441	1956	27.37	40.47	136898	33270	1.33
SEd	87	105	-	-	7322	8188	0.08
CD (5%)	259	311	-	-	21756	24328	0.26

Soil: Medium Black Soil, pH – 7.5, Ec – 0.22, OC - 0.48%, Soil available N : 150 kg ha⁻¹, P₂O₅ : 9.80 kg ha⁻¹, K₂O : 649 kg ha⁻¹, Environment : Irrigated

Dharwad

The data on seed cotton yield recorded in different multitier cropping system per hectare is presented in table 67. Among the different inter cropping system, seed cotton yield was significantly increased with paired row planting of sole cotton (T₁) (2560 kg ha⁻¹). However, it was on par with paired row planting of cotton + coriander (T₄) (2387 kg ha⁻¹) and farmers practice (T₈) (2416 kg ha⁻¹). Among the different intercropping treatments, recommended intercropping of cotton + green gram (90 x 60cm) (T₉) recorded significantly higher cotton equivalent yield (3395 kg



ha⁻¹). However, it was on par with another recommended intercropping of cotton + Beans (90x60cm) (T₁₀) (3380 kg ha⁻¹), Paired row planting of cotton with two rows of Green gram (T₂) (3362 kg ha⁻¹) and paired row planting of cotton with one row of Green gram and one row of beans (T₅) (3278 kg ha⁻¹) (Table 67).

Economic analysis indicated that recommended intercropping of cotton +Green gram (1:1) (T₉) recorded significantly higher gross returns (₹ 2,03,700 ha⁻¹), net returns (₹ 1,42,910 ha⁻¹) and B:C ratio (3.35). Intercropping of cotton + Green gram (1:1) (T₉) recorded significantly higher relative production efficiency (24.6), relative economic efficiency (50.0) and land equivalent ratio (1.33). Diversification index was significantly increased with paired row planting of cotton with one row of green gram and one row of beans (T₅) (2.53) as compared to any other treatments.

Table 67. Seed Cotton yield (kg ha⁻¹), intercrop yield, Seed cotton equivalent yield (kg ha⁻¹) and economics as influenced by multitier cropping system

Treatments	Seed cotton yield (kg ha ⁻¹)	Intercrop yield (kg ha ⁻¹)	Seed cotton equivalent yield (kg ha ⁻¹)	Relative production efficiency (RPE)	Relative Economic efficiency (REE)	Land equivalent ratio (LER)	Gross return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	B:C Ratio
T ₁ . Paired row Sole Bt cotton (60-120-60x 60cm)	2560	--	2560	0.0	0.0	1.00	153600	95160	2.63
T ₂ . Paired row planting of Bt cotton with two rows of intercrop (A) (Green gram)	1917	1239	3362	23.7	46.0	1.31	201740	139147	3.22
T ₃ . Paired row planting of Bt cotton with two rows of intercrop (B) (Beans)	1961	4313	3039	15.5	22.7	1.19	182340	117097	2.79
T ₄ . Paired row planting of Bt cotton with two rows of intercrop (C) (Coriander)	2387	3023	3035	15.4	23.3	1.18	182080	117607	2.83
T ₅ . Paired row planting of Bt cotton with one rows (A) (Green gram) +one row (B) (Beans)	1715	836+2350	3278	21.7	39.3	1.28	196660	132699	3.07
T ₆ . Paired row planting of Bt cotton with one rows (B) (Beans) +one row (C) (Coriander)	2033	2686+794	2874	11.0	12.7	1.12	172460	107228	2.64
T ₇ . Paired row planting of Bt cotton with one rows (C) (Coriander) +one row (A) (Green gram)	1851	844+1008	3050	15.9	24.7	1.19	183020	118817	2.85
T ₈ . Farmers practice (without intercrop with 90x60 cm spacing	2416	--	2416	0.0	0.0	1.00	144940	86477	2.48
T ₉ . Recommended intercropping (Cotton + Green gram at 90x60 cm)	1779	1385	3395	24.6	50.0	1.33	203700	142910	3.35
T ₁₀ . Recommended intercropping (Cotton + Beans at 90x60 cm)	2170	4840	3380	24.3	43.7	1.32	202820	136739	3.07
SEd	72	-	84	1.9	4.4	0.03	5068	4817	0.07
CD (5%)	215	--	251	5.6	13.0	0.08	15058	14313	0.20

Soil: Medium deep black, pH: 7.2 , OC : 0.45%, Soil fertility: N : 230 kg ha⁻¹, P₂O₅ : 27.0 kg ha⁻¹, K₂O : 425 kg ha⁻¹, Recommended:100:50:50 kg NPKha⁻¹, Total rainfall received: 978.2mm

Srivilliputhur

The multi-tier cropping system revealed that seed cotton yield was not influenced by different treatments. However, all the inter crops studied had increased the seed cotton yield slightly indicating the complimentary effect. The results showed that the performance of cluster



bean was better than other inter crops. Two rows of cluster bean intercropping with Bt cotton registered a pod yield of 3590 kg ha^{-1} (T_3). The second best intercropping was onion which recorded bulb yield of onion 1684 kg ha^{-1} (T_2). The total Seed Cotton Equivalent Yield (kg ha^{-1}) was the highest with intercropping of one row each of onion and cluster bean with cotton (T_5 , 3015 kg ha^{-1}) followed by two rows of cluster bean (T_3 , 2905 kg ha^{-1}) and two rows of onion (T_2 , 2813 kg ha^{-1}) (Table 68). In the present study, all the intercropping system observed higher seed cotton equivalent yield indicating superiority of intercropping than sole cropping. Among them intercropping of cluster bean and onion with Bt cotton (T_5) recorded the highest RPE of 1.55% followed by two rows of cluster bean intercropping T_3 (1.49%). Among the intercropping system, intercropping of two rows of cluster bean (T_3) registered the highest LER of 1.53 followed by that of Cluster bean and onion each two rows T_5 (1.36). Higher Diversification index was associated with intercropping of onion and cluster bean T_5 (1.9) followed by that of Onion, Cluster bean and Coriander T_8 (1.8). Higher nutrient uptake was observed with all the intercropping system treatments than sole cotton. The labour use was higher with all the intercropping system treatments than sole cropping of Bt cotton. Among them highest labour was utilized for the two rows intercropping with cluster bean (T_3 , 332) followed by one row each of onion, cluster bean and coriander (T_8 , 325). The economic analysis indicated that higher net return ($\text{₹ } 1,46,956 \text{ ha}^{-1}$) and benefit cost ratio (2.61) were associated with intercropping of two rows of cluster bean (T_3)



Table 68. Seed Cotton yield (kg ha⁻¹), intercrop yield, Seed cotton equivalent yield (kg ha⁻¹) and economics as influenced by multitier cropping system

Treatments	Seed cotton Yield (kg ha ⁻¹)	Intercrop yield (kg ha ⁻¹)	Seed cotton equivalent yield (kg ha ⁻¹)	Relative production efficiency (RPE) (%)	Relative Economic efficiency (%)	Land equivalent ratio	Gross return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	BCR
T ₁ . Sole Bt cotton	1945	--	1945	1.00	100.0	1.00	159490	84490	2.13
T ₂ . Paired row planting of Bt cotton with two rows of intercrop (Onion)	1991	Onion – 1684	2813	1.45	144.6	1.12	230622	132422	2.35
T ₃ . Paired row planting of Bt cotton with two rows of intercrop (Cluster bean)	2028	Cluster bean -3590	2905	1.49	149.4	1.53	238156	146956	2.61
T ₄ . Paired row planting of Bt cotton with two rows of intercrop (Coriander)	2007	Coriander – 982	2366	1.22	121.6	1.27	194034	112234	2.37
T ₅ . Paired row planting of Bt cotton with one rows (Onion) +one row (Cluster bean)	2035	Onion –909 Cluster bean -1925	3015	1.55	155.0	1.36	241730	140330	2.38
T ₆ . Paired row planting of Bt cotton with one rows (Cluster bean) +one row (Coriander)	2028	Cluster bean – 1846 Coriander – 503	2672	1.37	137.4	1.42	219126	129826	2.45
T ₇ . Paired row planting of Bt cotton with one rows (Coriander) +one row (Onion)	2016	Onion –802 Coriander – 534	2602	1.34	133.8	1.21	213412	117512	2.23
T ₈ . Paired row planting of Bt cotton with one rows (Onion) +one row (Cluster bean) +one row (Coriander)	2048	Onion – 585 Cluster bean –1397 Coriander -298	2783	1.43	143.1	1.35	228216	122416	2.16
T ₉ . Farmers practice (Cotton + 2 rows Black Gram)	1993	Black Gram – 149	2102	1.08	108.1	1.18	172366	93166	2.18
T ₁₀ . Recommended intercropping (Cotton + 2 rows Green Gram)	2001	Green Gram - 155	2114	1.09	108.7	1.18	173382	94182	2.19
SEd	71.6								
CD (5%)	NS								

Soil: Clay loam, pH: 8.26 dSm/m, Soil fertility: N : 196 kg ha⁻¹, P₂O₅ : 40 kg ha⁻¹, K₂O: 446 kg ha⁻¹, OC: 0.72%, Recommended: 120 : 60 : 60 kg NPK ha⁻¹, Environment: Irrigated



Raichur

The multi-tier cropping system revealed that significantly higher seed cotton yield (2866 kg ha^{-1}) was recorded in Sole Bt cotton compared to the Bt cotton raised along with inter crops. However, it was on par with Bt cotton + Black Gram (T_4 , 2655 kg ha^{-1}) and Bt cotton + Green Gram (T_9 , 2606 kg ha^{-1}). Significantly lower weed number (5.3) was recorded in Bt cotton + Soybean + Sesamum + Black Gram inter cropping system (T_{10}) followed by Bt cotton + Black Gram intercropping system (T_4 , 5.6). The significantly higher gross returns ($\text{₹ } 2,56,752 \text{ ha}^{-1}$), net returns ($\text{₹ } 1,92,436 \text{ ha}^{-1}$) and B: C (3.99) were recorded in Bt cotton + soybean intercropping system (T_2). The same system recorded significantly higher Relative Production Efficiency (12.02) and Relative Economic Efficiency (16.80) (Table 69). However, significantly higher LER (1.39) was recorded with Bt cotton + Green gram intercropping system (T_9). Weed Smothering Efficiency (57.89%) was significantly higher with in Bt cotton + groundnut intercropping system (T_8). Significantly higher Diversity Index (T_{10} , 1.78) was recorded in Paired row planting of Bt cotton with one row of Soybean (A) + one row of Sesamum (B) + one row of Black gram (C)



Table 69: Seed Cotton yield (kg ha⁻¹) , intercrop yield, Seed cotton equivalent yield(kg ha⁻¹) and economics as influenced by multitier cropping system

Treatments	Seed cotton Yield (kg ha ⁻¹)	Intercrop yield (kg ha ⁻¹)	Seed cotton equivalent yield (kg ha ⁻¹)	Labour used (No.ha ⁻¹)	Treatment Cost (₹ ha ⁻¹)	Cost of cultivation (₹ ha ⁻¹)	Gross return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	BCR
T ₁ . Sole Bt cotton	2866	--	2866	140	-	64316	229280	164964	3.56
T ₂ .Paired row planting of Bt cotton with two rows of intercrop, Soybean (A)	2462	330	3209	170	1900	66216	256752	192436	3.99
T ₃ .Paired row planting of Bt cotton with two rows of intercrop, Sesamum (B)	2450	225	3100	155	2000	66316	248030	183714	3.86
T ₄ .Paired row planting of Bt cotton with two rows of intercrop, Black gram (C)	2655	224	3169	185	2005	66321	253547	189231	3.94
T ₅ .Paired row planting of Bt cotton with one row of Soybean (A) + one row of Sesamum (B)	2416	187+145	3040	170	5400	69716	245002	180686	3.81
T ₆ Paired row planting of Bt cotton with one row of Sesamum (B) +one row of Black gram (C)	2485	147+154	3047	185	5505	69721	241363	177047	3.75
T ₇ Paired row planting of Bt cotton with one row of Black gram (C) +one row of Soybean (A)	2507	204+147	3072	200	5505	69621	241558	177242	3.76
T ₈ Recommended intercropping (Groundnut as intercrop)	2363	448	3017	170	5625	69941	245963	181647	3.82
T ₉ . Farmers practice (Green gram as inter crop)	2606	234	2978	170	3488	67804	246308	181992	3.83
T ₁₀ . Paired row planting of Bt cotton with one row of Soybean (A) + one row of Sesamum (B) + one row of Black gram (C)	2391	164+127+111	3037	167	7405	71721	245205	180889	3.81
SEd	152	--	15	--	--	--	1318	1318	0.02
CD (5%)	452	--	44	--	--	--	3916	3916	0.06

Soil: Medium black soil and fine, pH:8.12, Soil fertility status:N : 249 kg ha⁻¹, P₂O₅: 35 kg ha⁻¹, K₂O : 272 kg ha⁻¹, OC : 0.52%, Recommended: 180:90:90 kg NPKha⁻¹, Environment : Irrigated



Coimbatore

The experiment was conducted under irrigated ecosystem with multi intercrops found that boll weight(4.7g) and seed cotton yield (2089 kg ha⁻¹) were recorded significantly higher with T₂. Paired row planting of Bt cotton with two rows of Cluster bean. Less weed count (85 and 94.6 No/M²) was recorded with T₃. Paired row planting of Bt cotton with two rows of Beetroot. Higher equivalent yield (4233 kg/ha), gross return (₹ 2,28,637ha⁻¹), net return (₹ 1,54,034ha⁻¹) and BCR (3.06) were recorded with T₂. Paired row planting of Bt cotton with two rows of Cluster bean. Lesser equivalent yield (2059 kg ha⁻¹) and BCR (1.52) were recorded with T₁. Sole Bt cotton Higher LER (1.95) was recorded with T₄. Paired row planting of Bt cotton with two rows of Coriander and higher RPE and REE was recorded with T₂. Paired row planting of Bt cotton with two rows of Cluster bean (Table 70)

Table 70. Seed Cotton yield (kg ha⁻¹), Seed cotton equivalent yield (kg ha⁻¹) and economics as influenced by multitier cropping system

Treatments	Seed cotton Yield (kg ha ⁻¹)	Seed cotton equivalent yield (kg ha ⁻¹)	Relative production efficiency (RPE%)	Relative Economic efficiency (REE%)	Land equivalent ratio	Gross return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	BCR
T ₁ . Sole Bt cotton	2059				1.00	111191	37991	1.52
T ₂ . Paired row planting of Bt cotton with two rows of Cluster bean	2090	2059	-0.29	-0.54	1.00	228634	154034	3.06
T ₃ . Paired row planting of Bt cotton with two rows of Beetroot	1702	4234	0.45	0.86	1.70	180407	105157	2.40
T ₄ . Paired row planting of Bt cotton with two rows of Coriander	1974	3341	0.15	0.27	1.06	147652	73312	1.99
T ₅ . Paired row planting of Bt cotton with one rows of Cluster bean and Beetroot	1650	2734	-0.06	-0.12	1.95	219999	145089	2.94
T ₆ . Paired row planting of Bt cotton with one rows of Beetroot and one row Coriander	1802	4074	0.40	0.75	1.39	171500	97226	2.31
T ₇ . Paired row planting of Bt cotton with one rows of Coriander and Cluster bean	1697	3176	0.09	0.17	1.55	192724	117760	2.57
T ₈ . Farmers practice	1881	3569	0.23	0.42	1.83	157175	82925	2.12
T ₉ . Recommended intercropping (Black gram)	1754	2911	0.00	0.00	1.48	140735	66485	1.90
SEd	400							
CD (5%)	196							

Soil: Brown, pH:8.35, Soil fertility status: N : 224 kg ha⁻¹, P₂O₅ : 28 kg ha⁻¹, K₂O : 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 (T₁, 1862 kg ha⁻¹). Among the intercropping systems paired row of cotton intercropped with two rows of black gram recorded significantly higher seed cotton (T₃, 1562 kg ha⁻¹), followed by paired row of cotton



with two rows of green gram (T_2 , 1526 kg ha⁻¹) and both were found to be on par with each other (Table 71).

Seed cotton equivalent yield was significantly higher in cotton + cluster bean intercropping system (T_9 , 2533 kg ha⁻¹), followed by cotton + groundnut (T_{10} , 2191 kg ha⁻¹), paired row of cotton + black gram (T_3 , 2164 kg ha⁻¹) and paired row of cotton + green gram (T_2 , 2083 kg ha⁻¹). Cotton + cluster bean intercropping system (T_9) recorded significantly higher gross return (₹.227930 ha⁻¹) and net returns (₹143039 ha⁻¹), followed by cotton + groundnut intercropping system (T_{10} , ₹ 197223 and 129557 ha⁻¹, respectively) and Cotton + black gram intercropping system (T_3 , ₹. 194740 ha⁻¹ and ₹.127949 ha⁻¹, respectively). However, the benefit-cost ratio was maximum in cotton + black gram intercropping system (T_3 , 2.92), followed by Cotton + groundnut intercropping system (T_{10} , 2.91) and cotton + green gram (T_2 , 2.83). The lowest was recorded in sole cotton. Similarly, the weed smothering efficiency was maximum in cotton + green gram intercropping system (T_2 , 47.4 %) and the lowest was recorded in paired row cotton intercropped with sesame (T_4 , 28.7 %). 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 1.19 to 1.76. The nutrient uptake was maximum in the cotton cluster bean intercropping system (T_9) with 138.7, 39.3 and 85.0 kg NPKha⁻¹, respectively.



Table 71. Seed Cotton yield (kg ha⁻¹), intercrop yield, Seed cotton equivalent yield (kg ha⁻¹) and economics as influenced by multitier cropping system

Treatments	Seed cotton Yield (kg ha ⁻¹)	Intercrop yield (kg ha ⁻¹)	Seed cotton equivalent yield (kg ha ⁻¹)	Relative production efficiency (RPE %)	Relative Economic efficiency (REE%)	Land equivalent ratio	Diversification index	Gross return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	BCR
T ₁ . Sole Bt cotton	1826	-	1826	14.1	20.4	1.0	-	164340	100699	2.58
T ₂ . Paired row planting of Bt cotton with two rows of green gram	1526	386	2083	18.5	27.0	1.21	1.47	187500	121334	2.83
T ₃ . Paired row planting of Bt cotton with two rows of black gram	1562	405	2164	5.1	7.6	1.26	1.48	194740	127949	2.92
T ₄ . Paired row planting of Bt cotton with two rows of sesame	1375	130	1920	8.7	12.2	1.11	1.19	172790	108414	2.69
T ₅ . Paired row planting of Bt cotton with one row of each green gram and black gram	1483	207+215	1985	6.0	8.6	1.23	1.59	178623	112956	2.72
T ₆ . Paired row planting of Bt cotton with one row of each black gram and sesame	1411	184+90	1935	5.1	7.2	1.20	1.40	174163	109312	2.69
T ₇ . Paired row planting of Bt cotton with one row of each green gram and sesame	1423	193+81	1920	4.4	7.1	1.19	1.39	172773	107921	2.66
T ₈ . Paired row planting of Bt cotton with one row of each green gram, black gram and Sesame	1280	116+128+80	1907	38.7	42.1	1.16	1.54	171599	107872	2.69
T ₉ . Farmers practice (cotton + cluster bean)	1398	4239	2533	20.0	28.6	1.18	1.60	227930	143039	2.69
T ₁₀ . Recommended intercropping (cotton+ groundnut)	1431	658	2191	14.1	20.4	1.26	1.76	197223	129557	2.91
SEd	49.57	-	21.25	1.18	2.03	0.05	0.04	2883.7	2823.7	0.04
CD (5%)	104.15	-	44.64	2.51	4.31	0.10	0.08	5953.4	5932.4	0.09

Soil: Medium black soils, clay loam, pH:8.02, Soil fertility status: N: 242.4 kg ha⁻¹, P₂O₅: 23.7kg ha⁻¹, K₂O: 294.6 kg ha⁻¹, O.C.(%) : 0.31%, Sole cotton: 90 x 60 cm, Paired row: 60/120 x 45 cm, Recommended:150: 75: 75 kg NPKha⁻¹, Environment: Rainfed



LAM

The results found that it was evident that higher weed density and weed dry matter was recorded with farmer's practice (T_8) followed by sole Bt cotton plots and the lowest was recorded with T_4 and T_9 plots. At 45 DAS, the lowest weed dry matter was observed with T_8 and T_1 plots followed by T_7 plot with no significant difference. The maximum weed smothering efficiency was also noticed in T_4 followed by T_9 at 20 DAS and T_2 and T_9 at 45DAS. The seed cotton yield was significantly the highest with T_1 : Sole Bt cotton (5221 kg ha^{-1}) (Table 71 A). However, the seed cotton equivalent yield (5380 kg ha^{-1}) and relative production efficiency (4.9%) were the highest with T_3 : paired row planting with two rows of redgram

Table 71 A: Seed Cotton Equivalent yield (kg/ha), weed smothering efficiency and Relative Productive efficiency as influenced by different intercrops in cotton

Treatments	Seed Cotton Yield (kg ha^{-1})	Seed Cotton Equivalent Yield (kg ha^{-1})	RPE (%)	WSE (%) at 20 DAS	WSE (%) at 45 DAS
T1-Sole Bt cotton (105x60cm)	5221	5221	1.8	8.82	10.53
T2-PR(Paired Row) Cotton +2Rows of GG (Greengram)	3519	4175	-18.6	30.53	40.83
T3- PR Cotton +2Rows of RG (Redgram)	3890	5380	4.9	20.19	32.72
T4- PR Cotton +2 Rows of Korra	3030	3208	-37.5	27.78	50.68
T5- PR Cotton +1 Row of GG+1 Row of RG	4278	4810	-6.2	22.06	30.09
T6- PR Cotton +1Row of RG+1Row of Korra	3100	4521	-11.9	15.49	28.23
T7- PR Cotton +1 Row Korra+1Row GG	4123	4893	-4.6	11.62	16.64
T8-Farmer's Practice (120x60 cm)	5130	5130	0.0	0.00	0.00
T9- PR of Cotton + intercropping of 3 Rows of GG	4949	5623	9.6	26.21	39.13
SED	204.7				
CD (5%)	434				



Agronomy XI: Bio stimulant on growth and development of cotton North Zone (Irrigated)**Faridkot**

The results on foliar application bio stimulant with genotypes revealed that significant effect was observed among genotypes only for most of the recorded parameters including seed cotton yield but effect for bio stimulant treatments were trivial. Bt hybrid (RCH-926) resulted in the highest seed cotton yield (3194 kg ha^{-1}) than non bt variety F-2228 (2252 kg ha^{-1}) (Table 72). However, bio stimulants failed to exert any significant effect on cotton growth, yield parameters, seed cotton yield, Gross monetary returns (₹ ha^{-1}), Net monetary returns (₹ ha^{-1}) and B:C ratio.



Table 72: Seed cotton yield (kg ha⁻¹), Gross monetary returns (₹ ha⁻¹), Net monetary returns (₹ ha⁻¹) and B:C ratio as influenced by application of bio stimulant.

Treatments	Seed cotton yield (kg ha ⁻¹)			Gross monetary returns (₹ ha ⁻¹)			Net monetary returns (₹ 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-228)	Mean
B1.Bio stimulant@4mg/litre at 30 , 45 and 60 DAS	3233	2281	2757	177798	125469	151634	123802	82834	103318	2.29	1.94	2.11
B2. Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS	3063	2274	2668	168443	125071	146757	113935	80621	97278	2.08	1.81	1.95
B3. DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS	3279	2140	2710	180351	117719	149035	123623	73851	98737	2.17	1.68	1.93
B4.Control (water spray- 30, 45, 60 & 75 DAS)	3201	2313	2757	176066	127225	151646	124806	86820	105813	2.43	2.14	2.29
Mean	3194	2252		175665	123871		121542	81032		2.24	1.89	
	G	B	GxB	G	B	GxB	G	B	GxB	G	B	GxB
SEd	72	102	144	3978	5626	7957	3399	4808	6799	0.04	0.06	0.09
CD(5%)	156.6	NS	NS	8616	NS	NS	7362	NS	NS	0.1	0.14	NS

Soil parameters: pH= 8.5, EC=0.26 mmhos/cm, OC =0.21%, Available P₂O₅= 10.2 kg ha⁻¹, Available K₂O = 249 kg ha⁻¹, Recommended spacing: 67.5 x 75 cm, Recommended nutrients: 92.5 kg N and 30 kg P₂O₅ha⁻¹, Environment: irrigated; Total rainfall during cropping period: 499.8 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 (1819 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, 0.5 ml of DMSO+ 5 litre of water) and B₄ 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 (₹112774 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 (₹13436ha⁻¹) was calculated with B1.Bio stimulant spray@4mg/litre at 30,45 and 60 DAS(B1). Similar trend was also observed in case of B:C ratio (Table 73)

Table: 73 Seed cotton yield (kg ha⁻¹), Gross monetary returns (₹ ha⁻¹), Net monetary returns (₹ ha⁻¹) and B:C ratio as influenced by application of bio stimulant.

Treatments	Seed cotton yield (kg ha ⁻¹)			Gross return (₹ ha ⁻¹)			Net return(₹ ha ⁻¹)			B:c ratio		
	G1.RC H 776 BGII	G2.H1 098i	Mean	G1.RCH 776 BGII	G2.H109 8i	Mean	G1.RC H 776 BGII	G2.H109 8i	Mean	G1.RCH 776 BGII	G2.H 1098i	Mean
B1.Bio stimulant@4mg/litre at 30, 45 and 60 DAS	1959	1564	1762	121449	96955	109202	18901	7970	13436	1.18	1.09	1.14
B2. Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS	2008	1630	1819	124510	101037	112774	18665	6779	12722	1.18	1.07	1.13
B3. DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS	1531	1350	1441	94914	83687	89301	-21436	-15938	-18687	0.82	0.84	0.83
B4. Control (water spray- 30, 45, 60 & 75 DAS)	1613	1482	1548	100016	91852	95934	3086	7894	5490	1.03	1.09	1.06
Mean	1778	1507	1642	110222	93383	101803	4804	1676	3240	1.05	1.02	1.04
ANOVA	Genot ype	Bio stimu lants	GXB									
SE (d)	167	120	170									
CD (5%)	NS	265	NS									

Soil: Sandy loam type, pH:6.7, Soil fertility status:N: 142 kg ha⁻¹, P₂O₅ : 13.3kg ha⁻¹, K₂O : 256 kg ha⁻¹, OC : 0.46%, Recommended: 90:30:0:25 N:P:K:Zn kg ha⁻¹, 175:60:60:25 N:P:K:Zn kg ha⁻¹ for H 1098i and RCH 776 respectively, Recommended spacing:67.5 x 30 cm, 67.5x 60 cm, Environment: Irrigated

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) (2275 kg ha⁻¹) as compared to by AKH-9-5 (*Suvarna Shubhra*) (1725 kg ha⁻¹). Amongst bio stimulant treatments seed cotton yield was significantly the highest (2256 kg ha⁻¹) with bio stimulant spray@4mg/litre at 30,45 and 60 DAS(B1) which was found significantly



superior over B₃ (DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS, 0.5 ml of DMSO + 5 litre of water) and B₄ i.e. water spray at 30,45,60 and at 75 DAS. However, which was found at par with B₂ (bio stimulant spray@4mg/litre at 45,60 and 75 DAS). The interaction results revealed that PDKV-JKAL-116 Bt (BG-II) genotype with bio stimulant spray @ 4 mg/litre at 30,45 and 60 DAS combination recorded maximum seed cotton yield (2627 kg ha⁻¹) which was found significantly superior over other genotype and bio stimulant spray.

The calculating of economics found that significantly higher gross monetary return (₹137050 ha⁻¹) was registered in PDKV-JKAL-116 Bt. Amongst bio stimulant treatments, higher gross monetary return (135908 ha⁻¹) was calculated with bio stimulant spray @ 4 mg/litre at 30,45 and 60 DAS (b1) and lowest gross monetary return (₹103269 ha⁻¹) with control i.e. water spray(B4) (Table 74). Similar trend was also observed in case of net monetary return and B:C ratio. The significantly higher performance was observed with PDKV- JKAL-116 Bt between genotypes. Among the use of bio stimulants, higher net monetary return B:C ratio was registered in B₁ (@ 4 mg/litre at 30,45 and 60 DAS) and lowest with water spray.



Table 74: Seed cotton yield (kg ha⁻¹), Gross monetary returns (₹ ha⁻¹), Net monetary returns (₹ ha⁻¹) and B:C ratio as influenced by application of bio stimulant

Treatments	Seed cotton yield (kg ha ⁻¹)			Gross monetary returns (₹ ha ⁻¹)			Net monetary returns (₹ 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	2627	1885	2256	158261	113556	135908	102415	63712	83064	2.83	2.28	2.56
B2. Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS	2376	1761	2068	143154	106080	124617	86941	55109	71025	2.55	2.08	2.31
B3. DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS	2182	1741	1962	131466	104915	118190	75929	53572	64750	2.37	2.04	2.21
B4.Control (water spray- 30, 45, 60 & 75 DAS)	1914	1514	1714	115319	91219	103269	62835	42685	52760	2.2	1.88	2.04
Mean	2275	1725		137050	103942		82030	53770		2.49	2.07	
	G	B	GxB	G	B	GxB	G	B	GxB	G	B	GxB
SEd	50	71	102	3017	4267	6034	3017	4267	6034	0.06	0.08	0.11
CD(5%)	152	215	300	9151	12942	NS	9151	12942	NS	0.17	0.25	NS

Soil parameters : pH value: 7.90, EC (dSm⁻¹): 0.12, OC : 0.38%, Available N : 228 kg ha⁻¹, P₂O₅ : 16.4 kg ha⁻¹, K₂O : 368 kg ha⁻¹, Recommended spacing: 90X30 cm, Recommended Fertilizer dose : 60:30:30 Kg NPKha⁻¹, Environment : Rainfed, Total Rainfall during Cropping period : 1119.4 mm



Raichur

The experiment was conducted with two genotypes (Jaadoo and BGDS 1063) and four growth regulators sprays. Significantly higher seed cotton yield of 2687kg ha⁻¹ was obtained with Jaadoo compared to BGDS 1063 (2282 kg ha⁻¹) (Table 75). 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 & 75 DAS recorded (B2) significantly higher seed cotton yield (2662 kg ha⁻¹) compared to other sprays. Significantly higher net returns (₹141009 ha⁻¹) and higher benefit cost ratio (2.96) was obtained with Jaadoo. Among different growth regulators sprays, Bio stimulant spray at 45, 60 & 75 DAS (B2) recorded significantly higher net returns (₹142660 ha⁻¹) and B C Ratio (3.03) compared to other sprays. Interaction effect was found non-significant.

Table 75: Seed cotton yield (kg ha⁻¹), Gross monetary returns (₹ ha⁻¹), Net monetary returns (₹ ha⁻¹) and B:C ratio as influenced by application of bio stimulant

Treatments	Seed cotton yield (kg ha ⁻¹)			Gross return (₹ ha ⁻¹)			Net return (₹ ha ⁻¹)			B:c ratio		
	G1.Jaadoo	G2.BGDS1063	Mean	G1.Jaadoo	G2.BGDS1063	Mean	G1.Jaadoo	G2.BGDS1063	Mean	G1.Jaadoo	G2.BGDS1063	Mean
B1.Bio stimulant@4mg/litre at 30, 45 and 60 DAS	2755	2367	2561	220373	189360	204867	149032	123817	136425	3.09	2.89	2.99
B2. Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS	2882	2442	2662	230587	195360	212974	157374	127945	142660	3.15	2.9	3.03
B3. DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS	2755	2258	2507	211653	180640	196147	137952	112737	125345	2.87	2.66	2.77
B4.Control (water spray- 30, 45, 60 & 75 DAS)	2357	2060	2209	188533	164800	176667	119677	101742	110710	2.74	2.61	2.68
Mean	2687	2282	2485	212787	182540	197663	141009	116560	128785	2.96	2.77	2.86
ANOVA	G	B	GXB									
SE (d)	120	132	187									
CD (5%)	259	291	NS									

Soil: Black soil, shallow and fine textured, pH:8.1, Soil fertility status N : 203 kg ha⁻¹, P₂O₅ : 28 kg ha⁻¹, K₂O : 278 kg ha⁻¹, OC : 0.52%, Environment: Irrigated, Recommended For Bt cotton hybrid:180:90:90 kg NPKha⁻¹, For hirsutum variety:80:40:40 kg NPKha⁻¹

Coimbatore

The experiment was conducted with two genotypes (G1. TCHT175380 BG II and G2.CO 17) and four growth regulators sprays. Significantly higher seed cotton yield of 1942 kg ha⁻¹ was obtained with G1. TCHT175380 BG II as compared to G2.CO 17 (1340 kg ha⁻¹) (Table 76). 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 30, 45 and 60 DAS (B1) recorded significantly higher seed cotton yield (1833 kg ha⁻¹) compared to other sprays. Significantly higher gross return (₹145650ha⁻¹), net returns (₹76328 ha⁻¹) and higher benefit cost ratio (2.10) was obtained with G1. TCHT175380 BG II. Among different growth regulators sprays, Bio stimulant spray at 30, 45 and 60 DAS (B1) recorded significantly higher gross return (₹137512



ha⁻¹ net returns (₹ 68856 ha⁻¹) and B:C Ratio (2.0) compared to other sprays. Interaction effect was found non-significant

Table 76. Seed cotton yield (kg ha⁻¹), Gross monetary returns (₹ ha⁻¹), Net monetary returns (₹ ha⁻¹) and B:C ratio as influenced by application of bio stimulant

Treatments	Seed cotton yield (kg ha ⁻¹)			Gross return (₹ ha ⁻¹)			Net return (₹ ha ⁻¹)			B:c ratio		
	G1. TCHT175380	G2. CO 17	Mean	G1. TCHT175380	G2. CO 17	Mean	G1. TCHT175380	G2. CO 17	Mean	G1. TCHT175380	G2.CO 17	Mean
B1.Bio stimulant@4mg/litre at 30 , 45 and 60 DAS	1810	1210	1510	135750	90750	113250	66865	26065	46465	1.97	1.40	1.70
B2. Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS	2144	1523	1833.5	160800	114225	137512	90043	47668	68856	2.27	1.72	2.00
B3. DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS	2016	1431	1723.5	151200	107325	129262	79955	40280	60118	2.12	1.60	1.87
B4.Control (water spray- 30, 45, 60 & 75 DAS)	1798	1198	1498	134850	89850	112350	68450	27650	48050	2.03	1.44	1.75
Mean	1942	1340.5	1641.25	145650	100537		76328	35416		2.10	1.54	
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, P₂O₅ : 28 kg ha⁻¹, K₂O : 730 kg ha⁻¹, OC: 0.54%, Environment:iirrigated

Srivilliputhur

The results showed that significant variation in all the yield attributes by genotypes and sympodial branches and boll number per square meter by bio stimulant application. Among the genotypes, Bt hybrid Jadhu produced significantly higher number of bolls with higher boll weight than the cotton variety CO 17. Bio stimulant application @ 4 mg/litre at 45, 60 and 75 DAS (B2) water recorded significantly higher yield attributes than control followed by that of bio stimulant application

@ 4 mg/litre at 30, 45 and 60 DAS (B1).

The results indicated that genotypes and bio stimulant application exerted significant influence on seed cotton yield of cotton . With respect to genotypes, Bt hybrid Jadhu registered significantly higher seed cotton yield (2007 kg ha⁻¹) than the cotton variety CO 17 (1864 kg ha⁻¹). Bio stimulant application @ 4 mg/litre at 45, 60 and 75 DAS (B2) registered significantly higher seed cotton yield of 2005 kg/ ha which was significantly higher than control followed by that of bio stimulant application @ 4 mg/litre at 30, 45 and 60 DAS (B1)(Table 77) . The interaction effect was found to be not significant.

The economic analysis clearly revealed that higher gross income, net income and BC ratio was associated with Bt hybrid Jadhu than the cotton variety CO 17. 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(B2) followed by that of bio stimulant application @ 4 mg/litre at 30, 45 and 60 DAS (B1)

Table 77: Seed cotton yield (kg ha⁻¹), Gross monetary returns (₹ ha⁻¹), Net monetary returns (₹ ha⁻¹) and B:C ratio as influenced by application of bio stimulant

Treatments	Seed cotton yield (kg ha ⁻¹)	Cost of cultivation (₹/ ha)	Gross Income (₹/ ha)	Net Income (₹/ ha)	BCR
Genotypes					
G1.Bt hybrid –Jadhu	2012	81722	164574	82852	2.01
G2. Variety - SVPR 6	1866	78522	152848	74326	1.95
SEd	56.1				
CD (P=0.05)	136.1				
Bio – stimulant					
B1.Bio stimulant @ 4 mg/litre at 30, 45 and 60 DAS	1946	79685	161294	81609	2.02
B2.Bio stimulant@ 4 mg/litre at 45, 60 and 75 DAS	2005	81557	164410	82853	2.02
B3.DMSO 100 Ul/ litre @ at 30, 45, 60 and 75 DAS	1908	82045	157276	75231	1.92
B4.Control (water spray at 30, 45, 60 and 75 DAS)	1787	77200	151864	74664	1.97
SEd	66.4	79685	161294	81609	2.02
CD (P=0.05)	144.8	81557	164410	82853	2.02

Soil:Clay loam, pH:8.26 dSm/m, Soil fertility status:N : 196 kg ha⁻¹,P₂O₅ :40 kg ha⁻¹, K₂O : 446 kg ha⁻¹, OC : 0.72%, Recommended nutrients: 120 : 60 : 60 Kg NPK ha⁻¹ for hybrid and 100 : 50 : 50 kg NPK ha⁻¹ for variety, Environment:Irrigated

LAM

The results of the experiment revealed that both the genotypes differed significantly with respect to all growth and yield characters. Bt cotton hybrid (Jaadoo) recorded significantly higher Seed Cotton Yield (4093 kg ha⁻¹) than Hirsutum straight variety (3430 kg ha⁻¹). Among the treatments of Bio stimulant spraying (B1 to B4), spraying of bio stimulant @4mg/L at 30, 45 and 60 DAS resulted in higher growth and yield parameters i.e. sympodia/plant (24.2), bolls/m² (109.1), boll wt (4.69 g) and found significantly superior to rest of the treatments (B2, B3 and B4). Higher seed cotton yield (4837 kg ha⁻¹) was noticed with B1 and significantly superior over rest of the treatments, whereas B2 and B3 were found at par and the lowest yield (2512 kg ha⁻¹) was recorded with water spray @ 30, 45, 60 and 75 DAS (B4) (Table 77 A). The interaction between the genotypes and bio stimulant application was found significant only with boll weight and seed cotton yield and the rest of the parameters was found non significant.



Table 77A: Seed cotton yield (kg ha⁻¹), Gross monetary returns (₹ ha⁻¹), Net monetary returns (₹ ha⁻¹) and B:C ratio as influenced by application of bio stimulant

Treatments	Seed cotton yield (kg ha ⁻¹)			Gross return (₹ ha ⁻¹)			Net return (₹ 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	5346	4329	4837	427671	346293	386982	301356	228488	264922	3.39	2.94	3.16
B2. Bio stimulant@ 4mg/litre at 45, 60 & 75 DAS	4541	3284	3913	363313	262752	313033	235126	144947	190037	2.83	2.23	2.53
B3. DMSO@100 µL/litre spray at 30, 45, 60 & 75 DAS	3577	3988	3783	286170	319032	302601	157495	201227	179361	2.22	2.71	2.47
B4.Control (water spray- 30, 45, 60 & 75 DAS)	2906	2118	2512	232475	169467	200971	108645	51662	80154	1.88	1.44	1.66
Mean	4093	3430		327407.3	274386	300897	200656	156581	178618	2.58	2.33	2.45
ANOVA	G	B	GXB									
SE (d)	36.1	72.2	144.4									
CD (5%)	77.4	154.9	310.0									

Agronomy XII: Large scale testing of proven intervention

Akola

Integrated Crop Production System was demonstrated on demonstration farm of Cotton Research Unit, Dr.PDKV, Akola to demonstrate the technology of drip Fertigation to Bt hybrids on polymulch (PDKV-JKAL-116(BG-II) & PKV-Hy 2 (BG-II).The polymulch of 30 mm thickness was used with 16 mm drip laterals of 4lph discharge. Recommended Fertilizers (120:60:60Kg NPKha⁻¹) was applied through drip irrigation. It was compared with Bt hybrids on drip without polymulch and conventional application of fertilizers. The seed cotton yield recorded in the demonstration plots were 3960 and 3285 kg ha⁻¹ in Bt hybrids PDKV-JKAL-116 and PKV-Hy 2 (BG-II) respectively. Which were 15.65 and 12.51 per cent higher than control plot respectively (Table 78). The excess rainfall received during the cropping periods had nullified the positive effect of drip fertigation under poly mulch because of fact that abnormal excess moisture under polymulch by less evaporation had affected crop at reproductive phase

Table 78. Seed cotton yield (kg ha⁻¹) in demonstration and control plot

Technology	PDKV-JKAL-116 Bt (BG-II)	PKV-Hy-2Bt (BG-II)
Demonstration Plot Drip Fertigation with polymulch	3960	3285
Control Plot Drip irrigation without polymulch with conventional soil application of fertilizers	3340	2874
Percent increase in yield in Demo over control	15.65	12.51



Surat

The results of demonstration of Bt hybrid (G. Cot. Hy. 8 BG-II) with plastic mulch planted under HDPS along with canopy management (mepiquat chloride) recorded higher plant height (196 cm), number of bolls per sqm (70.76), seed cotton yield (2280 kg ha⁻¹), cost of cultivation (₹ 90,648 ha⁻¹), gross return (₹ 1,71,000 ha⁻¹) and net returns (₹ 80,352 ha⁻¹) as compare to control (Bt hybrid (G.Cot.Hy. 8 BG-II) planted under conventional spacing of 120 x 45 cm). The demonstration plot had been observed 28.5, 47.4, 28.5, 12.2 and -12.5 per cent higher Seed Cotton Yield (kg ha⁻¹), Cost of cultivation (₹ ha⁻¹), Gross Return (₹ ha⁻¹), Net Return (₹ ha⁻¹) and BCR respectively (Table 79)

Table 79. Growth and yield characters as well as seed cotton yield (kg ha⁻¹) as influenced by different production system

Treatments	Demo.Bt hybrid (G. Cot. Hy. 8 BG-II) with plastic mulch planted under HDPS along with canopy management (mepiquat chloride)	Bt Control.Bthybrid (G.Cot.Hy. 8 BG-II) planted under conventional spacing of 120 x 45 cm).	Per centage increase of demo plot with control
Seed Cotton Yield (kg ha ⁻¹)	2280	1775	28.5
Cost of cultivation (₹ ha ⁻¹)	90648	61513	47.4
Gross Return (₹ ha ⁻¹)	171000	133125	28.5
Net Return (₹ ha ⁻¹)	80352	71613	12.2
BCR	1.89	2.16	-12.5

Junagadh

The demonstration plot data showed that seed cotton yield and yield attributes of Bt cotton were higher with Bt hybrid with Drip fertigation with Plastic mulch, which produced higher seed cotton yield (2180 kg ha⁻¹), gross returns (₹ 2,02,740 ha⁻¹) and net returns (₹ 79,941 ha⁻¹) as compared with control (Table 80). The technology observed 19.2, 9.9, 31.1, 31.1, 49.1, 10.6 and -12.2 per cent increase of No. of Bolls/ sqm, Boll weight (g), Seed cotton Yield (kg ha⁻¹), Gross returns (₹ ha⁻¹), Cost of cultivation (₹ ha⁻¹), Net returns (₹ ha⁻¹) and B:C ratio as compared to control plot. The demonstrated technology was reported early flowering and squaring as well as more number of branch and good canopy structure as compared control. But after heavy rainfall in the month of September, the crop growth was observed stunted growth and yellowing of plant leaves by excess soil moisture under plastic mulch.



Table 80. Seed cotton yield (kg ha⁻¹) and economics of demonstration and conventional plot.

Treatments	D1 : Bt hybrid+Drip fertigation with polymulch	D2: Control (Conventional)	Percentage increase of demo plot with control
No. of Bolls/ SQM	53.2	44.6	19.2
Boll weight (g)	4.1	3.7	9.9
Seed cotton Yield (kg ha ⁻¹)	2180	1663	31.1
Gross returns (₹ ha ⁻¹)	202740	154659	31.1
Cost of cultivation(₹ ha ⁻¹)	122799	82360	49.1
Net returns (₹ ha ⁻¹)	79941	72299	10.6
B:C	1.7	1.9	-12.2

Soil parameters of pH:8.10, Soil Ec 0.36 dSm⁻¹, OC : 0.90%, Av.N: 290 kg ha⁻¹, P₂O₅ :61.23 kg ha⁻¹, K₂O:310 kg ha⁻¹, Spacing: 120 x 45 cm, Recommended .nutrient:240-50-150 kg ha⁻¹, Cotton species: GTHH-49 BGII, Environment: Irrigated, Total rain fall 1305.10 mm

Nanded

The demonstration of Bt hybrid (NHH 44 BG II) planted under closer spacing (90 x 30 cm) with plastic mulch with canopy management (mepiquat chloride 0.25 g a.i. at square formation and flowering) proved that plant growth characters were found to be reduced by adoption of proven interventions. However, number boll / m² (112), boll weight (3.15 g) and seed cotton yield (3285 kg ha⁻¹) were increased over control i.e. conventional practice of cotton cultivation (Table 81). The proven interventions had incurred greater cost of cultivation (₹1,18,213 ha⁻¹). But it had recorded higher gross (₹ 3,09,348 ha⁻¹) and net returns (₹1,91,135 ha⁻¹). However, the BCR (3.11) was greater in control (conventional practice).

Table 81. Growth characters, Seed cotton yield (kg ha⁻¹) and weed population (No/M²) as influenced by multi-tier cropping

Treatments	Plant height (cm) at harvest	No. of monopodia at harvest	No. of sympodia at harvest	Length of sympodia (cm)	No. of Bolls/ SQM	Boll weight (g)	Seed cotton Yield (kg ha ⁻¹)	Cost of cultivation (₹ ha ⁻¹)	Gross return (₹ ha ⁻¹)	Net Return (₹ ha ⁻¹)	BCR
T ₁ . Bt hybrid + Plastic mulch + HDPS + Canopy management	128.44	1.17	22.00	15.92	112	3.15	3285	118213	309348	191135	2.62
T ₂ . Control (Bt hybrid with conventional practices)	147.33	1.23	25.67	13.97	80	2.79	2287	69338	215367	146029	3.11

Soil properties : pH – 8.07; EC - 0.29 dSm⁻¹, OC - 0.47%, Soil fertility status:. N : 114.85 kg ha⁻¹; P₂O₅ : 11.85 kg ha⁻¹ and K₂O : 432.62 kg ha⁻¹; Rec. Spacing : 120 x 45 cm; Rec. NPK :120:60:60 kg ha⁻¹ ; Species : *G. hirsutum* BG II; Environment : Rainfed; Total rainfall : 1090.2 mm

Chamrajnagar

The demonstration of *in situ* growing of sunnhemp and using of harvested sunnhemp biomass as crop residue mulch was attempted under rainfed condition at Chamrajnagar. Sunnhemp variety, JRJ 610 was raised between rows of interspecific Bt Hybrid (puli) on 20 days after sowing of Bt cotton. The sunnhemp was made cut at 60 DAS and biomass used as mulch. The effect of sunnhemp mulch was assessed and found that 7.4, 7.4, 18.0 and 11.9 per cent higher Seed cotton yield (kg ha^{-1}), Gross Return (₹ ha^{-1}), Net Return (₹ ha^{-1}) and Benefit cost ratio was recorded with sunnhemp mulched plot (Table 82). The reduction of 69.4 and 30.6 per cent reduction of weed population (No/m^2) and weed biomass (30 days after mulching) were recorded with sunnhemp mulched plot. The available nitrogen status found that 7.6 per cent higher with sunnhemp mulched plot

Table 82. Seed cotton yield (kg ha^{-1}), economics, weed population and soil available nitrogen (kg ha^{-1}) as influenced by *insitu* growing of sunnhemp and using as mulch as compared to sole Bt cotton

Sl. No	Parameters	T1: Bt cotton + Sunhemp	T2: Sole Bt Cotton	Per cent increase of demo technology over control
1	Seed cotton yield (kg ha^{-1})	1543	1429	7.4
2	Intercrop biomass (kg ha^{-1})	3568	-	
3	Cost of Cultivation (₹ ha^{-1})	63766	67016	
4	Gross Return (₹ ha^{-1})	138870	128610	7.4
5	Net Return (₹ ha^{-1})	75104	61594	18.0
6	Benefit cost ratio	2.18	1.92	11.9
7	Weed population (No/m^2)	15.17	25.7	69.4
8	Weed population (No/m^2) 30 days after mulch	14.6	21.6	47.9
9	Weed biomass (g /m^2)	25.87	46.43	79.5
10	Weed biomass (g /m^2) 30 days after mulch	23.07	30.13	30.6
	Incorporation of sun hemp in Bt cotton	Initial	After harvest	
1	Organic carbon (%)	0.32	0.33	3.1
2	Soil Available Nitrogen (kg ha^{-1})	214.5	230.7	7.6

LAM

The results (Table-1) revealed that Demo plot-1 (Drip fertigation with plastic mulch) recorded higher growth and yield parameters i.e. Plant height (167.8 cm), monopodia per plant (1.70), sympodia per plant (26.6), boll wt (3.8 g) and seed cotton yield compared (3714 kg ha^{-1}) to Demo plot-2(Conventional) which recorded seed cotton yield of 2259 kg ha^{-1} only. Plastic mulch suppressed the weed growth and drip irrigation helped in good plant growth and resulted in higher seed cotton yield. Demo plot-I (Drip fertigation with plastic mulch) recorded higher net returns (₹ ha^{-1} of 1,40,000) and Benefit Cost Ratio (B:C) of 2.12 compared to Demo plot-II (Conventional plot). Controlled irrigation through drip system has reduced the weed intensity and plastic mulch helped



in moisture conservation thus reduced the cost for weeding and inter-cultivation and lead to higher net returns over conventional plot.

Table-82A: Seed cotton yield (kg/ha) and economics between Drip fertigation plot and Conventional plot

Plant Character	Demo Plot-1 (Drip fertigation with plastic mulch)	Control
Seed Cotton yield (kg ha ⁻¹)	3714	2259
Cost of cultivation particulars		
Drip irrigation (₹ ha ⁻¹)	13,750/-	-
Plastic mulch (₹ ha ⁻¹)	50,000/-	-
Cost of cultivation with drip+plastic mulch system per ha (including different operations) (₹ ha ⁻¹)	76,250/-	-
Total Cost of cultivation (₹ ha ⁻¹)	1,40,000/-	1,06,250/-
Gross Returns (₹ ha ⁻¹)	2,97,120/-	1,80,753/-
Net returns (₹ ha ⁻¹)	1,57,120/-	74,503/-
BC Ratio	2.12	1.70

Cotton price: Rs 8000/- per quintal.

Nandyal

S.No	Parameter	T1 Plastic mulch	T2 Conventional plot
1	Plant height(cm)	85	70
2	No of Monopodia per plant	1	1
3	No of Sympodia per plant	9	8
4	No.of bolls /sq mtr	20	19
5	Boll wt (g)	4.39	3.51
6	Seed cotton yield (kg ha ⁻¹)	928kg/ha	725kg/ha
7	Cost of cultivation (₹ ha ⁻¹)	52,000	50,000
8	Gross Returns (₹ ha ⁻¹)	83520	65250
9	Net Returns (₹ ha ⁻¹)	31520	15250

Cotton Price (Rs/-) : 90 per kg



PHYSIOLOGY AND BIOCHEMISTRY

PHY 1	PGR for optimum morpho frame and enhanced yield
PHY2	Preparing for climate change - Growth and development of <i>arboreum</i> cotton in response to growth regulators
PHY 3	Moisture Stress management through use of different Osmo-protectants
BIO CHEM1	Screening of Cotton genotypes for abiotic stress tolerance and estimation of seed oil, gossypol and protein
BIO CHEM1A	Screening of Cotton genotypes for drought and salinity tolerance
BIO CHEM1B	Estimation of seed oil, gossypol and protein
BIO.CHEM.2	Bio Chem.2. Biochemical basis of tolerance/susceptible of pest and disease
BIO.CHEM.2A	Bio Chem.2 A. Evaluation of Bt hybrids for biochemical basis of susceptible/tolerance of sucking pests
BIO.CHEM.2B	Bio Chem.2B. Evaluation of Biochemical basis of resistance against CLCuD
BIO.CHEM.2C	Bio Chem.2C. Evaluation of Biochemical basis of Tobacco streak virus

PHY 1: PGR 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 morpho-frame doesn't develop fully due to early switch over to reproductive phase under resource constraints condition. Modification of morpho-frame by agrochemicals could greatly help in dispensing away these limitations

Central Zone

Junagadh

The use of PGR for optimum morpho frame management in Bt and non Bt cotton was conducted under irrigated condition at Cotton Research Station, JAU, Junagadh during *Kharif* 2021-22. One Bt hybrid First Class BG II and one non Bt variety GN. Cot. 32 were sown, growth inhibitor Ethrel @ 45 ppm at 40 DAS, MC @ 100 ppm at 90 DAS and combination of both PGR were attempted. The application of Ethrel @ 45ppm at 40 DAS in Bt hybrid was inhibit vegetative growth of plants and it divert the photosynthate towards development of reproductive organs i.e. no. of bolls and boll weight were increased altimetry biomass was reduced at harvest. The seed cotton yield (**2217 kg ha⁻¹**) was found significantly highest in application of Ethrel @ 45ppm at 40 DAS in Bt hybrid as compared to control B4 (1838 kg ha⁻¹) whereas no any significant effect was found by application of PGR in non Bt cotton variety GN. Cot.32 as compare to Bt. hybrid. The net monetary return (₹1, 31,904ha⁻¹) was found significantly highest in application of Ethrel @ 45ppm at 40 DAS in Bt hybrid as compared to control B4 (₹ 1,02,132 ha⁻¹) . The B:C ratio (2.87) was found significantly highest in application of Ethrel @ 45ppm at 40 DAS in Bt hybrid as compared to control B4 (2.55)



Table 83. Seed cotton yield (kg ha⁻¹), gross Return (₹ ha⁻¹), net return(₹ ha⁻¹) and benefit Cost ratio as influenced by genotypes and PGR application

Treatments	Seed cotton yield (kg ha ⁻¹)			Gross Return (₹ ha ⁻¹)			Net Return (₹ ha ⁻¹)			B:C ratio		
	Bt hybrid (First Class BGI)	Variety(GN. Cot. 32)	Mean	Bt hybrid (First Class BGI)	Variety (GN.Cot. 32)	Mean	Bt hybrid (First Class BGI)	Variety (GN.Cot. 32)	Mean	Bt hybrid (First Class BGI)	Variety (GN.Cot. 32)	Mean
B1. Ethrel @ 45 ppm at 40 DAS	2393	2042	2217	217825	186270	202048	145841	117967	131904	3.02	2.72	2.87
B2. Mepiquat chloride @100 ppm at 90 DAS	1995	1709	1852	182087	156371	169214	113097	90355	101726	2.64	2.37	2.5
B3. Ethrel @ 45 ppm at 40 DAS +Mepiquat chloride @100 ppm at 90 DAS	2238	1940	2089	203889	177127	190508	131868	108228	120048	2.83	2.65	2.7
B4. Control (Water spray)	1935	1740	1838	176679	159103	167891	109895	94370	102132	2.64	2.45	2.55
Mean	2140	1858		196120	169710		125175	102730		2.78	2.53	
ANOVA	S.Em.±	CD (5%)	ANOVA	S.Em.±	CD (5%)	ANOVA	S.Em.±	CD (5%)	ANOVA	S.Em.±	CD (5%)	
Gen.	67.8	205.7	Gen.	6103	18514	Gen.	5401	16384	Gen.	0.06	0.19	
GR	95.9	290.9	GR	8631	26182	GR	7638	23171	GR	0.09	0.27	
Gen.XGR	135.6	NS	Gen.XGR	12206	NS	Gen.XGR	10802	NS	Gen.XGR	0.12	NS	

Soil: Medium Black, pH = 1.02, EC ds/m = 0.37, Recommended: 240-50-150, N-P-K kg ha⁻¹, Spacing: 120 x 45 cm, Environment: Irrigated



Surat

The experiment on plant growth regulator conducted with objective to physiological manipulation of morphoframe, growth and development of cotton at Surat under irrigated condition revealed that B3. Ethrel @ 45 ppm at 40 DAS +Mepiquat chloride @100 ppm at 90 DAS registered significantly higher Seed Cotton Yield (2170 kg ha^{-1}), gross return ($\text{₹}1,62,725 \text{ ha}^{-1}$), net return ($\text{₹}1,11,279 \text{ ha}^{-1}$) and benefit cost ratio (2.13) (Table 84). Between genotypes, V1.G.Cot Hy 12 BG II DAS registered significantly higher Seed Cotton Yield (2439 kg ha^{-1}), gross return ($\text{₹}1,82,920 \text{ ha}^{-1}$), net return ($\text{₹}1,29,555 \text{ ha}^{-1}$) and benefit cost ratio (2.43). The interaction effect was found non-significant

Table 84. Seed cotton yield (kg ha⁻¹), gross Return (₹ ha⁻¹), net return (₹ ha⁻¹) and benefit Cost ratio as influenced by genotypes and PGR application

Treatments	Seed cotton yield (kg ha ⁻¹)			Gross Return (₹ ha ⁻¹)			Net Return (₹ ha ⁻¹)			B:C ratio		
	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	2348	1474	1911	176085	110536	143311	123504	64947	94225	2.35	1.41	1.88
B2. Mepiquat chloride @100 ppm at 90 DAS	2528	1287	1907	189572	96538	143055	135531	52421	93976	2.51	1.16	1.83
B3. Ethrel @ 45 ppm at 40 DAS +Mepiquat chloride @100 ppm at 90 DAS	2609	1730	2170	195689	129762	162725	140727	81832	111279	2.56	1.7	2.13
B4. Control (Water spray)	2271	1405	1838	170334	105362	137848	118457	60416	89437	2.28	1.34	1.81
Mean	2439	1474	1956	182920	110550	146735	129555	64904	97229	2.43	1.40	1.91
ANOVA	SEd	CD (5%)		SEd	CD (5%)		SEd	CD (5%)		SEd	CD (5%)	
Gen.	75.5	168.36		5887	12627		5259.6	11280		0.1	0.22	
GR	111.01	238.28		8326.3	17858		7438.19	15953		0.14	NS	
Gen.XGR	157	NS		11775	NS		10519	NS		0.2	NS	

Soil:pH-7.25, EC-.0.78dS/m, Soil fertility status: N-440 kg ha⁻¹, P₂O₅-27.53kg ha⁻¹, K₂O -441kg ha⁻¹, Total rainfall-1317.65mm, Rainy days-88



Dharwad

The experiment on plant growth regulator conducted with objective to physiological manipulation of morphoframe, growth and development of cotton at Dharwad under rainfed condition revealed that significant difference for number of bolls per square meter, boll weight and seed cotton yield (kg ha^{-1}) were recorded by genotypes and growth regulator application. Between genotypes, G1.Ajeet- 199 Bt registered significantly higher number of bolls per square meter (41.4), boll weight (5.2 g) and seed cotton yield (1656 kg ha^{-1}). Amongst growth retardants, significantly higher performance of number of bolls per square meter (40.5), boll weight (5.2 g) and seed cotton yield (1577 kg ha^{-1}) recorded with combined spray of ethrel @ 45 ppm at 40 DAS and mepiquat chloride spray at 90 DAS (B3) (Table 85). The interaction results found that G1.Ajeet -199 Bt combined with spray of ethrel @ 45 ppm at 40 DAS and mepiquat chloride spray at 90 DAS observed significantly higher growth, yield attributes and seed cotton yield.



Table 85 . Boll weight(g), number of bolls , RWC and Seed cotton yield (kg ha⁻¹), as influenced by genotypes and PGR application

Treatments	Boll weight (g)			number of bolls per plant			RWC (%)			Seed cotton yield (kg ha ⁻¹)		
	G1.Ajeet 199 BG II	G2.Sahana	Mean	G1.Ajeet 199 BG II	G2.Sahana	Mean	G1.Ajeet 199 BG II	G2.Sahana	Mean	G1.Ajeet 199 BG II	G2.Sahana	Mean
B1. Ethrel @ 45 ppm at 40 DAS	5.3	4.3	4.8	41.2	33.5	37.4	82.4	78.4	80.4	1603	1292	1448
B2. Mepiquat chloride @100 ppm at 90 DAS	5.4	4.4	4.9	41.6	34.0	37.8	82.7	78.7	80.7	1714	1302	1508
B3. Ethrel @ 45 ppm at 40 DAS +Mepiquat chloride @100 ppm at 90 DAS	5.6	4.8	5.2	44.3	36.6	40.5	84.8	79.3	82.0	1832	1321	1577
B4. Control (Water spray)	4.6	4.1	4.3	38.3	31.6	34.9	79.3	76.8	78.1	1476	1042	1259
Mean	5.2	4.4	4.8	41.4	33.9	37.6	82.3	78.3	80.3	1656	1239	1448
ANOVA	S.Em.±	CD (5%)	ANOVA	S.Em.±	CD (5%)	ANOVA	S.Em.±	CD (5%)	ANOVA	S.Em.±	CD (5%)	
Gen.	0.07	0.22	Gen.	0.74	2.21	Gen.	0.2	0.53	Gen.	4.06	11.66	
GR	0.09	0.28	GR	1.06	3.18	GR	0.28	0.84	GR	4.7	14.08	
Gen.XGR	0.13	0.39	Gen.XGR	1.49	4.47	Gen.XGR	0.39	1.16	Gen.XGR	5.41	16.25	

Soil: Medium deep black Soil, pH:7.5, Soil fertility status: N: 255 kg ha⁻¹, P₂O₅ : 34 kg ha⁻¹, K₂O : 514 kg ha⁻¹, OC: 0.55 %, Recommended:100:50:50 kg NPKha⁻¹for Bt hybrids, Recommended :80:40:40 kg NPKha⁻¹for varieties, Recommended:60 x 30 cm (variety) 60 x 90 cm (Bt hybrid, Environment: Rainfed



Sirsa

The results revealed that yield attributes and seed cotton yield was significantly higher with RCH 776 BG II Bt hybrid as compared to hirsutum variety (CSH-3075), irrespective of the growth regulator applied. Among PGR treatments, yield attributes and seed cotton yield were significantly higher with B3 treatment [i.e., application of Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS] over B1 [i.e., Ethrel @ 45 ppm at 40 DAS]; B2 [i.e., Mepiquat chloride @100 ppm at 90 DAS] as well as over B4 [i.e., Control (Water spray)], irrespective of the cotton genotype (Table 85 A). All the interactions were non significant.

Table 85 A. Seed cotton yield (kg ha⁻¹) as influenced by genotypes and plant growth regulators

Treatments	V1.RCH 776 BG II	V2. CSH- 3075	Mean	ANOV A	SE d	CD (5%)
B1. Ethrel @ 45 ppm at 40 DAS	3389	2537	2963	Gen.	108.1	500.9
B2. Mepiquat chloride @100 ppm at 90 DAS	3455	2602	3029	GR	41.6	91.6
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS	3789	2832	3310	Gen. X GR	58.8	NS
B4. Control (Water spray)	3276	2376	2826			
Mean	3477	2587				

Guntur

The results revealed that per hectare seed cotton yield was significantly affected by both the genotypes and growth regulators, but not by their interaction. Bt hybrid (1205 kg ha⁻¹) recorded significantly higher seed cotton yield than the non Bt variety (873 kg ha⁻¹) and among the growth regulator treatments Mepiquat chloride @ 100 ppm at 90 DAS significantly increased the SCY (1163 kg ha⁻¹) over the control (949 kg/ha), and other GR treatments were on par with control in this respect (Table 85 B). Bt hybrid (Jaadoo BGII) showed significantly higher gross returns (Rs 48,028 /ha) than the non Bt variety (Rs 22,269/ha). Among the GR treatments Mepiquat chloride @ 100 ppm at 90 DAS showed significantly higher gross returns than all the other treatments, which were on par with each other. Net monetary returns per ha (Rs 45,996 /ha) was significantly higher with combination of ethrel and mepiquat chloride, while other three GR treatments were on par with each other. Jaadoo BGII recorded significantly higher net monetary returns per ha than the NDLH 1938. However interaction effect of genotypes and GR was not significant on net monetary returns.



Table 85 B. Seed cotton yield (kg ha⁻¹) and Net Return (Rs/ha) as influenced by genotypes and spacing levels

Treatments	Seed cotton yield (kg/ha)			Net Return (Rs/ha)		
	V1.Jadoo BG II	V2. NDLH 1938	Mean	V1.Jadoo BG II	V2. NDLH 1938	Mean
B1. Ethrel @ 45 ppm at 40 DAS	1154	726	1051	43896	29187	30201
B2. Mepiquat chloride @100 ppm at 90 DAS	1319	810	1163	57953	34040	36541
B3. Ethrel @ 45 ppm at 40 DAS + Mepiquat chloride @100 ppm at 90 DAS	1257	948	991	51840	8563	45996
B4. Control (Water spray)	1089	1008	949	38424	17288	27856
Mean	1205	873		48028	22269	
ANOVA	SE d	CD (5%)		SE d	CD (5%)	
Gen.	45.31	97.18		3987.10	8551.47	
GR	64.08	137.43		5638.61	12093.61	

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 delayed sowing of arboreum observed significant reduction in number of bolls, boll weight and seed cotton yield. The seed cotton yield (kg ha⁻¹) was significantly affected due to time of sowing only. Among times of sowing, D2+20 days delay sowing was showed significantly the least seed cotton yield (53.8 kg ha⁻¹) than normal sowing (747.3 kg ha⁻¹) and D1+20 days delay(343.6 kg ha⁻¹) (Table 86). The results added that number of flowers produced at 90DAS were varied by sowing date. The delay sowing D2+20 days produced significantly the highest number of flowers (115.2/plant) which was followed by D1+20 days (72.9/plant) and normal sowing (10.9/plant) recorded least one. However, the enhanced effect on flowering is not reflected in seed cotton yield may be due to non availability of conducive environment thus led to shedding of flowers in delay sowing treatments.



Table 86. No. of flowers at 90 DAS and Seed cotton yield (kg ha⁻¹) as influenced by delay sowing and PGR application

Treatments		Seed cotton yield (kg ha ⁻¹)				No of flowers at 90 DAS			
		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	819	476	48	448.0	14.67	58.00	139.00	70.6
G ₂	Mepiquat Chloride @ 20 g a.i. ha ⁻¹ at 45 & 60 DAS	716	355	40	370.7	15.00	104.33	79.00	66.1
G ₃	Salicylic Acid @ 0.5 mM at 45 & 60 DAS	593	343	74	336.9	11.67	63.67	139.33	71.6
G ₄	1-Methyl cyclo propene @10g a.i ha ⁻¹ at 45 & 60 DAS	640	220	58	305.9	10.00	60.33	152.00	74.1
G ₅	2,3,5, Tri iodo benzoic acid (TIBA) @ 100 ppm at 45 & 60 DAS	810	270	54	378.1	8.00	84.67	64.00	52.2
G ₆	Triacantanol @0.1 mg/l at 45 & 60 DAS	904	397	49	449.9	6.00	66.67	118.00	63.6
Mean		747.3	343.6	53.8	381.6	10.9	72.9	115.2	66.4
ANOVA			GR	D	GRXD		GR	D	GRXD
SE d			42.45	12.76	73.52		2.76	1.98	4.78
CD (5%)			NS	35.21	NS		NS	5.64	NS

Soil:pH-7.32, EC-.0.80dS/m, Soil fertility status : N-420 kg ha⁻¹, P-28 kg ha⁻¹, K-375 kg ha⁻¹, Total rainfall-1317.65mm, Rainy days-88

Junagadh

The results exposed that significantly highest seed cotton yield (1875 kg ha⁻¹) was produced by timely sown crop (D₁) as compare to 20 days late (D₂, 1435 kg ha⁻¹) and 40 days late (D₃, 944 kg ha⁻¹) sown crop. In response to growth regulators treatment Salicylic Acid @ 0.5 mM at 45 & 60 DAS produced significantly the highest yield (1541 kg ha⁻¹) and it was at par with Triacantanol @0.1 mg/l (G₆, 1440 kg ha⁻¹) & TIBA@100ppm (G₅ 1448 kg ha⁻¹) at 45 & 60 DAS as compared to other PGR treatment & control (Table 87). The number of flowers 30 days after 50% flowering produced the highest flowers in D2(84.28) sown crop and G₆ treatment (77.67). Days to first boll bursting & 50% boll bursting was found non-significant in case of GR treatments where significantly minimum time taken for boll bursting in D1. Environment and PGR effect was shown in bolls production and seed cotton yield. Timely sown crop get more time to develop vegetative and reproductive organs and get sufficient time to produce maximum photosynthates (dry weight) that transfer to developing bolls ultimately boll weight increased resulting higher seed cotton yield produced.



Table 87. No. of flowers at 30 days after 50 % flowering and Seed cotton yield (kg ha⁻¹) as influenced by delay sowing and PGR application

Treatments	No of flower at 30 days after 50% flowering				Seed cotton yield (kg ha ⁻¹)			
	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	53.33	92.00	59.67	68.33	1871	1248	872	1331
G ₂ . Detoping at 20 node+Mepiquat Chloride @ 20 g a.i. ha ⁻¹ at 45 & 60 DAS	45.00	74.67	60.00	59.89	1843	1432	907	1394
G ₃ . Detoping at 20 node+Salicylic Acid @ 0.5 mM at 45 & 60 DAS	48.00	82.33	66.67	65.67	1950	1605	1069	1541
G ₄ . etoping at 20 node+1-Methyl cyclo propene @ 10g a.i ha ⁻¹ at 45 & 60 DAS	53.67	74.33	64.33	64.11	1765	1382	921	1356
G ₅ . Detoping at 20 node+2,3,5, Tri iodo benzoic acid (TIBA) @ 100 ppm at 45 & 60 DAS	44.33	89.33	71.00	68.22	1865	1480	999	1448
G ₆ . Detoping at 20 node+Triacntanol @ 0.1 mg/l at 45 & 60 DAS	59.67	93.00	80.33	77.67	1958	1466	898	1440
Mean	50.67	84.28	67.00		1875	1435	944	
ANOVA	GR	D	GExD		GR	D	GRxD	
SEm±	1.72	2.25	2.98		47.38	49.33	82.06	
CD (5%)	4.97	8.83	8.61		136.83	193.67	NS	

Soil: Medium Black, pH = 1.02, EC ds/m = 0.37, Soil fertility status: N 279 kg ha⁻¹, P₂O₅ 17.54 kg ha⁻¹, K₂O: 395 kg ha⁻¹, Environment: Irrigated, Spacing: 90x30 cm

Dharwad

The results revealed that growth parameters like plant height, number of monopodia, number of sympodia were higher in normal date of sowing (D1) with salicylic acid @ 0.5 mM at 45 & 60 DAS treatment followed by Triacntanol @ 0.1 mg/l at 45 & 60 DAS treatment. The phenological parameters like days to square, days to flowering and days to boll bursting were earlier in normal sowing dates. Seed cotton yield (1266 kg ha⁻¹) and its components also more in case of normal sowing (D1) with salicylic acid @ 0.5 mM at 45 & 60 DAS (1541 kg ha⁻¹) and least was recorded in D3 control (944 kg ha⁻¹) (Table 88). Normal date of sowing is the best date for maximum yield and delay sowing results in yield reduction.



Table 88. No. of flowers at 3 days after 50 % flowering and Seed cotton yield (kg ha⁻¹) as influenced by delay sowing and PGR application

Treatments	No. of flowers at 30 days after 50% flowering				Seed cotton yield (kg ha ⁻¹)			
	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	19.25	14.30	10.45	14.67	1090.9	860.1	601.5	850.8
G2.Mepiquat Chloride @ 20 g a.i. ha ⁻¹ at 45 &60 DAS	24.75	18.15	13.75	18.88	1260.0	1080.0	720.0	1020.0
G3.Salicylic Acid @ 0.5 mM at 45 &60 DAS	29.59	25.19	19.58	24.79	1380.8	1195.5	835.5	1137.2
G4.1-Methyl cyclo propene @10g aiha ⁻¹ at 45 &60 DAS	22.55	18.70	13.20	18.15	1209.0	1010.0	719.8	979.6
G5.2,3,5, Tri iodo benzoic acid (TIBA) @ 100 ppm at 45 &60 DAS	21.45	18.15	12.32	17.31	1197.0	1040.0	693.5	977.1
G6.Triacontanol @0.1 mg/l at 45 &60 DAS	26.40	23.10	17.16	22.22	1266.0	1050.0	745.5	1021.0
Mean	24.00	19.60	14.41		1234.0	1039.3	719.3	-
ANOVA	GR	D	GR x D		GR	D	GR x D	-
SE d	1.03	1.16	1.40		9.61	11.56	10.65	-
CD (5%)	2.98	3.48	4.20		28.46	33.78	31.93	-

Soil: Medium deep black soil, pH:7.5, Soil fertility status:N : 250 kg/ka,P₂O₅: 33 kg ha⁻¹, K₂O : 510 kg ha⁻¹, OC : 0.55 % , Recommended :80:40:40 kg NPKha⁻¹, Rec.Spacing:60 x 15 cm, Environment: Rainfed

PHY 3: Stress management through use of different Osmo-protectants (irrigated trial)

South Zone

Dharwad

The effect of osmo-protectants on moisture stress management in cotton showed significant difference under rainfed condition . Physiological parameters like photosynthesis (33.57µmol m⁻² sec⁻¹) , chlorophyll stability index (47.2 mg/gm of fresh leaves) and proline (3.23 %) relative water content(87.9 %), specific leaf weight (10.2 mg/cm²) showed significantly higher with 2% KNO₃ - 4 sprays followed by Glycine Betaine @100 ppm, Salicylic acid @ 100 ppm-Single spray and lower were observed in control (water spray treatment). Bolls per square meter was higher in 2% KNO₃ spray(T₃) (167.2) followed by glycine Betaine (T₆) (156.2) compared to control (130.0). The significantly highest seed cotton yield recorded with T₃.Foliar application of 2 % KNO₃- 4 sprays at weekly intervals (1564 kg ha⁻¹) followed by T₆.Foliar application of Glycine Betaine @100 ppm-Single spray(1431 kg ha⁻¹) and Salicylic acid @ @ 100 ppm-Single spray (1316 kg ha⁻¹) as compared to control (1118kg ha⁻¹) (Table 89).



Table 89. Physiological parameters and seed cotton yield as influenced by moisture stress with osmoprotectant

Treatments	Photosynthesis ($\mu\text{mol m}^{-2} \text{sec}^{-1}$)	Transpiration ($\text{mmol m}^{-2} \text{sec}^{-1}$)	Chlorophyll stability mg/gm of fresh leaves	Proline content (%)	RWC (%)	SLW (mg/cm^2)	Boll per sq meter	Boll weight (g)	Seed cotton yield (kg ha^{-1})
T1.Control (water spray)	26.92	3.66	39.14	2.68	83.37	7.59	130	4.68	1118
T2.Foliar application of 2 % urea-4 sprays at weekly intervals	29.33	4.09	42.30	3.07	84.84	8.30	137	4.70	1189
T3.Foliar application of 2 % KNO_3 - 4 sprays at weekly intervals	33.57	5.53	47.22	3.23	87.99	10.32	167.2	5.07	1564
T4.Foliar application of 1 % Thio urea – Single spray	27.75	4.04	43.21	2.89	85.16	8.68	143.6	4.83	1173
T5.Foliar application of Salicylic acid @50 ppm-Single spray	28.90	4.17	44.18	2.88	86.00	9.17	145.2	4.84	1281
T6.Foliar application of Glycine Betaine @100 ppm-Single spray	31.78	4.91	45.97	3.10	86.94	10.07	156.2	5.02	1431
T7.Foliar application of Salicylic acid @ @ 100 ppm-Single spray	30.74	4.57	44.55	3.003	86.42	9.95	155.5	4.93	1316
T8.Foliar application of PPFM@1 % -3 spray at 10 days interval	31.38	4.70	45.24	3.04	86.00	9.71	154.5	4.81	1290
SE d	0.47	1.01	0.38	0.29	0.32	0.32	0.8	0.10	16
CD (5%)	1.41	NS	1.16	0.88	0.95	0.98	2.3	0.30	46

Guntur

The results revealed that KNO_3 @2% of four sprays at weekly interval and foliar application of glycine betaine @100 ppm single spray were found to be on par with each other as well as superior over all the other treatments including control statistically with respect to seed cotton yield (Table 89 A).

RWC was significantly affected by the osmoprotectant treatments recording significantly higher values with KNO_3 @2% of four sprays at weekly interval, which was found to be on par to that with the treatments glycine betaine, urea and PPFM sprays. SLW was found to be significantly higher with KNO_3 @2% of four spray which was found to be on par with glycine betaine treatment but superior over all the other treatments. Similar but inverse trends was found with SLA, i.e., significantly lowest values found with KNO_3 @2% of four spray treatment compared to all the other treatments. Significantly highest SPAD values were recorded with KNO_3 application @ 2% 4 times at weekly interval followed by glycine betaine @ 100 ppm single spray compared to all the other treatments.



Table 89 A. Seed cotton yield (kg/ha) and physiological parameters as influenced by stress managements

Treatments	Seed cotton yield (kg/ha)	RWC (%)	SLW (mg/cm ²)	SLA (cm ² /mg)	SPAD Values	Total Chlorophyll (mg/gm of fresh leaves)	Chlorophyll stability Index %	Proline Content μ moles/gm tissue)
T1.Control (water spray)	928	66.87	6.89	14.52	28.58	1.29	62.45	1.51
T2.Foliar application of 2 % urea-4 sprays at weekly intervals	1015	72.40	7.32	13.70	28.81	1.39	63.84	1.50
T3.Foliar application of 2 % KNO ₃ - 4 sprays at weekly intervals	1256	76.20	7.72	12.99	38.03	1.85	69.09	1.72
T4.Foliar application of 500ppm Thio urea –Single spray	1011	70.00	6.86	14.59	30.38	1.48	65.73	1.57
T5.Foliar application of Salicylic acid @50 ppm-Single spray	873	69.17	6.93	14.44	29.95	1.45	65.66	1.61
T6.Foliar application of Glycine Betaine @100 ppm-Single spray	1142	74.33	7.61	13.19	34.65	1.78	68.15	1.67
T7.Foliar application of Salicylic acid @ @ 100 ppm-Single spray	1027	70.07	7.04	14.21	30.70	1.39	64.13	1.44
T8.Foliar application of PPFM@1 % -3 spray at 10 days interval	957	72.13	7.12	14.07	29.84	1.44	66.43	1.55
SEd	72	2.07	0.25	0.46	2.08	0.08	1.11	0.04
CD (5%)	149	4.27	0.52	0.96	4.29	0.17	2.31	0.08



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 results revealed that genotypes H 1529, H1581, H 1564 and H 1530 showed maximum increase in specific leaf weight under rainfed condition as compared to irrigated control. The highest and lowest proline content was observed in H 1521 and H 1539 genotype under rainfed condition, respectively. The genotypes H 1529, H1581, H 1553, H 1530 and H 1569 showed maximum increase in proline content under rainfed condition as compared to irrigated control. Data for soluble protein showed significant increase under rainfed condition in all genotypes but less increase was observed in H 1539, H 1530 and H 1480 genotypes.

The genotypes H 1566 and H 1530 showed the highest seed cotton yield under irrigated and rainfed conditions, respectively (Table 90). Cotton seed yield under irrigated condition differ significantly from rainfed condition, however, least decrease in seed cotton yield was observed in H 1529 followed by H 1581, H 1553, H 1539, and H 1564 genotypes. The crude oil content decreased significantly under drought condition in all the genotypes except H 1533 genotype and gossypol content found to decrease under drought condition in all genotypes.

The genotypes, H 1529, H 1530, H 1581, H 1553 and H 1564, and 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 90. Physiological and biochemical parameters of genotypes as influenced by moisture stress

Genotypes (B)	RWC (%)		SLW (mg/cm ²)		Protein (%)		Proline content (μmoles/g) of tissue		Seed cotton yield (kg ha ⁻¹)	
	IR (A)	RF (A)	IR (A)	RF (A)	IR (A)	RF (A)	IR (A)	RF (A)	IR (A)	RF (A)
H 1480	68.68	61.64	4.51	5.83	2.83	2.92	1.13	1.26	2972	2515
H 1564	70.71	67.36	4.45	6.03	3.48	3.65	0.84	0.93	2926	2835
H 1491	73.45	70.15	4.21	5.41	3.18	3.80	1.35	1.57	2515	2058
H 1581	70.35	67.88	4.61	6.60	3.17	3.77	1.03	1.34	2652	2606
H 1566	80.11	76.79	4.61	5.51	2.34	2.81	0.90	1.05	4298	2926
H 1521	66.82	59.69	4.59	6.01	2.29	2.84	0.82	0.86	2972	2743
H 1539	73.09	70.36	4.88	5.97	2.93	3.00	1.31	1.61	3109	3018
H 1569	77.23	74.25	4.90	6.24	2.72	2.99	1.11	1.36	3292	2996
H 1528	68.31	62.51	4.35	5.41	2.88	3.24	1.19	1.40	2835	2378
H 1529	71.92	70.49	4.86	7.13	2.90	3.14	0.93	1.26	3018	3018
H 1530	71.68	69.23	4.69	6.29	3.22	3.31	1.32	1.68	3475	3342
H 1533	77.14	69.74	4.07	5.16	3.03	3.51	1.12	1.28	3384	3064
H 1531	76.47	73.17	4.68	6.10	3.13	3.86	1.17	1.41	2881	2103
H 1547	69.77	66.12	4.57	5.90	2.43	2.66	0.93	1.08	3658	2515
H 1553	70.84	68.58	4.85	6.48	2.26	2.57	1.12	1.42	3155	3064
H 1557	68.67	65.41	4.56	5.69	3.00	3.32	1.12	1.33	3475	3155
H 1098i	72.85	70.01	4.23	5.51	2.85	3.42	0.91	1.05	2561	2414
Mean	72.24	68.43 4	4.56 5	5.95 7	2.86	3.22 3	1.07 6	1.288	3,128.11	2,749.99
ANOVA	SE(d)	C.D. (5%)	SE(d)	C.D. (5%)	SE(d)	C.D. (5%)	SE(d)	C.D. (5%)	SE(d)	C.D. (5%)
A	0.31	0.62	0.05	0.10	0.03	0.07	0.01	0.03	29.902	61.104
B	0.91	1.80	0.15	0.29	0.10	0.20	0.04	0.08	87.177	178.148
A x B	1.29	2.54	0.21	0.41	0.14	0.28	0.05	0.11	123.288	251.94



Table 91. Biochemical seed quality parameters of genotypes as influenced by moisture stress condition

Genotypes	Crude Oil (%)		Crude Protein (%)		Total Gossypol (%)	
	IR (A)	RF(A)	IR (A)	RF(A)	IR (A)	RF(A)
H 1480	19.3	16.5	23.83	22.52	0.40	0.27
H 1564	19.5	16.8	26.77	23.91	0.72	0.25
H 1491	17.8	17.4	25.30	24.48	0.62	0.32
H 1581	18.3	16.6	24.48	21.93	0.37	0.20
H 1566	20.0	18.0	26.44	23.06	0.66	0.24
H 1521	19.7	17.3	18.93	17.30	0.62	0.22
H 1539	17.6	15.9	20.56	19.91	0.48	0.16
H 1569	16.2	15.5	22.85	19.91	0.66	0.25
H 1528	18.7	18.1	23.83	23.01	0.43	0.23
H 1529	17.7	17.4	27.09	25.30	0.50	0.21
H 1530	18.7	17.2	23.34	22.36	0.54	0.25
H 1533	18.2	18.3	24.64	22.20	0.45	0.27
H 1531	19.7	18.5	20.40	19.58	0.31	0.24
H 1547	17.6	15.4	17.63	15.99	0.50	0.26
H 1553	16.9	16.3	18.28	18.44	0.39	0.28
H 1557	18.1	15.5	21.05	20.07	0.44	0.20
H 1098i	16.5	16.1	19.91	19.42	0.61	0.30
Mean	18.238	16.85	22.666	21.141	0.510	0.244
ANOVA	SEd	CD at 5%	SEd	CD at 5%	SEd	CD at 5%
Genotypes	0.065	0.133	0.103	0.21	0.003	0.006
Environment	0.19	0.388	0.299	0.611	0.008	0.017
GxE	0.269	0.549	0.423	0.864	0.012	0.024

Surat

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. Relative water content (RWC), SLW (Specific Leaf weight) and SLA (Specific Leaf Area) were significantly differed between genotypes in rainfed and irrigated condition (Table 92). As well as total chlorophyll content and proline content were significant due to genotypes under rainfed. Reducing sugar was found non- significant in rainfed and irrigated condition. Chlorophyll stability and protein content were significantly differed among all genotypes in rainfed and irrigated conditions. Chlorophyll stability index was found significantly highest in NDLH-2035-5 and GISV-323 under rainfed condition.



Table 92. Physiological parameters of genotypes as influenced by moisture stress condition

Genotypes	Seed cotton yield (kg ha ⁻¹)		RWC(%)		SLW(mg/cm ²)		SLA(cm ² /mg)		Root/shoot ratio	
	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated
GISV-328	1447	2008	89.75	97.81	2.33	2.15	0.43	0.47	0.147	0.178
GISV-323	1868	1953	82.96	93.89	1.93	2.34	0.52	0.43	0.184	0.245
NDLH-2035-5	1718	1932	88.89	95.20	1.72	1.86	0.58	0.54	0.187	0.212
JLA-1207	759	912	93.33	91.60	2.43	2.00	0.41	0.50	0.206	0.276
GJHV-566	2644	2701	97.05	97.00	1.72	1.63	0.58	0.61	0.188	0.187
GJHV-522	1900	2272	94.68	95.54	2.07	1.89	0.48	0.53	0.174	0.164
GJHV-548	1537	1715	89.88	96.93	2.29	1.93	0.44	0.52	0.183	0.148
GJHV-568	1601	1602	94.13	86.70	1.73	1.79	0.58	0.56	0.191	0.225
LRA-5166	1405	1510	86.82	92.67	2.19	1.58	0.46	0.63	0.222	0.194
G.Cot-16	2016	2184	85.79	91.79	1.77	1.82	0.57	0.55	0.160	0.209
SE d	224	220	0.21	0.57	0.020	0.004	0.006	0.003	0.024	0.044
CD (5%)	474	465	0.45	1.22	0.042	0.009	0.012	0.006	NS	NS

Soil: pH:7.18, EC:0.66 dS/m, Soil fertility status: N-439kg ha⁻¹, P₂O₅-21.85kg ha⁻¹, Avail K₂O-557.31kg ha⁻¹, Total rainfall-1317.65mm, Rainy days-88

Table 93. Physiological parameters of genotypes as influenced by moisture stress condition

Genotypes	Reducing Sugar (mg/g of tissue)		Chlorophyll stability index (%)		Protein content (%)	
	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated
GISV-328	19.90	11.42	70.80	76.20	13.71	6.29
GISV-332	18.91	12.96	80.90	89.43	11.66	9.11
GJHV-548	17.74	12.80	81.53	88.12	15.33	7.76
GJHV-568	16.89	12.73	73.41	71.73	10.97	9.96
NDLH-2051-1	16.04	11.96	73.33	80.24	9.51	10.18
G.Cot-16	17.35	12.34	71.55	79.64	11.00	8.80
LRA-5166	18.43	11.88	70.67	78.88	15.43	12.50
Suraj	17.97	11.72	70.53	79.13	10.80	11.62
SE d	17.12	11.72	69.86	80.45	16.87	12.37
CD (5%)	17.05	11.96	72.25	75.67	13.65	13.44

Soil: pH:7.18, EC:0.66 dS/m, Soil fertility:N-439kg ha⁻¹, P₂O₅-21.85kg ha⁻¹, K₂O:557.31kg ha⁻¹, Total rainfall-1317.65mm, Rainy days-88

Junagadh

The results revealed that none of these genotypes were found significantly superior in seed cotton yield than local (GN. Cot. 22,2615 kg ha⁻¹) and zonal check (Yamuna Phule, 2865 kg ha⁻¹) where as GJHV-566 (2839 kg ha⁻¹) was found numerically higher than other genotypes and quality check Suraj (Table 94). The RWC was found significantly highest in Yamuna Phule (ZC) followed by GJHV 566 and NDLH-2035-5 as compared to GN.Cot.22 (LC). In case of SLW, it was found non significantly. The highest root length was found in JLA-1207 followed by GJHV 522 as compare to all



checks followed by GJHV-522 whereas among all genotype shoot length was found significantly highest in GJHV-548 as compared to all the checks. The total dry matter was produced significantly highest in JLA-1207 as compared to all the checks. The root: shoot ratio was found highest in JLA-1207 as compared to all the checks. SPAD value was found the highest in Suraj (QC) as compared to other genotypes. SLA was found non-significant. LAI was found non-significant but numerically the highest in Yamuna Phule (ZC). In case of total chlorophyll, the zonal check Yamuna Phule produced the highest followed by GJHV-566 as compared other genotypes. CSI was found the highest in Yamuna Phule followed by GJHV-566 as compared other genotypes. The highest oil % (18.29%) was found in NDLH-2035-5. The highest proline content was found in Yamuna Phule. The highest protein content (28.52) was found in Suraj (QC) whereas lowest (23.63) in GJHV 548. Significantly the highest gossypol content (1.260 mg/g tissue) was found in GJHV-522 and lowest (0.417 mg/g tissue) in GJHV-548.

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

Genotype	Total Chlorophyll mg/gm of fresh leaves	Chlorophyll Stability Index	Proline content µmoles/gm tissue	Root/ shoot ratio	RWC (%)	SLW (mg/cm ²)	SLA (cm ² /mg)	Seed cotton yield (kg ha ⁻¹)
NDLH-2035-5	9.79	65.69	0.209	0.075	76.3	0.440	0.133	2405
JLA-1207	10.88	71.85	0.231	0.086	74.8	0.464	0.130	2646
GJHV-548	9.54	67.16	0.224	0.071	66.5	0.471	0.138	2548
GJHV-568	10.74	67.53	0.216	0.062	72.7	0.453	0.132	2479
GJHV-522	10.93	66.53	0.232	0.070	73.3	0.476	0.137	2641
GJHV-566	11.21	74.61	0.241	0.076	76.2	0.480	0.124	2839
YAMUNA PHULE(ZC)	12.49	75.65	0.257	0.076	77.2	0.479	0.136	2865
GN COT.22 (LC)	8.87	71.28	0.205	0.075	69.5	0.463	0.138	2615
SURAJ (QC)	8.87	59.28	0.200	0.071	71.4	0.415	0.133	2140
SEm.±	0.451	2.74	0.010	0.002	1.22	0.013	0.004	137.2
CD (5%)	1.35	8.21	0.031	0.006	3.65	NS	NS	411.4
CV%	7.53	6.89	7.94	4.59	2.88	4.86	4.62	9.23

Dharwad

The drought screening study included eighteen cotton genotypes including local and zonal checks were sown at ARS, Dharwad Farm, Dharwad, during 2021-22. The genotypes DHCC1801 (2537.45 kg ha⁻¹), DDCC1801 (2008.68 kg ha⁻¹), CNA1091 (2075.40 kg ha⁻¹) and CNH7395 (1852.93 kg ha⁻¹) were promising high yielding ones. The genotype RAH1075 exhibited maximum CSI (>70%), RWC (>80%) and root:shoot ratio (>0.3). The genotype DHCC1801 showed high RWC (>80%), CSI (> 80%) and proline content (> 3 mg/g fr. wt.) (Table 95). Genotype DB1801 exhibited high RWC and CSI (> 80%), root/shoot ratio (>0.3). Genotype DSC1851 exhibited maximum CSI (> 80%), CSI (>70%) root/shoot ratio (> 0.3), and proline content (3 mg/g fr. wt.), whereas, CNA1091 exhibited higher CSI (> 70%), and proline content (> 3 mg/g fr.



wt.). Therefore, based on the physiological and biochemical parameters it was evident that the genotypes RAH1075, DHCC1801, DB1801, DSC1851, CNA1091 were found to be drought tolerant.

Quality assessment: Seed oil, protein and gossypol content in cotton seeds were varying significantly across the sub-plots. Mean oil content was found to be 18.83%. Oil content in seeds was maximum in RAH1075, NDLH 2035-5, DHCC1801, PA803 (>20%). Mean protein content was found to be 18.79%. Protein content was found maximum in RAH1075, DHCC1801, DB1801, DDCC-1, LHDP-5 and DSC1851 (>20%) (Table 96). Mean gossypol content in seed was found to be about 4.57 mg/g. The least gossypol was recorded to be in CNH17395, DWDa 1802 (<4 mg/g seed).



Table 95. Physiological parameters of genotypes as influenced by soil moisture stress

	Genotypes	RWC (%)			Root/shoot ratio			Chlorophyll content (mg/g fr. wt.)			Leaf proline ($\mu\text{mol.g}^{-1}$ of tissue)		
		Rainfed	Irrigated	Mean	Rainfed	Irrigated	Mean	Rainfed	Irrigated	Mean	Rainfed	Irrigated	Mean
1	ARBH813 (LC)	70.41	76.77	73.59	0.28	0.28	0.28	3.80	6.81	5.31	3.25	1.59	2.43
2	RAH1075	86.59	72.86	79.73	0.29	0.30	0.30	2.64	5.71	4.17	3.60	1.62	2.55
3	NDLH2035-5	64.28	60.24	62.26	0.23	0.29	0.26	3.39	5.75	4.57	3.94	1.41	2.67
4	Sahana (ZC)	81.85	76.35	79.10	0.32	0.32	0.32	4.14	4.50	4.32	3.44	1.30	2.38
5	CNH17395	65.76	66.88	66.32	0.31	0.25	0.28	2.47	4.21	3.34	3.50	2.06	2.71
6	DHCC1801	80.84	72.16	76.50	0.25	0.29	0.27	2.07	5.33	3.70	3.38	2.67	3.03
7	DB1801	85.38	67.25	76.31	0.31	0.36	0.34	3.46	5.89	4.68	3.14	1.90	2.52
8	Suvin (LC/ZC)	68.52	82.34	75.43	0.38	0.36	0.37	4.90	6.63	5.76	3.86	2.19	3.03
9	PA806	57.41	82.77	70.09	0.22	0.21	0.22	4.93	4.97	4.95	3.17	1.86	2.52
10	PA833	49.46	77.20	63.33	0.31	0.29	0.30	4.74	4.07	4.41	3.78	1.48	2.62
11	DLSa 17 (LC/ZC)	70.15	68.10	69.12	0.30	0.25	0.28	4.97	5.72	5.34	3.43	2.00	2.96
12	DWDa-1802	77.10	77.10	77.10	0.21	0.22	0.21	3.63	4.21	3.92	3.86	2.30	3.02
13	DDCC-1801	79.31	79.31	79.31	0.23	0.27	0.25	2.30	6.84	4.57	3.14	2.21	2.67
14	DDCC-1	72.83	72.83	72.83	0.30	0.19	0.24	3.29	4.92	4.10	3.35	2.41	2.90
15	CNA-1091	70.93	42.64	56.79	0.28	0.22	0.25	4.46	4.12	4.29	3.22	2.78	3.03
16	LHDP-5	68.69	63.93	66.31	0.26	0.30	0.28	4.06	4.13	4.10	3.34	2.13	2.76
17	DSC-1851	82.98	78.37	80.67	0.29	0.32	0.31	4.33	4.35	4.34	3.42	2.38	3.02
18	Suraj (LC/ZC)	77.80	72.20	75.00	0.37	0.28	0.32	3.21	4.26	3.74	3.16	2.92	2.81
	Mean	72.79	71.63	72.21	Rainfed	Irrigated	Mean	3.71	5.13	4.42	3.44	2.07	2.76
		MP	Genotype(SP)	Interaction	0.28	0.28	0.28	MP	Genotype (SP)	Interaction	MP	Genotype(SP)	Interaction
	SEm	0.277	4.843	1.174	0.29	0.30	0.30	0.358	0.531	1.517	0.016	0.111	0.068
	CD (5%)	NS	NS	19.948	0.23	0.29	0.26	NS	NS	NS	0.289	0.321	0.480



Table 96. Evaluation of seed oil (%) , gossypol (mg/g tissue) and protein content (%) of genotypes

S. No.	Genotypes	Oil content (%)	Protein content (%)	Total gossypol (mg/g tissue)
1	ARBH813 (LC)	19.16 (25.95)	19.13 (24.80)	4.3
2	RAH1075	21.37 (27.52)	20.10 (24.60)	4.39
3	NDLH2035-5	21.52 (27.63)	18.00 (24.80)	4.21
4	Sahana (ZC)	19.76 (26.38)	20.50 (26.34)	4.31
5	CNH17395	16.18 (23.58)	17.01 (24.42)	3.15
6	DHCC1801	22.14 (28.05)	22.38 (26.63)	4.5
7	DB1801	18.96 (25.80)	20.88 (26.45)	4.65
8	Suvin (LC/ZC)	19.96 (26.52)	17.00 (26.19)	4.74
9	PA806	20.3 (26.77)	16.88 (24.81)	4.91
10	PA833	18.32 (25.32)	18.00 (24.88)	5.15
11	DLSa 17 (LC/ZC)	19.90 (26.48)	16.50 (24.62)	4.6
12	DWDa-1802	17.02 (24.35)	16.41 (26.09)	3.85
13	DDCC-1801	17.12 (24.43)	16.28 (26.13)	5.75
14	DDCC-1	17.04 (24.37)	23.38 (24.26)	4.45
15	CNA-1091	17.46 (24.69)	16.88 (27.05)	4.3
16	LHDP-5	16.58 (24.02)	21.10 (24.43)	4.95
17	DSC-1851	17.96 (25.06)	20.75 (27.30)	5.7
18	Suraj (LC/ZC)	18.16 (25.21)	17.13 (26.66)	4.35
	Mean	18.83 (25.67)	18.79 (25.58)	4.57
	ANOVA	Genotype (SP)	Genotype (SP)	Genotype (SP)
	SEm	0.006	0.006	0.006
	CD (5%)	0.018	0.018	0.018
Values are in bracket are Angular transformed one				

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

Hisar

The data presented in Table 97 revealed that average boll weight and seed cotton yield under salt stress condition were differed significantly among the genotypes. The boll weight was found the highest in genotype H 1491. The maximum seed cotton yield was observed in the genotype H 1529 followed by H 1531, H 1530 and H 1521. The genotypes H 1529 had the highest potassium to sodium ratio followed by H 1531, H 1530, H 1521 and H 1098i. The gossypol content was the highest in genotype H 1539 while it was the lowest in genotype H 1564. The highest crude oil was observed in the H 1564 and 1581 and the highest protein content was observed in the H 1521 genotypes (Table 97). Among all the genotypes screened for salt tolerance H 1529 and H 1531 genotype performed the best.



Table 97. Quality parameters, ratio of K/N and seed cotton yield (kg ha⁻¹) of genotypes

Genotypes	Crude Oil (%)	Crude Protein (%)	Total Gossypol (%)	Boll wt (g)	Seed Cotton Yield (kg ha ⁻¹)	KO ⁺ /Na ⁺
H 1480	16.5	21.2	0.15	3.20	1,875	2.22
H 1564	18.6	22.4	0.08	3.23	1,966	1.87
H 1491	17.5	13.4	0.20	3.29	2,058	2.30
H 1581	18.6	13.9	0.18	3.09	1,692	2.06
H 1566	18.3	19.4	0.17	3.11	1,920	1.56
H 1521	16.9	23.3	0.14	3.02	2,103	2.58
H 1539	15.6	15.5	0.21	2.99	1,875	1.69
H 1569	18.1	21.9	0.12	2.85	1,966	1.54
H 1528	15.8	19.3	0.13	2.90	2,058	2.22
H 1529	16.3	17.1	0.14	3.03	2,423	2.79
H 1530	16.4	20.7	0.16	3.07	2,149	2.62
H 1533	16.6	19.4	0.18	2.98	1,966	1.27
H 1531	16.4	20.2	0.15	3.05	2,195	2.66
H 1547	17.1	18.9	0.19	2.97	2,058	2.22
H 1553	15.9	20.7	0.20	3.02	1,738	1.22
H 1557	15.4	19.7	0.18	2.85	2,012	1.42
H 1098i	18.1	11.4	0.15	3.02	2,058	2.40
SE(d)	0.345	0.382	0.011	0.095	146.487	-
C.D.	0.737	0.817	0.024	0.204	313.212	-

BIO CHEM1B: Estimation of seed oil, gossypol and protein**Junagadh**

The oil per cent was found significantly higher in NDH-2035-5 (18.0%) than local check GN. Cot. 22. The protein content was found significantly the highest in Suraj (QC) (29.02 **mg/g of tissue**) followed by GJHV-566. The significantly highest gossypol was found in GJHV-522 (1.403 **mg/g of tissue**) and followed by Yamuna Phule(ZC) (Table 98).



Table 98. Evaluation of cotton genotypes for seed oil, gossypol and protein

Sl. No.	Genotypes	Oil content (%)	Protein (mg/g of tissue)	Gossypol (+ Isomer)	Gossypol (- Isomer)	Total Gossypol (mg/g of tissue)
1	NDLH-2035-5	18.0	27.27	-	-	1.163
2	JLA-1207	17.5	26.29	-	-	0.880
3	GJHV-548	17.3	24.26	-	-	0.587
4	GJHV-568	17.6	25.22	-	-	0.860
5	GJHV-522	17.0	26.33	-	-	1.403
6	GJHV-566	17.8	28.31	-	-	1.017
7	Yamuna Phule(ZC)	17.5	26.54	-	-	1.237
8	GN.Cot.22 (LC)	17.1	26.91	-	-	1.093
9	Suraj (QC)	17.5	29.02			1.130
	SEm.±	0.162	0.889	-	-	0.06
	CD (5%)	0.491	2.67	-	-	0.20
	CV%	1.61	5.77	-	-	10.70

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 GJHV-548 (17.67%) followed by NDLH-2035-5 (17.66%) in rainfed condition while in irrigated condition, the highest oil content was found in GISV-328 (18.54%). Gossypol content ranges from 0.55 to 0.76% in different genotypes in both conditions (Table 99). The lowest gossypol content was observed in JLA-1207 in irrigated condition. Higher gossypol content was found in LRA-5166 (0.76%) in rainfed condition. The highest protein content was observed in GISV-323(19.24%) in rainfed condition.

Table 99. Evaluation of cotton genotypes for seed oil, gossypol and protein (Bio chemistry)

Genotypes	Oil content (%)		Protein content (%)		Total Gossypol (%)	
	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated
GISV-328	17.59	18.54	18.34	16.29	0.67	0.66
GISV-323	16.64	17.11	19.24	15.99	0.65	0.67
NDLH-2035-5	17.66	17.04	17.16	16.30	0.72	0.74
JLA-1207	16.72	17.15	16.35	15.40	0.56	0.55
GJHV-566	17.63	17.39	18.94	17.53	0.72	0.66
GJHV-522	17.24	17.48	18.36	16.86	0.69	0.72
GJHV-548	17.67	16.87	19.07	16.50	0.72	0.64
GJHV-568	16.92	17.45	16.84	16.54	0.67	0.63
LRA-5166	16.84	17.66	17.13	15.23	0.70	0.76
G.Cot-16	17.19	17.50	17.87	15.24	0.65	0.75
SE d	0.43	0.33	0.36	0.36	0.012	0.014
CD (5%)	NS	NS	0.17	0.77	0.026	0.029

Soil: pH7.18, EC-0.66 dS/m, Soil fertility: N-439kg ha⁻¹, P₂O₅:-21.85kg ha⁻¹, K₂O:557.31kg ha⁻¹, Total rainfall-1317.65mm, Rainy days-88



Bio Chem.1C. Analysis of biochemical constituents of organic vs inorganic plots

The data recorded during kharif 2021 at ongoing organic cotton experiment for various biochemical parameters at 90 DAS were presented in Table 100. Protein content was found in range of 7.42 to 18.43 mg/g of fresh leaf tissue under organic and in organic plots at 90 DAS while reducing sugar found non-significant among the treatments. The highest protein content (18.43 mg/g of tissue) was recorded with T₃. Application of RD of Nutrient through organic based on P equivalent basis. Phenol content was in range of 2.91 to 16.18 mg/g of fresh leaf. The highest phenol content was recorded in T₁₀: Seed treatment and soil application of recommended biofertilizers and foliar application of PPFM+ Neem cake 250kg ha⁻¹ + Raising of sun hemp between rows incorporated before flowering (16.18 mg/g of tissue). The significantly highest tannin (35.42mg/g of tissue) and gossypol (0.82%) content was found in absolute control T₁. Flavanoid and Gossypol content were significantly differed among organic and inorganic treatments.



Table 100. Analysis of biochemical constituents of organic vs inorganic plots

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:Absolute control (No organic and inorganic)	14.84	11.16	8.41	35.42	3.73	0.82
T2:Control (RDN through inorganic) (RDN 180:0);-Urea	14.52	13.27	9.87	16.49	3.40	0.81
T3: RD of Nutrient through organic based on P equivalent basis(00-40-00)	18.43	13.73	10.41	13.73	2.86	0.53
T4:Seed treatment and soil application of rec. bio fertilizer and foliar application of PPFM	12.67	14.19	4.51	19.61	4.62	0.45
T5:Neem cake 250kg ha ⁻¹	16.45	13.88	4.64	23.35	4.25	0.58
T6: Raising of sun hemp between rows incorporated before flowering	9.21	13.27	2.91	24.63	1.47	0.82
T7:Inter cropping with green gram sowing	13.00	13.16	3.34	12.12	2.23	0.57
T8:Seed treatment and soil application of rec. biofertilizers and foliar application of PPFM+ Neem cake 250kg ha ⁻¹	17.90	13.52	14.78	22.88	4.47	0.68
T9: Seed treatment and soil application of rec. biofertilizers and foliar application of PPFM+ Raising of sun hemp between rows incorporated before flowering	12.02	13.94	15.01	14.86	2.75	0.81
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	7.42	13.52	16.18	14.44	2.66	0.72
T11:Seed treatment and soil application of rec. biofertilizers and foliar application of PPFM+ Neem cake 250kg ha ⁻¹ + Intercropping with green gram sowing	13.47	13.47	3.32	11.74	2.99	0.72
S. Ed	0.037	0.78	0.030	0.65	0.191	0.014
CD (5%)	0.077	NS	0.063	1.37	0.402	0.029



Dharwad

The cotton genotype Sahana was sown at ARS Dharwad, during 2021-22, for evaluation of different treatments for organic cultivation, the details of all treatment and design of experiment are provided above. Results indicated that the biochemicals evaluated in the treatments T8, T9, T10, T11 and T12 were expressing higher levels of carbohydrates, proteins and all defensive metabolites (tannins, polyphenols, and flavonoids) (Table 101).

Table 101. Primary and secondary metabolite content as influenced by organic treatments

Treatment	Carbohydrate content (mg/g fr. wt.)	Protein content (mg/g fr. wt.)	Tannin content (mg/g fr. wt.)	Polyphenol content (mg/g fr. wt.)	Flavonoids (mg/g fr. wt.)	Gossypol (mg/g fr. wt.)
T1: Absolute control (No organic & inorganic)	105.70	66.07	14.40	1.74	16.69	1.28
T2: Control (STCR based inorganic)	146.87	80.20	22.13	3.07	20.16	1.18
T3: RD of nutrient through organic based on P equivalent basis (12.5 tha ⁻¹ aFYM)	148.03	84.20	16.80	2.86	24.26	1.05
T4: Seed treatment and soil application of rec. biofertilizers and foliar application of PPFM@1% at flowering and BDS	153.53	67.93	17.33	2.78	19.40	1.00
T5: Neem cake 250 kg ha ⁻¹	146.44	63.93	23.60	2.98	20.93	1.15
T6: Raising of sunhemp between rows incorporated before flowering (12 tha ⁻¹)	173.85	63.40	20.53	2.35	21.69	1.13
T7: Intercropping with black gram and crop residue application after plucking (1.5 tha ⁻¹)	176.71	82.71	33.60	2.70	23.74	1.23
T8: T4+T5	173.64	76.20	35.47	3.16	28.55	1.17
T9: T4+T6	186.55	86.79	28.53	3.39	32.31	1.20
T10: T4+T5+T6	264.64	86.92	36.40	3.33	28.93	1.16
T11: T4+T5+T7 (PPFM as per TNAU)	236.28	69.53	33.29	4.33	30.78	1.00
T12: T4+T5+T7 (PPFM as per UASD)	183.27	71.94	36.53	4.67	27.88	1.03
Mean	174.63	66.07	26.55	3.11	24.61	1.13
SEm	1.017	0.864	0.485	0.232	0.144	0.111
CD (5%)	3.003	2.551	1.430	0.686	0.426	NS



BIO.CHEM.3: Evaluation of Bt hybrids for biochemical basis of tolerance to sucking pests**BIO.CHEM.3: Evaluation of Bt hybrids for biochemical basis of tolerance to sucking pests****Surat**

The results revealed that protein content was found significantly different under protected and unprotected condition in before and after incidence of sucking pest. The highest protein content was found in GISV-375 (18.36 mg/g of tissue) under unprotected condition while reducing sugar content was the highest in GISV-371 under unprotected condition compared to protected condition (Table 102). Higher phenol content was recorded in GSHV-191 (40.12 mg/g) under protected condition while it was found the highest in GISV-323 (41.62 mg/g) under unprotected condition (Table 103). Overall phenol content was increased in unprotected condition compared to protected condition. Tannin content was ranging from 24.07 to 34.97 (mg/100g). It was significantly differed among protected and unprotected condition in before and after incidence of sucking pest in all the non Bt genotypes. Flavanoid and Gossypol content were significantly differed among Non BT genotypes under protected and unprotected condition. Higher gossypol content was found in GISV-366 under (0.83%) under protected and unprotected condition while lower gossypol content was found in GISV-236 under protected condition.



Table 102. Primary metabolites as influenced by genotypes under protected and unprotected condition

Genotypes	Protein (mg/g of tissue)							Reducing sugar (mg/g of tissue)						
	Protected			Unprotected			Grand Mean	Protected			Unprotected			Grand Mean
	Incidence (B)	Incidence (A)	Mean	Incidence (B)	Incidence (A)	Mean		Incidence (B)	Incidence (A)	Mean	Incidence (B)	Incidence (A)	Mean	
GISV-380	9.92	11.88	10.90	11.85	12.00	11.92	11.41	13.88	19.82	16.85	16.89	7.10	11.99	14.42
GISV-332	8.41	9.67	9.04	14.45	9.03	11.74	10.39	15.12	16.43	15.77	20.98	19.13	20.05	17.91
GISV-382	5.18	17.63	11.41	6.82	7.15	6.98	9.19	16.43	17.35	16.89	23.37	13.73	18.55	17.72
GSHV-191	8.93	14.87	11.90	16.68	10.91	13.79	12.85	13.88	9.49	11.69	21.75	9.10	15.43	13.56
GISV-375	8.93	8.32	8.63	24.68	12.04	18.36	13.49	16.89	5.86	11.38	19.82	17.66	18.74	15.06
GISV-319	11.08	10.50	10.79	11.78	8.95	10.37	10.58	16.66	21.44	19.05	23.99	10.26	17.12	18.09
GISV-366	24.04	8.05	16.05	15.32	9.52	12.42	14.23	11.57	8.64	10.10	21.98	21.83	21.91	16.00
GISV-323	10.09	10.80	10.44	18.99	10.01	14.50	12.47	14.12	11.65	12.88	19.13	7.33	13.23	13.05
GISV-371	15.90	13.07	14.49	6.31	9.53	7.92	11.20	15.27	14.42	14.85	24.53	21.21	22.87	18.86
GISV-236	11.90	12.21	12.06	18.83	9.47	14.15	13.11	18.20	17.66	17.93	21.75	15.04	18.40	18.16
Mean	11.44	11.70	11.57	14.57	9.86	12.22	11.89	15.20	14.28	14.74	21.42	14.24	17.83	16.28
	P	I	G	PxI	PxG	IxG	PxIxG	P	I	G	PxI	PxG	IxG	PxIxG
CD@5%	0.163	0.047	0.106	0.067	0.150	0.150	0.212	N.S	0.80	1.79	1.13	2.53	2.53	3.59



Table 103. Secondary metabolites as influenced by genotypes under protected and unprotected condition

Genotypes	Phenol (mg/g of tissue)							Tannin (g/100g of dry tissue)						
	Protected			Unprotected			Grand Mean	Protected			Unprotected			Grand Mean
	Incidence (B)	Incidence (A)	Mean	Incidence (B)	Incidence (A)	Mean		Incidence (B)	Incidence (A)	Mean	Incidence (B)	Incidence (A)	Mean	
GISV-380	33.53	43.38	38.46	30.41	43.38	36.89	37.68	25.14	30.57	27.86	32.54	28.76	30.65	29.25
GISV-332	28.91	42.39	35.65	30.43	42.39	36.41	36.03	28.52	28.17	28.35	29.39	29.92	29.65	29.00
GISV-382	28.68	41.18	34.93	30.72	41.18	35.95	35.44	32.12	27.76	29.94	24.39	32.45	28.42	29.18
GSHV-191	36.79	43.44	40.12	26.75	43.44	35.10	37.61	44.06	25.88	34.97	32.89	29.95	31.42	33.20
GISV-375	23.21	42.03	32.62	30.04	42.03	36.04	34.33	32.30	26.38	29.34	34.76	35.00	34.88	32.11
GISV-319	27.48	41.59	34.53	27.27	41.59	34.43	34.48	23.59	24.54	24.07	35.39	31.76	33.58	28.82
GISV-366	34.10	39.98	37.04	28.11	39.98	34.05	35.54	30.72	30.25	30.49	18.01	34.14	26.07	28.28
GISV-323	36.10	40.85	38.48	42.40	40.85	41.62	40.05	35.57	30.07	32.82	34.70	29.71	32.21	32.51
GISV-371	36.57	41.11	38.84	35.55	41.11	38.33	38.58	34.67	31.70	33.19	34.23	34.14	34.18	33.69
GISV-236	30.30	41.66	35.98	35.97	41.66	38.82	37.40	32.18	28.64	30.41	37.20	35.12	36.16	33.29
Mean	31.57	41.76	36.66	31.77	41.76	36.76	36.71	31.89	28.40	30.14	31.35	32.10	31.72	30.93
	P	I	G	PxI	PxG	IxG	PxIxG	P	I	G	PxI	PxG	IxG	PxIxG
CD@5%	2.46	0.84	1.89	1.20	2.68	2.68	3.79	0.37	0.13	0.30	0.19	0.43	0.43	0.61



Dharwad

Thirteen non-Bt cotton genotypes were sown at ARS, Dharwad, during 2021-22 for evaluation of sucking pest tolerance. Among them, the genotypes ARBH813 (2146 kg ha⁻¹), ARBC1651 (2077 kg ha⁻¹), DSC 1651 (2014 kg ha⁻¹) and Sahana (1803 kg ha⁻¹) were high yielding (Table 104). The genotypes DSC1851, DSC2051, DS1951 and Sahana exhibited higher levels of expression for defensive metabolites, tannins (36.8, 36.8, 38.2, 37.8 mg/g fr. wt.), total phenols (4.39, 4.17, 2.72, and 2.62 mg/g fr. wt.) and flavonoid content (33.0, 24.8, 30.2, 24.64 mg/g fr. wt.), respectively, with low jassids infestation (< 4 nymphs/3 leaves) indicating the higher levels of sucking pest tolerance.



Table 104. Seed cotton yield (kg ha⁻¹), Jassid population, primary and secondary metabolites level of genotypes at 60 DAS

Treatments	Seed Cotton Yield (kg ha ⁻¹)	Jassid population		Carbohydrates	Proteins	Tannins	Polyphenols	Flavonoids	Gossypol
		No. of nymphs/ 3 leaves	Transformed value						
ARBH813	2146	2.90	1.66	91.75	60.00	33.2	2.76	32.14	1.28
ARBC1651	2077	2.25	1.48	102.54	62.40	28.4	2.11	25.50	1.18
ARBH1551	1688	2.20	1.46	96.67	64.40	34.8	3.12	23.64	1.05
ARBC1601	1786	2.10	1.45	146.98	72.00	22.8	3.90	32.86	1.00
CPD1652	1763	2.35	1.51	144.76	68.80	19.8	3.13	26.00	1.15
CPD1701	1607	3.75	1.88	169.84	68.00	21.4	1.89	23.79	1.13
CPD1702	1782	3.80	1.95	184.92	55.60	24.8	3.36	13.64	1.23
DSC1651	2014	4.40	2.10	148.10	71.20	27.4	4.39	33.00	1.17
DSC1851	1781	3.90	1.95	81.90	87.60	36.8	4.17	24.86	1.20
DSC2051	1506	3.90	1.92	133.97	60.80	36.8	2.72	30.29	1.16
DSC1951	1717	4.45	2.05	135.56	64.80	38.2	2.62	24.64	1.00
Sahana	1803	4.03	2.01	186.51	71.20	37.8	3.63	20.64	1.03
Suvin	571	6.60	2.57	160.48	87.60	18.2	2.43	18.93	1.13
Mean	1711	3.59	1.84	137.23	68.80	29.26	3.10	25.38	1.13
SEM	91		0.188	0.775	1.279	0.380	0.923	1.643	0.111
CD (5%)	282		0.586	0.798	3.89	1.183	NS	5.120	NS



Evaluation of biochemical basis of resistance against Cotton leaf curl disease (CLCuD)

Hisar

The data presented in Table 104 A revealed that gossypol and tannin content were differing significantly among the genotypes. Among these genotypes i.e., H 1098i and CSH 3075 (tolerant) showed higher phenol, gossypol and tannin content in both sprayed and non-sprayed condition as compared to susceptible genotypes. The maximum plant height and average boll weight was observed in H 1098i and CSH 3075 in both types of conditions, respectively. Maximum yield was observed in tolerant genotypes as compare to susceptible genotypes in both sprayed and non-sprayed condition. The data reveals that tolerant genotypes H 1098i and CSH 3075 performed best against CLCuV infection.

Table 104A: Effects of CLCuV on sugar, phenol, gossypol and tannin content in different cotton genotypes

Genotype (B)	Sugar (%)		Phenol (%)		Gossypol (%)		Tannin (%)		CLCuD PDI at 100 DAS
	Spray (A)	Non-Spray (A)	Spray (A)	Non-Spray (A)	Spray (A)	Non-Spray (A)	Spray (A)	Non-Spray (A)	
HS 6	4.77	4.77	0.30	0.39	0.25	0.29	0.18	0.20	28.76
H 1098i	3.94	3.79	0.58	0.63	0.34	0.36	0.19	0.22	24.82
RST 9	4.10	3.98	0.36	0.41	0.28	0.30	0.18	0.21	34.15
CSH 3075	3.40	3.39	0.43	0.48	0.30	0.32	0.20	0.23	18.55
Mean A	4.051	3.981	0.416	0.476	0.293	0.315	0.187	0.216	
	C.D. (5%)	SE(d)	C.D. (5%)	SE(d)	C.D. (5%)	SE(d)	C.D. (5%)	SE(d)	
A	0.038	0.016	0.008	0.003	0.005	0.002	0.007	0.003	
B	0.053	0.022	0.012	0.005	0.008	0.003	0.01	0.004	
A X B	0.075	0.031	0.017	0.007	0.011	0.005	NS	0.006	

Surat

The experiment on evaluation of Biochemical basis of resistance/susceptible against bacterial leaf blight was assessed. Total four genotypes were evaluated in this trial under protected and unprotected condition from which one genotype viz., R2 MRC 7918 BG II observed as moderately resistant in the grade 2, one genotype S2 RCH-659 BG II as resistant and the remaining genotypes were disease free against the Bacterial leaf blight infection under the protected condition. In case of unprotected condition, two genotypes R1 MCU-7 and S1 SUVIN were observed as disease free, S2 RCH-659 BG II as resistant and R2 MRC 7918 BG II genotype as moderately resistant against the Bacterial leaf blight infection (Table 105). In case of *Corynespora* leaf spot disease under unprotected condition, S1 CO14 observed as resistant (12.83 PDI).



Table 105. Seed cotton yield (kg ha⁻¹) and metabolites content genotypes of Bacterial leaf blight (BLB) (PDI)

Genotypes	Seed cotton yield (kg ha ⁻¹)		Protein (mg/g of tissue)		Reducing sugar (mg/g of tissue)		Phenol (mg/g of tissue)		Tannin(mg/100g of dry tissue)		Flavanol (mg/g of tissue)		Gossypol (%)		Bacterial leaf blight (BLB) (PDI)	
	Protected	Unprotected	Protected	Unprotected	Protected	Unprotected	Protected	Unprotected	Protected	Unprotected	Protected	Unprotected	Protected	Unprotected	Protected	Unprotected
MCU 7 (R)	745.6	354.7	8.2	9.06	17.59	19.62	28.22	26.7	31.59	37.21	2.77	1.78	0.94	0.9	0.00	0.00
MRC 7918 BG II (R)	1823.6	1599	13.96	13.41	20.36	21.47	20.03	17.07	35.42	37.88	1.47	1.1	0.96	0.9	34.66	36.33
Mean	1284.6	976.9	11.08	11.23	18.97	20.55	24.12	21.89	33.51	37.55	4.24	2.88	0.95	0.9	0.00	0.00
CO 14(S)	850.4	627.2	10.49	17.14	21.38	26.29	24.08	22.66	35.56	38.18	1.46	1.27	0.93	0.9	8.00	13.16
RCH-659 BG II(S)	2972.5	2391	8.12	15.91	26.01	15.73	14.87	31.5	35.84	36.67	1.69	1.66	0.94	0.9	0.00	0.00
Mean	1911.4	1509.1	9.3	16.52	23.7	21.01	19.47	27.08	35.7	37.42	1.57	1.46	0.93	0.9		

Soil:pH-7.18 , EC-.0.68 dS/m, soil fertility:N-439.04 kg ha⁻¹, P₂O₅:21.85kg ha⁻¹, K₂O:557.21kg ha⁻¹, Total rainfall-1317.65mm, Rainy days-88



Dharwad

Seven genotypes evaluated for tolerance to Tobacco Streak Virus (TSV) at ARS, Dharwad, during 2021-22, following split-plot design which included two main-plots of insecticide sprayed and un-sprayed in three replications. The symptoms of infection due to TSV were not observed in any of the genotypes, however the plant metabolites were analysed in the cotton genotypes in relation to the insecticidal spray taken up to control the sucking pest population. Among the genotypes, Ankur 3034 (1543 kg ha⁻¹), MRC7918 (1288 kg ha⁻¹) and MCU7 (1299 kg ha⁻¹) were found to be high yielding. Differential expression of primary and secondary metabolites was observed among the genotypes. There was a significant difference among the main and sub-plots for the expression of plant metabolites. The expression of secondary metabolites was found to be higher among the TSV tolerant genotypes (MRC7918, MCU7, and CO14) compared to the TSV-susceptible genotypes (Ankur 3034, RCH659, Suvin and Tierra) (Table 106).

Table 106. Primary and Secondary metabolite content as influenced by genotypes under protected and unprotected conditions:

	Genotypes	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.)
	TSV resistant genotypes:						
1	MRC 7918	168.63	84.60	56.57	5.76	13.47	1.30
2	MCU7	168.95	79.00	58.13	5.50	13.26	1.47
3	CO14	160.01	75.20	61.91	4.90	14.41	1.20
	TSV susceptible genotypes:						
4	Ankur3034	132.97	69.80	57.02	3.64	11.63	0.92
5	RCH659	148.42	64.40	56.96	4.14	11.93	0.93
6	Suvin	150.80	66.00	56.24	2.87	12.27	0.94
7	Tierra	143.60	73.60	48.30	4.65	10.99	0.91
	Mean	153.34	73.23	56.45	4.49	12.57	1.10
	SEm	1.217	0.467	0.796	0.071	0.527	0.004
	CD (5%)	3.572	1.372	2.336	0.208	1.546	0.012



All India Coordinated
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Project Coordinator (Cotton Improvement)
All India Coordinated Research Project on Cotton
(Indian Council of Agricultural Research)
Central Institute for Cotton Research
Regional Station, Coimbatore- 641003
www.cicr.org.in

CROP PROTECTION

ENTOMOLOGY

The following experiments were conducted in Entomology under All India Coordinated Research Project (AICRP) on Cotton, in five centers 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 seven centers in South Zone (Lam Guntur, Nandyal, Dharwad, Raichur, Chamaranagar, Coimbatore and Srivilliputhur).

Expt. No.	Title of the Experiment	Participating Centers
Ent 1(a)	Screening of breeding material for resistance to insect-pests (National and Zonal Trials)	All centers of North, Central & South zones
Ent 1(b)	Advance screening of promising entries for development of repository for sucking pests	All North Centers Central zone: Surat, Nanded, Junagarh, Rahuri South zone: Dharwad and Raichur
Ent 2	Seasonal dynamics to develop suitable forecasting model	All centers
Ent 3	A. Survey for key and emerging pests in farmer's fields for weekly advisory	All centers
	B. Intensive survey for Pink Bollworm on Bt hybrids in the farmers' fields	All North Zone centers
Ent 4	Management of sucking pests in cotton	All centers of South & Central Zone
Ent 5	Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton	North Zone(Hisar, Bathinda, Faridkot and Sriganganagar) Central zone (Surat, Nanded, Junagarh, Rahuri and Akola) South zone (Lam Guntur, Nandyal, Warangal, Dharwad, Raichur)
Ent 6	Evaluation of prominent insecticides against bollworm complex of cotton	All centers
Ent 7	Determination of nymphal based ETL estimation and yield losses for cotton whitefly <i>Bemisia tabaci</i>	North Zone (Sriganganagar, Hisar, Faridkot, Sirsa and Bathinda)



Ent.1 (a): 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 as indicated below.

Trial No.	Tolerant/Moderately tolerant cultures –Leaf hopper	Trial No.	Tolerant/Moderately tolerant cultures –Leaf hopper
Br02a	----	Br 22a/b(NT)	HD 562 & HD 564 (2)
Br06a	----	Br 24 a(ZT)	PBD 92 & PBD 88 (2)
Br04a(ZT)	H 1569	Br 25a/b(NT)	KR 151 & KR 152 (2)
Br06a(CVT)	----	Br 25a (ZT)	KR 148 & KR 149 (2)

NT - National trials; ZT - Zonal trials

CENTRAL ZONE

The results obtained from Central Zone screening trials are presented in Table 16-38. The following genotypes were identified as tolerant/moderately tolerant to leafhopper as indicated below.

Trial No.	Moderately tolerant cultures –Leafhopper
Br02a/bCC (NT)	CNH-20449 (SU & KH)
Br 22a/b (NT)	-
Br 32b (NT)	GShv 831/17, GVhv 1014, GShv 807/17, GVhv 1028, GVhv 1172 (5)
Br03a/bCC (ZT)	CNH-18529 & CNH-19325 (2)
Br04a (ZT)	GJHV-566, GJHV-548, GISV-328 (3)
Br04b (ZT)	AKH 2013-3 (1)
Br 24b (ZT)	PA-873, PA-869, JLA-1430, NDLA 3104-4, GAM-266, PAIG-410, CNA-1071 (7)
Br 24b CC (ZT)	CNA-1092, DDCC-1902, CNA-18562, DDCC-1901, CNA-19475, DDCC-2001 (6)
Br14a (South-ZT)	

NT - National trials; ZT- Zonal trials

BA- Banswara, JU- Junagadh, SU- Surat, BH- Bharuch, AK- Akola, NA- Nanded, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna

SOUTH ZONE

The results obtained from South Zone screening trials are presented in Tables 39-53. The following genotypes were identified as tolerant/moderately tolerant to leafhopper as indicated below.

Trial No.	Moderately tolerant cultures–Leafhopper
Br-03a/b (ZT)	CCHC 19-2 & CNH 18529 (2)
Br-04a(ZT)	TSH 387, SHSV 14, RHC 1409 & RAH 1081 (4)
Br – 14 a(ZT)	
Br-04b(ZT)	AKH 2013-3 (1)
Br-24 b(ZT)	CNA 2034 & PAIG 411 (2)

NT, National trials; ZT, Zonal trials.



Ent.1 (b): Advanced screening of promising entries for development of repository for sucking pests (Leafhopper) (Table 54-58)

Zone	Centres	Leafhopper cultures–Tolerant/Moderately tolerant
North Zone	Bathinda, Faridkot, Sirsa, Hisar, Sriganganagar	RS 2943, RS2013, H 1528, F2772, F2720 & F2462(6)
Central Zone	Junagadh, Surat, Nanded and Rahuri	AKH-1302, GISV-323, NDLH-1938(JR) & RAH-1076 (4)
South Zone	Dharwad and Raichur	DWO 1802 & DWO 2051 (2)

Ent.2: Seasonal dynamics to develop suitable forecasting model (Table 59-105).

NORTH ZONE

S.N.	States	Genotypes (Sucking pests)	Genotypes (Bollworm)		Centres
			Non Bt	BG-II hybrids	
1	Rajasthan	Ganganagar Ageti, RS-2013	HS-6	RCH 650 BG-II	Sriganganagar
2	Punjab	Ganganagar Ageti, RS-2013	HS-6	RCH 650 BG-II	Faridkot, Bathinda
3	Haryana	Ganganagar Ageti, RS-2013	HS-6	RCH-650 BG-II	Sirsa, Hisar

CENTRAL AND SOUTH ZONE

S.N.	States	Genotypes (Sucking Pests)	Genotypes (Bollworm)		Centers
			Non-Bt	BG-II hybrids	
1.	Rajasthan	DCH-32	Suraj	RCH-2BG-II	Banswara
2.	Gujarat	DCH-32	Suraj	RCH-2BG-II	Surat, Junagadh, Bharuch
3.	MP	DCH-32	Suraj	RCH-2 BG-II	Khandwa
4.	Maharashtra	DCH-32	Suraj	Ajeet 155 BG II	Nanded, Akola, Rahuri
5.	Odisha	DCH-32	Suraj	-----	Bhawanipatna
6.	Karnataka	DCH-32	Suraj	Jadoo BG-II /Bahubali BG-II	Dharwad, Raichur, Chamarajanagar
7.	AP	DCH-32	Suraj	Jadoo BG II	Guntur, Nandyal
8.	Tamil Nadu	DCH-32	Suraj	Jadoo BG 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)
	Leafhopper	Thrips	Whitefly	Aphid	
Bathinda	0.20-12.33(30-31)	0.00-55(28-30)	0.80-18.93(33-34)	0.00	0.00-5(28-31)
Faridkot	0.00-13.30(27-30)	0.00-39.8(28)	0.90-12.50(28-33)	0.00	0.00-9.20(34-39)
Hisar	0.00-10.40(27-32)	0.13-121.07(28)	0.20-29.40(28-34)	0.00	0.13-1.20(29-30)
Sirsa	0.00-9.40(31-29)	0.00-54.10(29-31)	0.30-28.00(29-38)	0.00	0.00-0.26(31-39)
Sriganganagar	0.00-7.23(29-30)	0.00-95.43(31)	0.00-38.67(37-40)	0.00	0.00-1.40(32-40)

Centre Name	Population Range and Peak Activity of Bollworm (SMW)/ 5 plant				Range of Bollworm Damage (%) and Peak (SMW)							
	Non- Bt Cotton		Bt Cotton		Non- Bt Cotton				Bt Cotton			
	<i>P. Gossypiella</i> **	<i>Earias</i> spp.	<i>P. gossypiella</i>	<i>Earias</i> spp.	Fruiting Body Damage (%)	Green boll damage due to PBW (%)	Open Boll Damage (%)***	Locule Damage (%)	Fruiting Body Damage (%)	Green boll damage due to PBW (%)	Open Boll Damage (%)***	Locule Damage (%)
Bathinda#	-	-	-	-	-	10-35	8-11	11-17.90	-	10-35	12.00	14.75
Faridkot#	-	0.10-0.30 (37)	-	NA	0.00-0.96 (37)	5-15	NA	NA	NA	NA	NA	NA
Hisar	-	0.00-4.00 (42)	-	0.00-4.00 (42)	0.00-80 (42)	0.00-20.00	8.47-10.04	2.86-4.31	0.00-72 (42)	4-6	10.55	3.22
Sirsa	-	0.00-0.60 (40-42)	-	-	0.00-16.53 (36-43)	0.00-90.00	15.30-29.77	5.05-9.80	0.00-8.21 (43)	0.00-60.00	7.69	2.65
Sriganga Nagar	-	0.00-12 (39-40)	-	-	0.00-37.00 (39-40)	36-100	22-36	9.18-16.67	-	22.00-96	12.00	7.28

* Population of *H. armigera* & *S. litura* was nil. ** PBW population through destructive boll sampling.

*** Open boll and locule damage at harvesting stage

Population range and peak activity of Bollworm based on 10 plants.



LEAFHOPPER: In Punjab at Bathinda, maximum population of leafhopper was observed during 30-31st SMW. In Faridkot, leafhopper infestation was found to be maximum from 27-30th SMW. In Haryana at Hisar & Sirsa peak of leafhoppers, was observed during 27-32nd and 31-29th SMW, respectively. In Sriganganagar, peak leafhopper infestation was reported during 29-30th SMW.

WHITEFLY: In Punjab at Bathinda maximum population of whitefly adults was observed during 33 & 34th SMW and at Faridkot whitefly adults were at peak during 28-33rd SMW. In Haryana at Hisar & Sirsa, whitefly adult population was at its peak during 28-34th SMW and 29-38th SMW respectively. In Sriganganagar, whitefly appeared during 24th and 25th SMW and reached its peak during 33rd to 38th SMW.

THRIPS: In entire North zone population of thrips was observed during 28-31st SMW.

NATURAL ENEMIES: In Punjab, population range of predators per plant and peak activity were recorded during 28 to 31st SMW in Bathinda (0.00 to 5.00) and 34 to 39th in Faridkot (0 to 9.20). In Haryana, population range of predators and peak activity varied in Hisar and Sirsa with maximum predators (0.13-1.20) recorded in Hisar during 29-30th SMW and in Sirsa predator's population ranged 0.00-0.26 during 31-39th SMW. In Sriganganagar, population range (0.00-1.40) and peak activity was recorded during 32th & 40 SMW.

BOLLWORMS (Non Bt) : In North Zone, Population of *H. armigera* and *Spodoptera litura* found to be nil at all the centres of north zone. Population of *Earias spp.* ranged from 0.00-12.00/5plant and maximum at 40th SMW. Fruiting body damage was found to be highest at 42nd SMW with range of 0.00-80 percent. Green boll damage due to pink bollworm was reported to be upto 100% with range of 0.00-100% and peak of damage was at 135-150DAS. Open boll damage and locule damage ranged from 8-29.77 percent and 2.86-17.90 percent respectively.

BOLLWORMS (Bt) : In North Zone, Population of *H. armigera* and *Spodoptera litura* found to be nil at all the centres of north zone. Population of *Earias spp.* ranged from 0.00-4.0/5plant and maximum at 42nd SMW. Fruiting body damage was found to be highest at 42-43rd SMW with range of 0.00-72 percent. Green boll damage due to pink bollworm was reported to be upto 96 percent with range of 0.00-96 percent and peak of damage was at 135-150DAS. Open boll damage and locule damage ranged from 7.69-12.00 percent and 2.65-14.75 percent, respectively.



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

Centers Name	Population Range and Peak Activity Period (SMW) of Sucking pests /3leaves				Natural Enemies / plant (Range)
	Jassid	Thrips	Whitefly	Aphid	
Banswara	0.3-8.7 (38-43)	-	0.7-20.7 (41-44)	-	0.2-0.5 (41-45)
Surat	0.00-24.3 (44-45)	0.00-37.5 (41-44)	0.00-8.0 (44)	0.00-54.7 (47-50)	0.00-3.8 (47-49)
Junagadh	1.4-18.8 (37)	0.4-21.5 (34-35)	0.7-10.8 (39)	0.1-26.3 (52)	0.02-0.1 (41)
Bharuch	0.00-12.1 (38-42)	0.00-10.3 (38-42)	0.00-7.2 (50-52)	0.00-13.8 (43-46)	0.00-0.8 (41-44)
Khandwa	0.00-7.4 (42)	-	0.00-30.4 (45)	1.6-28.2 (45)	0.00-1.7 (39)
Nanded	0.00-18.3 (46)	0.00-53.0 (34-37)	0.00-30.5 (45)	0.00-93.6 (52)	0.00-1.9 (48-51)
Akola	0.5-8.9 (34-35)	0.20-7.8 (34-36)	1.10-9.5 (36-38)	0.00-26.70 (50-51)	0.00-0.4 (40-42)
Rahuri	0.00-10.2 (38)	0.00-67.3 (36)	0.2-6.6 (46)	3.1-119.9 (52)	0.00-3.00 (46-52)
Bhawanipatna	0.00-15.0 (43)	0.00-10.2 (38)	0.00-2.4 (47)	0.00-38.4 (34)	0.00-3.10 (35)

Centers Name	Population Range & Peak Activity of Bollworm (SMW)/5plant								Range of Bollworm Damage (%) and Peak (SMW)			
	Non-Bt Cotton				Bt Cotton				Non-Bt Cotton		Bt Cotton	
	<i>H. armigera</i>	<i>S. litura</i>	<i>P. gossypiella</i> *	<i>Earias spp.</i>	<i>H. armigera</i>	<i>S. litura</i>	<i>P. gossypiella</i>	<i>Earias spp.</i>	Fruiting body damage (%)	Green boll damage due to PBW (%)	Fruiting body damage (%)	Green boll damage due to PBW (%)
Banswara	-	-	-	-	-	-	-	-	-	-	-	-
Surat	0.0-4.0 (44-46)	0.0-4.0 (44)	0.0-9.0 (49-50)	0.0-3.0 (40-41)	0.0	0.0	0.0-10.0 (47)	0.0	0.0-28.5 (44)	0.0-45.0 (48-50)	0.0-8.9 (44)	0.0-40.0 (48)
Junagadh	0.0-0.8 (46-47)	0.0-3.0 (45)	0.0-13.0 (50-52)	0.0-0.5 (42)	0.0-0.5 (40-41)	0.0-1.0 (41-42)	0.0-6.0 (51)	0.0-0.3 (44)	-	-	-	-
Bharuch	0.0-1.0 (40)	0.0-1.0 (48-49)	0.0-2.0 (50)	0.0-2.0 (49)	0.0-0.3 (38-39)	0.0-0.5 (44-45)	0.0-1.0 (49)	0.0-0.3 (41-43)	-	-	-	-
Khandwa	0.0-0.6 (39)	-	0.0-1.0 (48-49)	0.0-0.8 (36/42)	0.0-0.6 (47)	-	0.0-0.8 (45)	0.0-0.2 (43)	0.0-95.0 (49)	-	0.0-80.0 (45)	-
Nanded#	0.0-17.0 (43)	0.0-2.0 (34-36)	0.0-17.0 (49)	0.0-3.0 (37)	0.0-2.0 (39)	0.0-1.0 (34)	0.0-11.0 (49)	0.0	0.0-16.8 (43)	-	0.0-1.2 (38)	-
Akola	0.0-0.6 (38-40)	-	0.0-34.0 (47-50)	0.0-0.7 (45)	0.0-0.2 (38)	-	0.0-32.0 (50)	0.0-0.2 (50)	0.0-3.8 (38-39)	0.0-80.0 (46-50)	-	0.0-75.0 (46-50)
Rahuri	0.0-6.6 (34)	0.0-3.6 (34)	2.1-44.8 (52)	0.0-4.2 (34)	-	-	1.2-37.6 (52)	-	0.0-92.2 (52)	-	3.1-88.7 (52)	-
Bhawanipatna	0.0-3.0 (39)	0.0-3.5 (37)	0.0	0.0-3.0 (41)	-	-	-	-	0.0-3.6 (41)	0.0	-	-

*PBW population through destructive boll sampling, # Population of bollworm based on 10 plants



LEAFHOPPER: Peak activity of leafhopper observed during 38-43rd SMW at Banswara. In Junagadh, Bharuch & Surat, leafhopper was at its peak during 37th, 38-42nd, 44-45th SMW, respectively. Peak incidence of leafhoppers reported on 42nd SMW at Khandwa. In Akola, Rahuri & Nanded, maximum population of leafhopper appeared during 34-35th, 38th, 46th SMW. Peak infestation of leafhopper was observed on 43rd SMW at Bhawanipatna.

WHITEFLY: Peak activity of whitefly recorded during 41-44th SMW at Banswara. In Junagadh, Bharuch & Surat, whitefly population was at its peak during 39th, 44th, 50-52nd SMW, respectively. Peak infestation of whitefly reported during 36-38th at Akola. In Khandwa, Nanded, Rahuri & Bhawanipatna, severe whitefly population appeared during 45-47th SMW.

THRIPS: Thrips activity was nil at Banswara & Khandwa. In Junagadh, Bharuch & Surat, maximum population of thrips observed during 34-35th, 38-42nd, 41-44th SMW, respectively. In Akola, Rahuri, Nanded & Bhawanipatna, thrips infestation was at its peak during 34-38th SMW.

APHIDS: Aphid activity was nil at Banswara. In Bharuch, Surat & Junagadh,, aphids were at its peak during 43-46th, 47-50th & 52nd SMW, respectively. Peak incidence of aphid appeared on 45th SMW at Khandwa. In Akola, Nanded & Rahuri, peak infestation of aphids recorded during 50-52nd SMW. Severe whitefly population appeared on 34th SMW at Bhawanipatna.

NATURAL ENEMIES: In Banswara, Bharuch & Junagadh, peak activity of predators per plant observed during 41-44th SMW. In Surat, peak population of predators (3.8/plant) observed during 47-49th SMW. Peak activity of predators appeared on 39th SMW at Khandwa. In Akola, Nanded & Rahuri, predators were at its peak during 40-42nd, 48- 51st & 46-52nd SMW, respectively. Peak population of natural enemies (3.10/plant) appeared on 35th SMW at Bhawanipatna.

BOLLWORMS (Non-Bt): Peak activity of *H. armigera* (0.0-17.0/10plant) was during 43rd SMW at Nanded. Population of *S. litura* was maximum at Surat (0.0-4.0/5plant) on 44th SMW. Population of *Earias spp.* (0.0-4.2/5plant) & *P. gossypiella* (2.1-44.8/5plant) were maximum at Rahuri on 34th & 52nd SMW, respectively followed by Akola (0.0-34.0/5plant) for PBW where green boll damage due to pink bollworm was maximum (80%) during 46-50th SMW. Fruiting body damage was highest at Khandwa (95%) followed by Rahuri (92.2%).

BOLLWORMS (Bt): Peak population of *H. armigera* (0.0-2.0/10plant) and *S. litura* (0.0-1.0/10plant) observed at Nanded on 39th & 34th SMW, respectively whereas population of *Earias spp.* was maximum at Junagadh. Population range of *P. gossypiella* (1.2-37.6) observed maximum at Rahuri during 52nd SMW followed by Akola (0.0-32.0) whereas green boll damage due to pink bollworm was maximum (75%) during 46-50th SMW. Fruiting body damage was highest at Rahuri (88.7%) followed by Khandwa (80%).



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

Centers Name	Population Range and Peak Activity Period (SMW) of sucking pests /3leaves				Natural Enemies/Plant
	Leafhopper	Thrips	Whitefly (SMW)	Aphid	
Lam,Guntur	0.4-20.1(44)	0.2-20(39-41)	0.1-8.5(44)	0.1-10.2(44)	0.0-0.6(44-45)
Nandyal	5.4-18.4(39)	10.8-38.8(43)	-	-	-
Dharwad	0.0-12.4(41)	0.0-51.8(37)	0.0-2.3(41)	0.0-41.6 (48)	0.0-2(46)
Raichur	0.0-16.5(46)	0.5-30.1(40)	0.0-10.5(45)	0.0-10.5(34)	0.0-2.0(46)
Chamrajanagara	0.0-7.5(37)	0.0-7.5(31)	0.0-2.8(38-39)	1.3-40.3(36)	0.0-4.5(36)
Coimbatore	0.0-14.4(41)	0.0-12.8(42-43)	0.0-5.2(44)	0.0-14.2(44)	0.0-2.96(46)
Srivilliputtur	0.5-14.6(39)	0.0-7.2(40)	0.0-6.6(39)	1.2-13.8(39)	0.0-0.8(45)

Centre Name	Population Range & Peak Activity of Bollworm (SMW)/5plant								Range of Bollworm Damage (%) and Peak (SMW)					
	Non- Bt Cotton				Bt Cotton				Non- Bt Cotton			Bt Cotton		
	<i>H. armigera</i>	<i>S. litura</i>	<i>P. gossypiella</i> *	<i>Earias spp.</i>	<i>H. armigera</i>	<i>S. litura</i>	<i>P. gossypiella</i>	<i>Earias spp.</i>	Fruiting Body Damage (%)	Green boll damage due to PBW (%)	Locule Damage (%)	Fruiting Body Damage (%)	Green boll damage due to PBW (%)	Locule Damage (%)
Lam	0.0	0.00-0.20 (48)	0.00-18.0(52)	--	0.0	0.0-0.2(48)	0.0-18.0(48)	-	--	0.0-90.0(49-51)	--	-	0.0-100(50-52)	-
Nandyal	---	0.00	6.0-19.2(52)	---	-	-	3.0-17.3(52-2)	-	35.00-90.0(47-51)	---	--	15-75(50-51)	-	-
Dharwad	0.00-5.4 (39-40)	---	0.00-34(47-48)	0.00-2.2(37-38)	0.0-0.2(38)	0.0-2 (48)	0.0-28(48)	0.0-0.2(37)	-----	0.00-30.6(50)	--	-	0.0-8.4(46)	-
Raichur	0.00-8.0(42-43)	0.00-3.0(36-39)	0.00-16.0(51)	0.00	0.0	0.0-2(48)	0.0-14(50-52)	0.0	0.00-100(49-52)	0.00-100(46-52)	--	0.0-93(48-52)	0.0-8.5(52)	-
Chamrajanagara	0.00	0.00	---	0.00	0.0	0.0	-	0.0	0.00	--	--	0.0	-	-
Coimbatore	--	--	--	--	-	-	-	-	--	--	--	-	-	-
Srivilliputtur	--	--	---	--	-	-	-	-	--	--	--	-	-	-

* PBW population through destructive boll sampling



LEAFHOPPER/3 leaves: In Lam Guntur, leafhopper incidence was observed thorough out crop growth period. Population ranged from 0.4-20.1/3 leaves with peak population during 44th SMW. In Nandyal, peak activity was on 39th SMW. In Dharwad, leafhopper attained peak at 41st SMW. In Raichur leafhopper population reached maximum during 46th SMW. In Chamrajnagara, infestation of leafhopper was moderate and at its peak during 37th SMW. In Coimbatore, infestation of leafhopper ranged between 0-14.40/3 leaves and peak incidence at 41st SMW. In Srivilliputtur, peak activity observed on 39th SMW. Leafhopper maximum (20.1/3 leaves) was recorded in Guntur.

WHITEFLY/3 leaves: In Lam Guntur, whitefly peak during 44th SMW. In Dharwad, population ranged between 0-2.3 and its peak in 41 SMW. In Raichur, population ranged 0-10.5/3leaves and peak in 45th SMW. In Chamarajanagar population attaine its peak during 38th - 39th SMW, In Coimbatore population range between 0-5.2/3leaves and peak during 44th SMW. In Srivilliputtur, peak activity observed on 39th SMW. Whitefly maximum population (10.5/3leaves) was observed in Raichur.

THRIPS/3 leaves: In Lam, Guntur, thrips were at peak during 39th – 41st SMW. In Nandyal, peak activity was on 43rd SMW & in Dharwad, 37th standard week. In Raichur, population of thrips was severe during 40th SMW. In Chamrajnagara, thrips was noticed 31st SMW. In Coimbatore, infestation of thrips population attained peak in 42nd - 43rd SMW. In Srivilliputtur, peak activity observed o during 40th SMW. Maximum population (51.8/3leaves) of thrips was observed in Dharwad.

APHIDS/3 leaves: In Lam Guntur, aphid was at its peak during 44th SMW. In Dharwad, aphid incidence was noticed at its peak during 48th SMW. In Raichur, peak incidence of aphid was noticed at 34th SMW. In Chamrajnagara, aphid population was at its peak during 36th SMW. In Coimbatore, population of aphids attained its peak during 44th SMW. In Srivilliputtur, peak activity observed on 39th SMW. Highest population (41.6/3leavse) of aphids was recorded in Dharwad.

Natural Enemies/Plant: In Lam Guntur, aphid was at peak during 44th SMW. In Dharwad and Raichur aphid incidence was noticed at its peak during 46th SMW. In Chamrajnagara, aphid population at its peak observed during 36th SMW. In Coimbatore, population of aphids attained its peak during 34th SMW. In Srivilliputtur, peak activity was observed during 45th SMW.

BOLLWORMS (N-Bt): Peak activity of *H. armigera*, *P. gossypiella* & *Earias spp.* observed duing 39-40th SMW, 47-48th & 38th SMW, respectively at Dharwad. Severe incidence of *S. litura* observed at Raichur (3.0/5plant). Green boll damage due to PBW maximum at Raichur & Lam guntur. Fruiting body damage was maximum at Nandyal & Raichur.

BOLLWORMS (Bt): In Dharwad, peak infestation of *H. armigera* (0.0-28/5plant) observed during 48th SMW & *Earias spp.* during 37th SMW. Peak incidence of *S.litura* observed at Lam, Dharwad & Raichur during 48th to 52nd SMW. Green boll damage due to PBW was maximum at Lam Guntur and fruit body damage was highest at Nandyal & Raichur.



Ent 3 (a): Survey for key and emerging pests in cotton in farmers' fields for weekly advisory – All centers (Table No -106)
NORTH ZONE

In **Bathinda**, a total of 215 locations were surveyed for surveillance of insect pests of cotton starting from June to October of kharif, in which leafhopper and pink bollworm crossed ETL in 12 and 59 locations, respectively. In **Faridkot**, 294 locations were surveyed where thrips crossed ETL at 44 locations, leafhopper crossed ETL at 26 locations. Whitefly was above ETL at 15 locations and Pink bollworm at 18 locations. In **Hisar**, a total of 113 locations were surveyed from July to Oct. Out of all locations of Hisar 9, 8, 10 and 26 locations were found to cross ETL for whiteflies, leafhoppers, thrips and PBW, respectively. In **Sirsa**, total out of 123 locations were surveyed where 9, 6 and 31 locations crossed ETL for whitefly, thrips and PBW, respectively. In **Sriganganagar**, total 475 locations were surveyed during Kharif 2021-22 for infestation of insect pests, whitefly, leafhopper, thrips, *E. vitella* and PBW crossed ETL in 51, 67, 92, 36 and 78 locations, respectively. In North zone PBW was a major pest.

CENTRAL ZONE

In **Banswara**, out of 173 locations surveyed during August to December, leafhopper crossed ETL at 32 locations. In **Junagadh**, 216 locations surveyed from July to December in which leafhopper, thrips, aphids and *Pectinophora gossypiella* crossed ETL at 9, 36, 69, 90 locations, respectively. In **Surat**, 602 locations surveyed during June to January in which leafhopper, thrips, aphids and *P. gossypiella* crossed ETL at 42, 15, 56, 58 locations, respectively. In **Akola**, whitefly, leafhopper, thrips, *P. gossypiella* crossed ETL at 14, 16, 7, 25 locations out of 92 locations surveyed respectively. In **Nanded**, 500 locations surveyed during August to December, out of these 2, 83, 57, 39, 141 locations crossed ETL for whitefly, leafhopper, thrips, aphids, *P. gossypiella*, respectively. In **Rahuri**, 371 locations surveyed during July to December in which whitefly, leafhopper, thrips, aphids, *H. armigera*, *Earias vitella*, *P. gossypiella*, *S. litura* crossed ETL at 25, 28, 54, 191, 1, 2, 21, 4 locations, respectively. In **Bhawanipatna**, out of 632 locations surveyed during August to December, leafhopper crossed ETL at 80 locations. In central zone PBW was major pest at all location except Bhawanipatna.

SOUTH ZONE

In **Lam Guntur**, whitefly, leafhopper, thrips, aphids and PBW crossed ETL in 4, 23, 7, 1 and 71 locations, respectively out of 249 locations surveyed. In **Dharwad**, 315 locations were surveyed for pest infestation in which whitefly, leafhopper, thrips, aphids, mirid bug and PBW crossed ETL in 1, 81, 93, 46, 57 and 80 locations, respectively. In **Raichur**, 1267 locations were surveyed in which leafhopper, thrips and PBW crossed ETL in 296, 362 and 202 locations, respectively. In **Chamarajanagar**, out of 1049 locations surveyed leafhopper, aphids and PBW crossed ETL in 58, 43 and 18 locations, respectively. In **Coimbatore** out of 57 locations surveyed whitefly, leafhopper, thrips, mealy bug, aphids, mirid bug and stem weevil crossed ETL in 9, 12, 3, 1, 9, 13 and 20 locations, respectively. In **Srivilliputhur**, out of 43 locations surveyed whitefly, leafhopper, thrips, mealy bug, aphids, mirid bug, PBW and stem weevil crossed ETL in 24, 15, 3, 1, 6, 8, 3 and 34 locations, respectively. In South zone PBW was a major pest.



Ent 3 (b): Intensive survey for Pink Bollworm on Bt hybrids in the farmers' fields (Table-107)

North Zone- Intensive surveys of farmer's field location adjoining to cotton ginning cum oil extraction mills were conducted during 2021-22 cotton season in North Cotton Growing Zone of India. Among all the locations of North zone maximum rosette flower recorded in Hisar and no rosette flower symptoms were reported at Faridkot and Sriganaganagar. None of the location was reported with flower damage except Sirsa where damage varied from 0-8%. Highest green boll damage was observed at Hisar i.e. 40-90%. Similarly, maximum number of PBW larvae per 20 destructive boll sampling was recorded at Hisar with range of 3-54.

Ent 4. Management of sucking pests in cotton (Table: 108-127)

S.NO	Name of the insecticide/ Treatment	g.a.i /ha	Dosage in ml /ha
1	Spinetoram11.7%	50	420
2	Pyriproxyfen 10% EC	100	1000
3	Dinotefuran20%SG	30	150
4	Spiromesifen 240 SC (22.9%)	144	600
5	Diafenthiuron 50WP	300	600
6	Flonicamid 50% WG	75	150
7	Imidacloprid 200 SL (17.8%)	25	125
8	Control	--	----

Central Zone

Based on sprays applied against sucking pests' **Flonicamid 50%WG** imparted maximum efficacy against sucking pests at all locations except Junagadh (where Spinetoram 11.7% & Pyriproxyfen found to be effective against aphid, jassid, thrips) and Khandwa (where Spiromesifen 240 SC found to be effective against aphid & whitefly). However, in case of **aphid**, Flonicamid 50% imparted maximum efficacy at Surat, Akola, Nanded, Rahuri, Bhawanipatna, Spinetoram11.7% at Junagadh, Spiromesifen 240 SC at Khandwa. In case of **jassid**, Flonicamid 50% WG imparted maximum efficacy at all the centres of except Junagadh. Similarly, in case of **thrips**, Flonicamid 50% WG imparted maximum efficacy at Surat, Akola, Nanded, Rahuri and Bhamswara. However, Spinetoram11.7% at Junagadh. In case of **whitefly**, Flonicamid 50% WG imparted maximum efficacy at Banswara, Surat, Akola, Nanded, Rahuri, Khandwa. However, Diafenthiuron 50WP at Junagadh and Imidacloprid 200 SL (17.8%) at Bhawanipatna. Maximum population of natural enemies/plant after spray applied recorded for Spinetoram11.7% at Junagadh, Nanded and Rahuri, Diafenthiuron 50WP at Surat, Dinotefuran20%SG at Akola, Spiromesifen 240 SC at Bhawanipatna. Minimum population of natural enemies/plant recorded for Dinotefuran20%SG at Junagadh, Imidacloprid 200 SL at Surat, Nanded, Rahuri and Bhawanipatna, Pyriproxyfen 10% EC at Akola.

South Zone

Based on sprays applied against sucking pests, maximum efficacy against **aphid** was imparted by Flonicamid 50% WG at Lam Guntur, Raichur, Chamarajnagar & Coimbatore, Spiromesifen 240 SC at Dharwad. In case of **jassids**, Flonicamid 50% WG at Lam Guntur, Dharwad, Raichur, Chamarajnagar & Coimbatore, Spiromesifen 240 SC at Nandyal imparted maximum efficacy. Maximum efficacy against **thrips** was imparted by Spinetoram 11.7% at Lam Guntur, Dharwad, Raichur, Spiromesifen 240 SC at Nandyal, Flonicamid 50% WG at Chamarajnagar, Coimbatore. However, Spiromesifen 240



SC at Dharwad, Coimbatore, Pyriproxyfen 10% EC at Raichur, Diafenthiuron 50WP at Chamarajnagar recorded minimum efficacy. In case of **whitefly**, Diafenthiuron 50WP at Lam Guntur, Spinetoram 11.7% at Dharwad, Flonicamid 50% WG at Raichur, Coimbatore, Imidacloprid 200SL at Chamarajnagar imparted maximum efficacy. However, population of whitefly was nil at Nandyal. Maximum population of natural enemies/plant after spray applied recorded for Spinetoram 11.7% at Dharwad, Imidacloprid 200 SL at Coimbatore. Minimum population of natural enemies/plant recorded for Spiromesifen 240 SC at Dharwad & Coimbatore. Population of natural enemies was negligible at Lam Guntur, Nandyal, Raichur and Chamarajnagar.

Ent 5 Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton.

(Table: 128-157)

Centre – All centres.

SN	Treatment detail	Remarks
T1	100% Bt	-
T2	100% Non-Bt	-
T3	20% Structured Refugia	Border sowing of 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

North Zone

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 larva in flowers in case of **N-Bt** plants. Rosette flower due to PBW was highest in T2 i.e. 11.6%. However among combination treatments, maximum rosette flowers were reported on Non-Bt plants of T3 (8.6%) followed by T6 (7.4%). Green boll damage due to pink bollworm was highest in T2 (38.4%) on the other hand in the combination treatments, it was highest in T3 (31.6%) in case of **N-Bt** plants followed by T6 (26.6%). Open boll and locule damage was highest in T2 i.e. 30.0% and 14.6% respectively but among the combination treatments damage was highest in T3 i.e. 24 and 12%, respectively and lowest in T5 i.e. 13% and 4.3%, respectively in case of N-Bt plants. Highest seed cotton yield was in T5 and T6 (27.10q/ha in both the treatments) followed by T2 (25.47q/ha) and lowest yield was observed in T2 (17.85q/ha).

Faridkot-Population of ABW/SBW/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 i.e. 0.92% but among the combination treatments T3(0.73%) bears maximum damage followed by T6 (0.7%). Green boll damage due to PBW was highest in T2 (100% Non-Bt) i.e. 20.5% but among the combination treatments highest damage of 19.5% in T3 was recorded. Open boll and locule damage percentage was highest in T3 i.e. 10.99 and 6.36% respectively in case of N-Bt plants followed by T6 i.e. 10.23% and 4.64%



respectively. T6 gave highest seed cotton yield of 29.31q/ha followed by T4 (29.03q/ha) and lowest yield was observed in T2 (22.85q/ha).

Hisar- 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. PBW larva per plant in flower was 3.89 in T2 (100% Non-Bt) which was highest among all the treatments. However, among the combination treatments T5 (3.70%) showed maximum population followed by T6 (3.39%) in case of N-Bt plants. Maximum rosette flower i.e. 9.38% was found in T2. On the otherhand, among the combination treatments maximum rosette flower in N-Bt plants was recorded in T5(8.30 followed by T6 (7.38%). T2 showed maximum green boll damage due PBW i.e. 38.75%. Among the combination treatments, green boll damage was maximum in T5 (37%) and minimum in T3 (30.25%) in case of N-Bt plants. Open boll (%) and locule damage(%) was highest in T2 i.e 38.24 and 21.28, respectively but among the combination treatments damage was highest in T4 i.e. 34.05 and 24.48, respectively and lowest in T3 i.e. 27.46 and 18.71, respectively in case of N-Bt plants. T1(26.37q/ha) gave maximum yield followed by T3(23.79q/ha) and lowest yield was obtained from T2(19.05q/ha).

Sirsa- Population of ABW/SBW/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 i.e 4.53% but among the combination treatments T6 bears maximum damage and T4 bears minimum damage in case of N-Bt plants and nil damage was recorded on Bt plants in all the treatments except T1(0.14%). Green boll damage due to PBW was highest in T2 (19%). However, among the combination treatments T3 (13.50%) showed maximum and T4(10%) showed minimum green boll damage (N-Bt plants). Open boll and locule damage percentage was maximum in T2. On the other hand, among the combination treatments T3 bear maximum damage and T4 bears minimum damage in case of N-Bt plants. T1 gave highest yield (27.25q/ha) and lowest yield was gained from T2 (21.30q/ha)

Sriganganagar- Population of ABW/SBW/TC was not observed at this location. Population of PBW was highest in T2 (100% Non-Bt). Among the combination treatment of non-Bt and Bt plants, T3 (3.43%) harbor maximum and T5 (2.26%) harbor minimum larvae of PBW in flowers in N-Bt Plants. Green boll damage due to ABW/SBW/TC was highest in T2 (22%) but among the combination treatments it was highest in T3 (17.7%) followed by T6 (15.8%) in case of N-Bt plants. Maximum rosette flower i.e. 13.7% was found in T2. On the otherhand, among the combination treatments it was highest in T3 (10.3%) followed by T6 (9%) in case of N-Bt plants. Green boll damage due to PBW was highest in T2. However, among the combination treatments T3 showed maximum and T5 showed minimum green boll damage in case of N-Bt plants. Open boll and locule damage percentage was highest in T2. On the other hand, among the combination treatments T3 bear maximum and T5 bear minimum open boll damage in case of N-Bt plants. T4 gave highest yield (24.8q/ha) and lowest yield was gained from T2 (20.01q/ha)

Central Zone

Population of ABW/SBW/TC was negligible for all treatments in central zone. Similarly, population of PBW in flowers was minimum in Bt plants at all locations & maximum in T2 of N-Bt plants at Junagadh, Surat. Among all treatments, T2 (100% N-Bt plants) showed highest green boll damage due to ABW/SBW/TC, maximum number of rosette flowers due to PBW (except at Rahuri & nil at Akola), highest green boll damage due to PBW, maximum larval recovery of PBW from green boll dissection, maximum open boll & open locule damage with minimum yield at all locations. Among



the combination treatments (in case of N-Bt plants) green boll damage due to SBW/ABW/TC recorded maximum in T6 at Junagadh, T3 at Surat, Akola, Nanded & Rahuri, however minimum in T5 at Junagadh, Surat & Nanded, T4 at Akola & Rahuri. Rosette flowers due to PBW was maximum in T6 at Junagadh & Surat, T3 at Nanded & Rahuri whereas found minimum in T4 at Junagadh & Nanded, T5 at Surat, T6 at Rahuri. Green boll damage due to PBW was maximum in T6 at Junagadh & Rahuri, T3 at Surat, Akola & Nanded, whereas found minimum damage in T4 at Junagadh, Surat, Akola & Rahuri, T5 at Nanded. Open boll damage was maximum in T6 at Junagadh, T3 at Surat, Akola, Nanded & Rahuri whereas minimum damage in T4 at Junagadh, Surat, Akola, T5 at Nanded & Rahuri. Open locule damage was maximum in T6 at Junagadh & Rahuri, T3 at Surat, Akola & Nanded whereas minimum damage in T4 at Junagadh, Surat & Akola, T5 at Nanded, T4 at Rahuri. Out of 5 location of Central zone, maximum yield was recorded in T5 and T1 in majority of the locations whereas minimum yield was in T2 at all the locations.

South Zone

In Lam, Maximum rosette flower i.e 18.1% was found in T3 followed by T2 (16.5%) in case of N-Bt plants. Green boll damage due to PBW was highest in T3 (46.6) and minimum in T2 (30.9%) in case of N-Bt plants. Open boll damage was highest in T2 (67%) but among the combination treatment it was highest in T4 (66.6%) and minimum in T5 (56.3%) in case of N-Bt plants. T1 gave maximum yield (15.8q/ha) and minimum yield was obtained from T2 (10.7%)

In Nandyal, population of ABW/SBW/TC and rosette flower was not reported on any Bt and Non-Bt plant of all the treatments at this location. In case of N-Bt plants, PBW from flower was reported maximum in T2 (32%) and no larva was found in remaining treatments. Green boll damage due to PBW was highest in T2 (40%). Among the combination treatments maximum damage was recorded in T6 (46.7%) and minimum damage recorded in T3 (35%) in case of Bt plants and none of the plant was damaged in case of N-Bt plants. Open boll damage percentage was highest in T2 (50%). Among the combination treatments T5 (25%) bears maximum damage and T3 (16%) bears minimum damage in case of Bt plants none of the plant was damaged in case of N-Bt plants. Locule damage percentage was highest in T2 (11%). Among the combination treatments T6 (16%) bears maximum damage and T3 (12.5%) bears minimum damage in case of Bt plants, none of the plant was damaged in case of N-Bt plants. T1 gave maximum yield (13.43q/ha) and minimum yield was obtained from T5 (8.50q/ha).

In Dharwad- ABW was found maximum in T2 (5larvae/plant). Among the combination treatments ABW was maximum in T3 (4.3%) and minimum in T4 and T5 (3.6 larvae/plant in both) in case of N-Bt plants. Same trend was found in case of SBW. Maximum PBW in flowers was reported in T2 (24.2%). Among the combination treatments it was highest in T3 (20.1%) and minimum in T5 (17.7%) in case of N-Bt plants. Green boll damage due to ABW/SBW/TC was highest in T2 (24.8%) but among the combination treatments T3 (20.3%) bears maximum damage and T5 (15.2%) bears minimum damage in case of N-Bt plant. Same trend was recorded in case of rosette flower due to PBW. Green boll damage due to PBW was highest in T2. Among the combination treatments it was highest in T3 and Minimum in T5 (N-Bt plants). Open boll and locule damage was highest in T2, however among the combination treatments open boll and locule damage was highest in T3 and minimum in T5 (N-Bt plants). T1 gave maximum yield (11.95q/ha) and minimum yield was obtained from T2 (5.95q/ha).

In Raichur- Maximum larvae of ABW was recorded in T2 (1.08%) but among the combination treatments maximum larvae reported in T6 (1.02%) and minimum in T5 (0.66%). Incidence of SBW



was nil. Green boll damage due to ABW/SBW/TC was highest in T3 (36.80) and minimum damage recorded in T4 (26.08%) in case of N-Bt plants. Among the combination treatments the maximum rosette flower reported in T3 and T6 (8.0% in both) and minimum in T5 (6.0%) in case of N-Bt plants. Green boll damage due to PBW was highest in T2 (83.14%) and among the combination treatments the maximum GBD reported in T3 (82.64%) and minimum in T5 (68.22%) in case of non Bt plants. Open boll damage percentage was highest in T2 (92.98%) and among the combination treatments T3 (87.63%) bears maximum damage and T4 (86.14%) bears minimum damage in case of N-Bt plants. Locule damage percentage was highest in T2 (91.38%) and among the combination treatments T3 (85%) bears maximum damage and T4 (83.25%) bears minimum damage in case of N-Bt plants. T1 gave maximum yield (8.33q/ha) and minimum yield was obtained from T2 (4.23q/ha).

Ent 6 Evaluation of prominent insecticides against bollworm complex of cotton (Table 158-198)

Variety: **Non-Bt (Popular) hirsutum**

Locations: **North Zone (Bathinda, Faridkot, Sirsa, Hisar, Sriganaganagar)**

Centre Zone (Junagarh, Surat, Akola, Nanded, Rahuri, Bhawanipatna)

South Zone (Guntur, Nandyal, Dharwad, Chamrajnagar, Coimbatore, Srivilliputur)

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	--
T4	Profenophos	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	--

North Zone

In Bathinda- Incidence of ABW/SBW and green boll damage due to ABW/SBW was found to be negligible. Spinosad 45 SC found to be more effective against PBW as more reduction in population of PBW (49.77%) and green boll damage due to PBW (45.23%) was observed after spray followed by Spinetoram 11.7 SC and Indoxacarb 14.5 SC. Maximum population of natural enemies was recorded in Flubendamide 39.35SC and Spinetoram 45 SC. Highest open boll damage and locule damage was recorded in case of Flubendamide 39.35SC. Highest yield (23.86q/ha) was recorded in plots treated with Emamectin benzoate 5 SG.

In Faridkot- Very less population ABW/SBW and PBW was reported and fruiting body damage (%) due to ABW/SBW was insignificant at Faridkot. Indoxacarb 14.5 SC found to be more effective as it reduced 70.84% green boll damage due to PBW followed by Fenpropathrin (51.26% reduction).



Maximum population of natural enemies was recorded in fenpropathrin, chlorantraniliprole 18.5 SC and spinosad 45 SC treated plots. Treatment of Profenofos 50EC (21.46q/ha) gave highest yield followed by cypermethrin 25EC (20.36q/ha). Pyridalyl 10 EC reported to be highly effective for green boll damage due to SBW/ABW over control as reduction(%) in green boll damage was 41%.

In Hisar: Spinetoram 11.7 SC reduced maximum (74.47%) population of ABW/SBW followed by Chlorantraniliprole 18.5 SC (72.67% reduction). Eamectin benzoate 5 SG found to be more affective against PBW as higher reduction in population of PBW (68.48%) followed by Spinetoram 11.7 SC (63.90%). Chlorantraniliprole 18.5 SC and Eamectin benzoate 5 SG reduced maximum green boll damage due to ABW/SBW and PBW respectively. Maximum population of natural enemies was recorded for Chlorantraniliprole 18.5 SC and spinosad 45 SC. In case of plot treated with bifentherin 10EC maximum open boll and locule damage was observed viz. 14.2% and 9.4% respectively. Plot treated with Spinetoram 11.7 SC gave highest yield 28.20 q/ha.

In Sirsa: Incidence of ABW/SBW and PBW was found to be negligible. Chlorantraniliprole 18.5 SC and Profenophos reduced maximum green boll damage due to ABW/SBW (78.33%) and PBW (76.52%) respectively. Natural enemies were recorded highest for Flubendiamide 39.35 SC. In plot treated with flubendamide 39.35SC, maximum open boll and locule damage was observed i.e. 13.3 and 5.5% respectively. T4 (Profenophos) gave maximum yield viz. 20.83q/ha.

In Sriganganagar: Spinetoram 11.7 SC reduced maximum population of ABW/SBW i.e. 73%. Similarly, chlorantraniliprole 18.5 SC reduced maximum population of PBW (66.08%), green boll damage due to ABW/SBW (65.8%) and PBW (69.4%). Population of natural enemies was maximum for Pyridalyl 10 EC. Fenpropathrin reduced maximum open boll (16.1%) and locule damage (7.5%). Highest yield was recorded in 32.50q/ha in Spinetoram 11.7 SC.

Central zone

Based on sprays applied against bollworms, incidence of ABW/SBW/TC and PBW found to be negligible & inconclusive at all locations. Chlorantraniliprole 18.5 SC reduced maximum green boll damage due to SBW/ABW at all locations except Surat where Indoxacarb 14.5 SC found to be more effective. Similarly, green boll damage due to PBW reduced maximum by Eamectin benzoate 5 SG at all locations except Akola (where Indoxacarb 14.5 SC found to be more effective) and Rahuri (where Chlorantraniliprole 18.5 SC found to be more effective). Maximum population of natural enemies/plant recorded in Chlorantraniliprole 18.5 SC at all locations and minimum population observed in Pyridalyl 10 EC at Junagarh, Bifenthrin 10 EC & Cypermethrin 25 EC at Surat, Nanded and Bhawanipatna. However, at Akola population of natural enemies was very low and inconclusive. Open boll damage and locule damage reduced maximum by Flubendiamide 39.35 SC at Junagadh, Bifenthrin 10 EC at Surat, Fenpropathrin at Akola, Cypermethrin 25 EC at Bhawanipatna, Ethion 50 EC at Nanded and Rahuri. Exceptionally, open locule damage reduced maximum by Pyridalyl 10EC at Rahuri. Highest yield was recorded in plot treated with Eamectin benzoate 5 SG at Junagadh (30.20q/ha) & Akola (12.72q/ha), Indoxacarb 14.5 SC at Surat (24.08q/ha), Spinetoram 11.7 SC at Nanded (11.95q/ha), Chlorantraniliprole 18.5 SC at Rahuri (17.84q/ha) & Bhawanipatna (21.30q/ha). At all the locations yield recorded in treated plots was higher than control.



South Zone

Based on sprays applied against bollworms, incidence of ABW/SBW/TC found to be negligible & inconclusive at all locations. Rosette flowers due to PBW reduced maximum by Chlorantraniliprole 18.5 SC at Raichur & Cypermethrin 25 EC at Coimbatore. Green boll damage due to ABW/SBW/TC reduced maximum by Spinetoram 11.7 SC at Dharwad, Spinosad 45 SC at Raichur, Cypermethrin 25 EC at Chamarajnagar, Chlorantraniliprole 18.5 SC at Coimbatore. Similarly, green boll damage due to PBW reduced maximum by Fenpropathrin at Lam Guntur, Indoxacarb 14.5 SC at Nandyal, Spinetoram 11.7 SC at Dharwad & Flubendiamide 39.35 SC at Raichur. Maximum population of natural enemies/plant recorded for Chlorantraniliprole 18.5 SC at Dharwad, Ethion 50 EC at Coimbatore and minimum population by Pyridalyl 10 EC at Dharwad & Coimbatore. Open boll & locule damage reduced maximum by Emamectin benzoate 5 SG at Lam Guntur, Pyridalyl 10 EC at Dharwad, Ethion 50 SC at Raichur, Cypermethrin 25 EC at Chamarajnagar & Coimbatore, Spinosad 45 SC & Cypermethrin 25 EC at Nandyal. Highest yield recorded in plot sprayed with Indoxacarb 14.5 SC at Lam Guntur (9.97 q/ha), Spinetoram 11.7 SC at Dharwad (11.20 q/ha), Fenpropathrin at Raichur (24.68 q/ha) & Chlorantraniliprole 18.5 SC at Chamarajnagar (21.30 q/ha). At all the locations yield recorded in treated plots was higher than control.



Ent7: Determination of nymphal based ETL estimation and yield losses for cotton whitefly *Bemisia tabaci*. (Table 199-203)**Cultivar:** RCH773**Locations:** PAU Bathinda, PAU Faridkot, ICAR-CICR Sirsa, CCSHAU, Hisar, ARS Sriganaganagar**Replications:** Three

S. No	Treatment	Observation	Additional Observation		
			Nymphs to be observed	Additional Observations	Required Observation
1	1 nymph/leaf --- (30 or more live red eyed nymph on selected & tagged 10 plants)	Nymphal counts from one (uniformly fixed) leaf of upper/middle/lower strata of 30 tagged plants	5 th main stem internodes leaf of each 10 plant (randomly selected and tagged)	Observe three leaves from upper/middle /lower strata for total number of nymphal and adults counts only from 3 plants of each plot other than the selected 10 tagged plants	Observe/counts the number of ants/3 leaves in all treatments
2	2 nymph/leaf – (60 or more live red eyed nymph on selected & tagged 10 plants)				
3	4 nymph/leaf 120 or more live red eyed nymph on selected & tagged 10 plants)				
4	6 nymph/leaf 180 or more live red eyed nymph on selected & tagged 10 plants)				
5	Honey dew symptoms on 20 percent of the total plants	Count on plot basis			
6	Honey dew symptoms on 30 percent of the total plants				
7	Honey dew symptoms on 40 percent of the total plants				
8	Honey dew symptoms on 50 percent of the total plants				
9	6-8 adults//leaf (Treated control)				
10	Untreated control				



Results –SIRSA/Hisar/Bathinda/Faridkot/Sriganganagar

- After sowing, plots were regularly monitored (twice a week) for whitefly nymphal and adult population. Total 30 plants were observed and one leaf between 5th-7th main stem was observed for total number of red eyed nymphs on it. From each plot plants having desired level of nymphal count/leaf were fixed. Whitefly adults and Ant's count was also recorded at each observation.
- In **treatment-1** (30 or more live red eyed nymph) when average population of 30 leaves of 10 plants was 30 nymphs or above/, treatment in the form of interventions started.
- In **treatment-2** (60 or more live red eyed nymph) when average population of 30 leaves of 10 was 60 nymphs or above, treatment in the form of interventions started.
- In **treatment-3** (120 or more livered eyed nymph) when average population of 30 leaves of 10 plants observed was 120 nymphs or above, treatment in the form of interventions started.
- In **treatment-4** (180 or more live red eyed nymph) when average population of 30 leaves of 10 plants observed was 180 nymphs or above, treatment in the form of interventions started. These plants were observed twice a week and whenever the fixed level of nymphs/30 leaves arrived, plot was sprayed.
- In **treatment -5**, plants were observed and whenever Honey dew symptoms on 20 per cent of the plants were observed, treatment initiated.
- In **treatment -6**, plants were observed and whenever Honey dew symptoms on 30 per cent of the plants were observed, treatment initiated.
- In **treatment -7**, plants were observed and whenever Honey dew symptoms on 40 per cent of the plants were observed, treatment initiated.
- In **treatment -8**, plants were observed and whenever Honey dew symptoms on 50 per cent of the plants were observed, treatment initiated.
- In **treatment -9**, adult's population /3 leaves were observed and whenever the counts reached to 6-8 adults/ leaf (Treated control) interventions were applied.
- In **treatment -10**, no intervention was applied, untreated control
- All the observations were recorded with 5-8x magnification lens and special care was taken to determine if the nymphs are dead due to predators (i.e., shrunken, deflated, or ghost-like in appearance), parasites [i.e., golden, black, or possessing asymmetrical or insecticides (i.e., discolored or distorted in body-shape)]. Dead nymphs were excluded from counts.
- At the end yield data was also recorded and yield loss over treated control was calculated.

In Bathinda, Observations of nymphal counts from one leaf of upper/middle /lower strata of 10 tagged plants and adult count were recorded. The average nymphal count/3 leaves on tagged plant and on 5th main stem leaf was 2.45 and 4.71 respectively in T1 (30 or more live red eyed nymph/10 plants) and 2.88 and 5.14 respectively in T2 (60 or more live red eyed nymph/10 plants). In treatment T3 (120 or more live red eyed nymphs/10 plants) the average nymphs/3 leaves was 4.97 and on 5th main stem leaf was 6.05. Whitefly adults were highest in T3 followed by T2 and T1. Yield reduction over treated control was recorded only in T3 (2.70%). In the treatment T9 (treated control) average adult population of whitefly/3 leaves was 6.41. The treatment T10 was an untreated control in which the population of adult whitefly was maximum i.e. 11.82 adults/3 leaves.



Faridkot- Observations of nymphal counts from one leaf of upper/middle/lower strata of 10 tagged plants and adult count were recorded. The average nymphal count/3 leaves on tagged plant and on 5th main stem was 0.32 and 0.47 respectively in T1 (30 or more live red eyed nymph/10 plants) similarly, 0.38 and 0.47 respectively in T2 (60 or more live red eyed nymph/10 plants). In treatment T3 (120 or more live red eyed nymphs/10plants) average nymphal count/3 leaf and on 5th main stem leaf and was 0.33 and 0.72 respectively. In T4 (180 or more live red eyed nymph/10 plants) average nymphal count/3 leaves and on 5th main stem leaf was 0.16 and 0.25 respectively. The whitefly adults/3leaves was highest in T1 followed by T3, T2 and T4. In the treatment T9 (Treated control) and T10 (Untreated control) whitefly adults/3leaves was 2.22 and 2.09 respectively.

In Sirsa- Observations of nymphal counts from one leaf of upper/middle /lower strata of 10 tagged plants and adult count were recorded. Incidence of whitefly reported in all the treatments. Among all the treatments (Except T9 and T10) the average nymphal count/3 leaves on tagged plant and on 5th main stem leaf was minimum in T1 (30 or more live red eyed nymph/10 plants) and maximum in T8 (Honey dew symptoms on 40 percent of the plants). Minimum whitefly adults were reported in T1 (30 or more live red eyed nymph/10 plants) i.e. 9.87 adults/3 leaves. Among all the treatments (Except T9 and T10) whitefly incidence was remained highest in T8 (Honey dew symptoms on 40 percent of the plants) i.e. 10.42 adults/3 leaves. Reduction in yield in comparison with T9 (treated control) was reported in all the treatments except T1 (30 or more live red eyed nymph/10) plants and T5 (Honey dew symptoms on 20 percent of the plants) in which yield was increased 2.53 and 0.42% respectively. Maximum count of whitefly adult was reported in untreated control (T10) followed by treated control (T9) with 10.89 and 10.77 adults/3 leaves respectively.

In Hisar- Observations of nymphal counts from one leaf of upper/middle /lower strata of 10 tagged plants and adult count were recorded. Incidence of whitefly reported in all the treatments. Among all the treatments (Except T9 and T10) the average nymphal count/3 leaves on tagged plant and on 5th main stem was minimum in T1 (30 or more live red eyed nymph/10 plants) and maximum in T8 (Honey dew symptoms on 40 percent of the plants). Minimum whitefly adults were reported in T1 (30 or more live red eyed nymph/10 plants) i.e. 5.99 adults/3 leaves. Among all the treatments (Except T9 and T10) whitefly incidence was remained highest in T8 (Honey dew symptoms on 40 percent of the plants) i.e. 10.56 adults/3 leaves. Maximum yield reduction was recorded in T5 and T10 (5.54% in both) and maximum addition in yield was recorded in T1 (6.13%). Treatment (T10) was an untreated control in which the population of adult whitefly was 10.54/3leaves (highest among all the treatments).

In Sriganaganagar- Among all the treatments (Except T9 and T10) the average nymphal count/3 leaves on tagged plant and on 5th main stem leaf was minimum in T1 (30 or more live red eyed nymph/10 plants) and maximum in T8 (Honey dew symptoms on 40 percent of the plants). Minimum whitefly adults were reported in T1 (30 or more live red eyed nymph/10 plants) i.e. 4.86 adults/3 leaves. Among all the treatments (Except T9 and T10) whitefly incidence was remained highest in T8 (Honey dew symptoms on 40 percent of the plants) i.e. 35.83 adults/3 leaves. Maximum yield reduction was recorded in T8 (8.70%) and maximum addition in yield was recorded T1 (6.16%).



Table: 1. Ent1a. Br 22a/b: Intial Evaluation of breeding material for resistance to insect pest of cotton (Sucking pests) at North Zone during 2021-22.

Entry code	Name of entry	Jassid Injury Grade(JIG)*					No. of Jassid/ 3leaves					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
101	HD 564	-	II	I	I	I	0.33	3.00	0.70	0.44	0.4	3.83	4.30	6.70	2.11	3.7	1.67	8.50	5.00	0.44	5.4
102	PBD 160	-	II	I	I	I	0.33	3.60	0.90	0.67	0.9	1.83	6.30	6.90	2.22	2.5	2.00	10.8	4.00	0.56	3.4
103	RG 868	-	II	I	I	I	0.50	3.80	0.70	0.78	0.7	2.67	6.60	4.90	2.56	2.2	1.00	9.60	4.90	0.67	4.7
104	ZC (FDK 124)	-	II	I	I	I	1.00	4.20	0.80	0.67	0.8	2.33	8.30	4.90	2.11	3.1	2.50	10.9	4.30	0.89	4.6
105	CISA 7	-	II	I	I	I	0.50	4.80	1.10	0.56	1.2	2.17	8.90	5.00	2.44	3.0	1.83	9.90	5.00	0.78	5.2
106	FDK 325	-	II	I	I	I	0.50	5.70	0.40	0.78	0.8	2.83	8.70	5.80	2.56	1.9	3.00	10.3	4.00	1.00	4.0
107	RG 888	-	II	I	I	I	1.17	7.20	0.90	0.67	0.7	3.00	9.50	4.20	3.11	2.5	2.17	8.80	3.80	1.22	3.3
108	PBD 156	-	II	I	I	I	1.00	4.60	0.90	1.00	1.6	2.17	7.20	4.70	2.89	3.3	3.50	9.80	4.80	1.33	4.4
109	CISA 33-7	-	II	I	I	I	2.17	4.20	0.70	0.78	0.8	2.50	8.40	9.00	3.33	2.6	4.50	8.60	3.50	1.67	5.9
110	LC	-	II	I	I	I	1.50	3.70	1.10	0.89	0.6	2.33	6.70	7.10	2.44	3.0	2.50	7.50	4.60	1.67	6.8
111	FDK 315	-	II	I	I	I	2.00	4.20	0.70	1.00	0.8	3.83	5.80	7.50	2.78	2.6	2.83	8.50	4.40	1.22	4.4
112	HD 562	-	I	I	I	I	2.17	2.60	0.60	0.56	1.5	3.33	7.00	6.70	2.89	2.1	1.33	10.9	3.30	1.56	5.5

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:2. Ent1a Br 22a/b: Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) at NZ.

Entry code	Name of entry	Natural Enemies/ Plant*					Rosette Flower					Green Boll Damage (%) due to ABW/SBW/TC				
		FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG
101	HD 564	3.33	1.40	-	0.00	2.0	0.00	0.00	0.00	0.00	0.0	7.64	0.00	40.00	3.79	15.1
102	PBD 160	2.67	1.40	-	0.07	1.5	0.00	0.00	0.00	0.00	0.0	7.40	5.00	27.50	4.69	15.8
103	RG 868	2.67	1.60	-	0.07	2.5	0.00	0.00	0.00	0.00	0.0	5.31	2.50	32.50	6.34	17.3
104	FDK 124 (ZC)	4.33	1.60	-	0.04	2.0	0.00	0.00	0.00	0.00	0.0	7.59	0.00	27.50	4.12	13.6
105	CISA 7	2.33	1.90	-	0.00	1.5	0.00	0.00	0.00	0.00	0.0	6.93	5.00	35.00	3.08	17.8
106	FDK 325	4.00	1.40	-	0.07	3.0	0.00	0.00	0.00	0.00	0.0	5.39	2.50	17.50	5.05	29.5
107	RG 888	3.17	1.10	-	0.11	2.5	0.00	0.00	0.00	0.00	0.0	7.00	0.00	35.00	4.34	24.5
108	PBD 156	4.50	1.90	-	0.11	2.0	0.00	0.00	0.00	0.00	0.0	3.22	2.50	25.00	4.29	15.2
109	CISA 33-7	3.17	1.40	-	0.11	1.5	0.00	0.00	0.00	0.00	0.0	2.87	0.00	20.00	4.25	19.4
110	LC	3.50	2.30	-	0.04	2.5	0.00	0.00	0.00	0.00	0.0	3.44	2.50	37.50	5.13	33.0
111	FDK 315	4.83	1.80	-	0.15	3.5	0.00	0.00	0.00	0.00	0.0	7.03	2.50	40.00	3.43	11.2
112	HD 562	3.50	1.20	-	0.07	2.5	0.00	0.00	0.00	0.00	0.0	6.56	0.00	35.00	2.96	13.4

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganganagar

* Natural Enemies include coccinellids, chrysopids, syrphids and spider;

** Fruiting Body damage includes damage in squares, flowers and boll

Table: 3. Ent1a Br 22a/b: Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at North Zone during 2021-22.

Entry code	Name of Entry	Green Boll Damage (%) due to PBW					Open Boll damage (%)					Open Locule Damage (%)					Good Open Bolls				
		FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG	FA	BT	HI	SR	SG
101	HD 564	15.0	7.50	7.50	45.00	37.0	10.84	20.00	13.72	11.11	23.0	4.94	2.36	6.80	4.17	9.3	24.33	80.0	-	88.89	-
102	PBD 160	45.0	2.50	10.00	50.00	41.0	11.47	7.50	4.38	47.86	27.0	5.92	3.30	4.51	19.56	10.4	62.17	92.5	-	52.14	-
103	RG 868	15.0	2.50	5.00	45.00	31.0	12.81	12.50	6.48	29.46	21.3	6.49	6.57	3.43	11.06	7.7	41.00	87.5	-	70.54	-
104	FDK 124 (ZC)	30.0	2.50	7.50	65.00	35.0	13.71	15.00	4.37	49.37	21.0	5.43	3.35	3.31	22.22	8.9	61.50	85.0	-	50.63	-
105	CISA 7	25.0	12.50	10.00	35.00	57.0	13.26	22.50	14.82	13.33	48.0	6.25	8.01	3.08	6.67	20.8	44.50	77.5	-	86.67	-
106	FDK 325	25.0	7.50	5.00	50.00	42.0	6.28	17.50	5.15	39.74	29.7	3.07	3.08	4.21	18.33	12.3	79.50	82.5	-	60.26	-
107	RG 888	35.0	2.50	5.00	50.00	46.0	14.16	5.00	14.30	48.41	30.0	6.81	3.29	8.32	19.35	12.6	59.00	95.0	-	51.59	-
108	PBD 156	35.0	2.50	7.50	65.00	46.0	5.77	7.50	7.43	40.05	30.0	2.82	6.38	4.07	15.40	12.6	56.33	92.5	-	59.95	-
109	CISA 33-7	30.0	12.50	5.00	60.00	47.0	20.95	22.50	9.54	42.42	35.0	10.31	6.37	4.28	14.38	14.1	51.50	77.0	-	57.58	-
110	LC	15.0	2.50	5.00	60.00	43.0	15.40	10.00	8.63	40.86	28.0	7.15	3.03	3.82	17.26	9.4	59.00	90.0	-	59.14	-
111	FDK 315	20.0	2.50	7.50	60.00	55.0	8.83	12.50	7.55	44.49	44.0	4.44	6.37	5.38	19.82	19.3	68.67	87.5	-	55.51	-
112	HD 562	25.0	7.50	5.00	50.00	51.0	18.23	17.50	7.53	41.88	37.0	7.72	7.89	3.92	19.01	14.5	59.17	82.5	-	58.12	-

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganganagar



Table: 4. Ent1a. Br 25a/b: Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at North Zone

Entry code	Name of entry	Jassid Injury Grade(JIG)*				No. of Jassid/ 3leaves				Whitefly/ 3 leaves				Thrips / 3 leaves			
		BT	HI	SR	SG	BT	HI	SR	SG	BT	HI	SR	SG	BT	HI	SR	SG
121	KR 152	II	I	I	I	3.60	0.70	0.67	0.5	7.80	3.40	2.00	1.6	8.90	4.00	0.67	4.6
122	CISAA 20-2	II	I	I	I	3.40	0.80	0.89	1.0	7.30	5.60	1.67	1.8	7.60	3.90	0.78	3.9
123	KR 151	I	I	I	I	3.00	0.60	0.67	0.8	7.70	6.40	1.78	1.7	9.40	4.70	1.11	4.7
124	CISAA 20-1	II	I	I	I	3.90	1.00	0.78	0.6	8.40	6.20	1.78	3.0	8.30	5.10	0.44	4.6
125	AAH 45	II	I	I	I	3.60	0.70	0.56	0.5	7.90	4.60	2.44	1.9	7.10	3.20	0.33	3.0
126	LC	II	I	I	I	4.70	0.80	0.67	0.0	7.60	4.80	2.22	0.0	7.60	5.00	0.67	0.0
127	KR 153	II	I	I	I	4.70	0.90	0.67	0.4	7.60	6.70	1.89	2.5	8.30	2.60	0.56	5.4
128	AAH 44	II	I	I	I	5.40	1.40	0.89	0.7	7.80	5.00	1.78	3.5	7.70	6.80	0.22	5.4
129	ZC (KR 64-NZ)	II	I	I	I	4.50	1.20	1.00	0.9	10.10	7.20	2.33	2.5	7.50	5.60	0.67	3.0

BT- Bathinda; **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: Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) - NZ

Entry code	Name of entry	Natural Enemies/ Plant*				Rosette flower (%) due to PBW				Green Boll Damage (%) due to ABW/SBW			
		BT	HI	SR	SG	BT	HI	SR	SG	BT	HI	SR	SG
121	KR 152	1.50	-	0.07	2.5	0.0	0.0	0.0	0.0	0.00	15.00	2.35	22.3
122	CISAA 20-2	1.10	-	0.07	1.5	0.0	0.0	0.0	0.0	2.50	10.00	3.38	10.6
123	KR 151	1.70	-	0.19	2.0	0.0	0.0	0.0	0.0	2.50	15.00	5.77	9.2
124	CISAA 20-1	1.70	-	0.04	1.0	0.0	0.0	0.0	0.0	0.00	7.50	5.24	15.2
125	AAH 45	1.10	-	0.04	1.5	0.0	0.0	0.0	0.0	5.00	7.50	5.34	26.3
126	LC	1.70	-	0.07	0.0	0.0	0.0	0.0	0.0	2.50	12.50	4.07	0.0
127	KR 153	1.20	-	0.07	3.0	0.0	0.0	0.0	0.0	0.00	15.00	4.43	13.2
128	AAH 44	1.20	-	0.04	2.0	0.0	0.0	0.0	0.0	2.50	5.00	5.67	17.6
129	ZC (KR 64-NZ)	1.70	-	0.04	1.5	0.0	0.0	0.0	0.0	5.00	5.00	3.93	22.9

BT- Bathinda; **HI** – Hisar; **SR-** Sirsa; **SG-** Sriganganagar

* Natural Enemies include coccinellids, chrysopids, syrphids and spider.

** Fruiting Body damage includes damage in squares, flowers and boll.



Table: 6. Ent1a. Br 25a/b: Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at North Zone

Entry code	Name of entry	Green Boll Damage (%) due to PBW				Open Boll damage (%)				Open Locule Damage (%)				Good Open Bolls			
		BT	HI	SR	SG	BT	HI	SR	SG	BT	HI	SR	SG	BT	HI	SR	SG
121	KR 152	7.50	7.50	60.0	35.0	17.50	11.15	42.1	25.0	5.26	5.38	18.1	9.34	92.50	-	57.9	-
122	CISAA 20-2	10.00	22.50	75.0	33.0	17.50	8.41	38.2	24.3	7.60	4.71	17.5	9.29	90.00	-	61.8	-
123	KR 151	7.50	7.50	65.0	29.0	17.50	14.00	40.5	22.0	7.92	4.65	17.6	8.39	92.50	-	59.5	-
124	CISAA 20-1	2.50	25.00	65.0	40.0	12.50	7.39	37.8	26.0	11.84	1.63	18.4	10.82	97.50	-	62.2	-
125	AAH 45	7.50	15.00	75.0	29.0	15.00	10.52	38.2	18.3	7.65	3.08	18.7	7.73	92.50	-	61.8	-
126	LC	2.50	15.00	55.0	0.0	12.50	6.99	33.0	0.0	5.53	5.30	17.4	0.00	97.50	-	67.0	-
127	KR 153	5.00	20.00	20.0	42.0	12.50	6.08	43.2	27.0	5.69	4.51	15.9	12.46	95.00	-	56.8	-
128	AAH 44	5.00	12.50	55.0	32.0	12.50	5.42	36.2	21.0	4.38	3.06	16.0	8.61	95.00	-	63.8	-
129	ZC (KR 64-NZ)	7.50	27.50	15.0	27.3	15.00	9.95	37.6	14.0	4.28	6.59	18.8	6.46	92.50	-	62.4	-

BT- Bathinda; HI – Hisar; SR- Sirsa; SG- Sriganaganagar

Table: 7. Ent1a. Br 04a: Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at North Zone.

Entry code	Name of entry	Jassid Injury Grade(JIG)*					No. of Jassid/ 3leaves					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
1001	LC	II	III	II	I	II	4.10	6.23	1.90	1.2	1.9	4.00	3.38	17.7	5.6	2.7	11.8	7.4	106.1	35.5	46.4
1002	PBH 79	II	II	II	I	I	5.00	1.70	2.10	2.3	1.7	5.00	1.93	16.9	8.5	2.3	13.5	10.5	109.8	32.5	34.5
1003	F 2732	II	II	II	I	I	5.40	0.57	1.70	2.5	1.5	3.50	3.38	18.7	4.7	4.4	12.7	19.7	85.4	28.5	40.8
1004	ZC (F 2228)	I	III	II	II	I	3.10	2.83	1.70	2.4	1.6	3.30	4.35	13.1	10.2	4.1	13.0	12.3	93.4	32.7	27.2
1005	CSH 90	II	III	II	II	I	6.90	2.83	1.70	2.1	1.0	4.80	4.83	13.9	9.5	3.4	13.7	21.0	84.8	30.2	33.4
1006	H 1480	I	III	II	II	I	5.30	3.97	2.20	3.5	0.7	3.30	5.32	15.9	8.5	4.5	11.9	13.6	92.6	27.2	24.9
1007	Quality Check (CSH 3129)	II	III	II	I	I	5.90	2.83	2.30	2.4	1.7	4.10	4.35	12.5	8.7	2.8	15.3	14.8	101.0	25.6	23.2
1008	F 2743	II	III	II	II	I	5.20	3.40	1.90	2.7	0.9	3.20	5.32	16.8	7.5	6.9	15.7	14.2	90.4	25.3	38.3
1009	H 1569	I	III	II	II	I	4.90	5.67	2.30	2.3	0.7	4.30	4.83	11.9	8.9	3.8	13.0	13.6	101.1	32.4	52.2

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganaganagar

*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: Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm)- NZ

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
1001	LC	1.40	4.33	-	1.2	3.25	0.00	0.00	0.00	0	0.0	2.50	0.00	20.00	3.25	15.5
1002	PBH 79	1.10	1.33	-	1.6	2.25	0.00	0.00	0.00	0	0.0	0.00	0.00	7.50	4.25	22.7
1003	F 2732	1.20	5.33	-	1.4	2.00	0.00	0.00	0.00	0	0.0	2.50	3.59	10.00	5.20	12.8
1004	ZC (F 2228)	1.40	3.17	-	1.3	3.75	0.00	0.00	0.00	0	0.0	0.00	1.85	22.50	3.21	16.8
1005	CSH 90	1.80	3.67	-	1.4	2.88	0.00	0.00	0.00	0	0.0	5.00	15.06	22.50	4.51	14.2
1006	H 1480	1.40	3.83	-	1.6	3.25	0.00	0.00	0.00	0	0.0	2.50	0.49	5.00	2.53	19.6
1007	Quality Check (CSH 3129)	2.00	4.00	-	2.1	2.50	0.00	0.00	0.00	0	0.0	0.00	6.54	10.00	2.45	14.3
1008	F 2743	1.60	4.17	-	1.5	2.63	0.00	0.00	0.00	0	0.0	5.00	0.00	22.50	3.25	18.2
1009	H 1569	1.00	3.50	-	1.4	2.25	0.00	0.00	0.00	0	0.0	2.50	2.98	5.00	4.21	29.4

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganaganagar

* Natural Enemies include coccinellids, chrysopids, syrphids and spider.

** Fruiting Body damage includes damage in squares, flowers and boll.

Table: 9. Ent1a. Br 04a: Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at North Zone during 2021-22.

Entry code	Name of entry	Green Boll Damage (%) due to PBW					Open Boll damage (%)					Open Locule Damage (%)					Good Open Bolls				
		BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
1001	LC	15.00	12.50	7.50	5.0	41.0	22.50	2.97	22.47	11.2	26.0	2.03	1.35	5.59	3.2	12.8	77.50	42.33	-	68.0	-
1002	PBH 79	5.00	2.50	10.00	5.0	61.0	20.00	0.70	16.39	13.2	41.0	5.23	0.31	6.09	4.2	17.4	80.00	45.00	-	55.5	-
1003	F 2732	7.50	7.50	25.00	10.0	39.0	17.50	3.18	12.07	10.5	21.0	5.15	1.39	4.75	3.7	8.7	82.50	43.17	-	56.8	-
1004	ZC (F 2228)	5.00	7.50	25.00	15.0	46.0	17.50	1.86	17.31	11.2	32.0	6.84	0.88	6.84	2.8	12.7	82.50	44.67	-	62.5	-
1005	CSH 90	5.00	12.50	7.50	5.0	34.0	20.00	7.34	35.00	12.3	19.0	4.86	3.23	9.37	4.1	7.7	80.00	32.83	-	64.5	-
1006	H 1480	7.50	7.50	15.00	10.0	43.0	20.00	3.82	17.99	10.2	25.0	4.19	1.69	3.83	3.2	12.0	80.00	34.33	-	48.9	-
1007	Quality Check (CSH 3129)	7.50	7.50	5.00	10.0	40.0	25.00	1.75	3.38	10.8	23.0	3.00	0.73	1.16	2.8	7.8	75.00	42.17	-	61.4	-
1008	F 2743	2.50	17.50	17.50	20.0	65.0	15.00	1.13	24.51	11.2	48.0	2.25	0.48	8.84	3.4	20.9	85.00	42.50	-	54.3	-
1009	H 1569	5.00	7.50	20.00	10.0	47.0	15.00	2.66	6.57	12.2	28.0	1.98	1.51	2.35	4.1	11.5	85.00	42.67	-	60.3	-

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganaganagar



Table: 10. Ent1a. Br 24a: Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at North Zone.

Entry code	Name of entry	Jassid Injury Grade(JIG)*				No. of Jassid/ 3leaves				Whitefly/ 3 leaves				Thrips / 3 leaves			
		FA	BT	HI	SG	FA	BT	HI	SG	FA	BT	HI	SG	FA	BT	HI	SG
1011	PBD 88	-	II	I	I	1.67	5.50	1.00	0.4	2.00	7.40	4.00	2.7	3.67	8.20	6.10	7.8
1012	FDK 124 (ZC)	-	II	I	I	0.67	5.60	1.00	0.6	1.67	7.30	4.70	3.8	3.17	9.35	4.90	5.5
1013	FDK 312	-	II	I	I	0.67	5.50	1.00	0.7	1.83	8.20	3.00	2.2	3.67	9.95	4.60	7.7
1014	PBD 92	-	II	I	I	0.67	4.40	0.50	0.5	1.83	5.90	2.90	2.1	2.67	6.65	3.10	4.8
1015	FDK 324	-	II	I	I	0.83	5.00	1.20	1.0	2.50	8.70	7.10	1.9	3.17	9.55	6.70	4.2
1016	Local Check	-	II	I	I	1.17	5.50	0.90	0.7	2.33	7.40	6.00	2.9	5.00	7.75	4.70	6.9

BT- Bathinda; **FA-** Faridkot; **HI** – Hisar; **SG-** Sriganaganagar;

***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: Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) – NZ.

Entry code	Name of entry	Natural Enemies/ Plant*				Rosette Flower				Green Boll Damage (%) due to ABW/SBW/TC			
		FA	BT	HI	SG	FA	BT	HI	SG	FA	BT	HI	SG
1011	PBD 88	3.67	1.50	-	2.5	0.00	0	0.00	0.0	6.57	2.50	5.00	12.2
1012	FDK 124 (ZC)	3.50	1.40	-	1.0	0.00	0	0.00	0.0	8.31	2.50	5.00	19.3
1013	FDK 312	3.33	1.50	-	1.5	0.00	0	0.00	0.0	6.36	0.00	12.50	8.5
1014	PBD 92	3.67	1.80	-	2.0	0.00	0	0.00	0.0	5.74	0.00	12.50	20.5
1015	FDK 324	4.00	1.20	-	3.0	0.00	0	0.00	0.0	4.39	5.00	5.00	12.6
1016	Local Check	2.67	1.70	-	2.0	0.00	0	0.00	0.0	4.01	2.50	35.00	8.1

BT- Bathinda; **FA-** Faridkot; **HI** – Hisar; **SG-** Sriganaganagar;

* Natural Enemies include coccinellids, chrysopids, syrphids and spider.

** Fruiting Body damage includes damage in squares, flowers and boll.



Table: 12. Ent1a. Br 24a: Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at North Zone during 2021-22.

Entry code	Name of entry	Green Boll Damage (%) due to PBW				Open Boll damage (%)				Open Locule Damage (%)				Good Open Bolls			
		FA	BT	HI	SG	FA	BT	HI	SG	FA	BT	HI	SG	FA	BT	HI	SG
1011	PBD 88	20.0	12.50	20.00	46.0	11.68	22.50	5.43	38.00	5.81	8.58	4.11	15.26	64.33	77.50	-	-
1012	FDK 124 (ZC)	35.0	15.00	27.50	30.0	14.77	17.50	8.95	17.00	6.59	4.32	3.24	8.99	68.17	82.50	-	-
1013	FDK 312	20.0	17.50	25.00	41.0	10.47	22.50	12.62	30.00	4.74	4.54	5.89	11.58	65.33	77.50	-	-
1014	PBD 92	35.0	10.00	27.50	45.0	10.07	17.50	10.13	33.00	5.20	14.42	7.31	14.90	66.17	82.50	-	-
1015	FDK 324	20.0	5.00	20.00	32.0	12.27	12.50	10.69	24.00	5.15	7.96	6.63	9.60	74.00	87.50	-	-
1016	Local Check	25.0	7.50	10.00	30.4	14.87	12.50	8.85	22.00	7.17	7.55	4.97	9.52	55.33	87.50	-	-

BT- Bathinda; FA- Faridkot; HI – Hisar; SG- Sriganaganagar;

Table: 13. Ent1a. Br 25a: Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at North Zone.

Entry code	Name of entry	Jassid Injury Grade(JIG)*				No. of Jassid/ 3leaves				Whitefly/ 3 leaves				Thrips / 3 leaves			
		FA	BT	HI	SG	FA	BT	HI	SG	FA	BT	HI	SG	FA	BT	HI	SG
1021	KR 149	-	II	I	I	0.50	4.80	0.80	0.5	2.50	7.20	4.40	2.5	4.00	8.30	3.60	6.1
1022	Local Check	-	II	I	I	0.50	4.90	0.70	0.4	2.00	9.20	4.70	1.9	3.83	7.90	4.30	5.6
1023	CISAA 19-3	-	II	I	I	0.83	4.70	1.00	1.0	2.67	7.60	6.00	3.9	2.67	8.00	5.30	5.8
1024	CISAA 19-4	-	II	I	I	0.83	5.80	0.90	0.5	2.00	7.70	5.30	2.1	3.83	7.00	4.30	6.3
1025	Zonal Check (KR 64)	-	II	I	I	1.00	5.30	0.90	0.8	2.67	8.20	6.20	2.9	4.33	9.00	4.30	6.4
1026	KR 150	-	II	I	I	1.33	4.70	1.10	0.6	2.50	8.80	9.30	2.8	3.17	8.70	4.90	6.1
1027	KR 148	-	II	I	I	0.50	3.80	1.00	0.7	2.67	6.60	6.40	2.7	2.67	8.00	5.40	9.2

BT- Bathinda; FA- Faridkot; HI – Hisar; SG- Sriganaganagar;

*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 leaves)



Table: 14. Ent1a Br 25a: Preliminary screening of breeding material for resistance to insect pest of cotton (Natural Enemies & Bollworm) - NZ.

Entry code	Name of entry	Natural Enemies/ Plant*				Rosette flower (%) due to PBW				Green Boll Damage (%) due to ABW/SBW/TC			
		FA	BT	HI	SG	FA	BT	HI	SG	FA	BT	HI	SG
1021	KR 149	5.67	1.30	-	2.0	0.0	0.0	0.0	0.0	8.17	2.50	12.50	29.5
1022	Local Check	6.17	1.50	-	2.5	0.0	0.0	0.0	0.0	5.51	0.00	22.50	29.1
1023	CISAA 19-3	3.00	1.60	-	2.0	0.0	0.0	0.0	0.0	8.81	0.00	15.00	29.1
1024	CISAA 19-4	4.00	1.60	-	3.0	0.0	0.0	0.0	0.0	9.53	2.50	15.00	15.4
1025	Zonal Check (KR 64)	3.83	1.20	-	3.0	0.0	0.0	0.0	0.0	6.20	2.50	10.00	11.4
1026	KR 150	4.50	1.40	-	1.5	0.0	0.0	0.0	0.0	10.82	0.00	17.50	32.4
1027	KR 148	4.67	1.50	-	2.5	0.0	0.0	0.0	0.0	7.91	2.50	15.00	33.4

BT- Bathinda; FA- Faridkot; HI – Hisar; SG- Sriganganagar

* Natural Enemies include coccinellids, chrysopids, syrphids and spider

** Fruiting Body damage includes damage in squares, flowers and boll.

Table: 15. Ent1a. Br 25a: Preliminary screening of breeding material for resistance to insect pest of cotton (Bollworm) at North Zone during 2021-22.

Entry code	Name of entry	Green Boll Damage (%) due to PBW				Open Boll damage				Open Locule Damage (%)				Good Open Bolls			
		FA	BT	HI	SG	FA	BT	HI	SG	FA	BT	HI	SG	FA	BT	HI	SG
1021	KR 149	15.0	17.5	20.00	28.0	12.36	22.5	13.10	13.0	5.66	6.10	7.32	5.82	79.00	77.5	-	-
1022	Local Check	25.0	5.00	30.00	35.4	9.58	12.5	5.84	18.2	4.39	3.16	2.80	8.56	79.17	87.5	-	-
1023	CISAA 19-3	20.0	7.50	20.00	30.0	10.05	12.5	8.07	13.2	4.02	2.08	2.98	6.03	55.00	87.5	-	-
1024	CISAA 19-4	25.0	10.0	15.00	33.0	12.36	15.0	7.94	15.6	5.51	6.03	4.31	7.89	65.83	85.0	-	-
1025	Zonal Check (KR 64)	25.0	12.5	20.00	41.3	9.76	17.5	9.36	24.0	4.59	3.11	2.52	11.76	71.33	82.5	-	-
1026	KR 150	25.0	2.50	20.00	47.0	14.10	10.0	7.20	32.0	6.44	5.41	2.78	14.81	69.83	90.0	-	-
1027	KR 148	30.0	7.50	15.00	38.0	12.63	12.5	11.30	22.0	6.42	4.45	6.56	10.13	68.50	87.5	-	-

BT- Bathinda; FA- Faridkot; HI – Hisar; SG- Sriganganagar



Table: 16. Ent1a. Br. 02 a/b CC: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Jassid Injury Grade(JIG)*		No. of Jassid/ 3leaves		Whitefly/ 3 leaves		Thrips / 3 leaves	
		SU	KH	SU	KH	SU	KH	SU	KH
131	CNH 21198	II	-	6.20	4.60	4.27	15.87	24.60	-
132	ZC (Phule Yamuna)	I	-	1.53	4.50	3.07	19.09	16.33	-
133	CNH 20449	I	-	1.67	3.10	2.80	19.82	15.60	-
134	LHCC 23	III	-	7.33	3.50	3.93	19.47	23.20	-
135	Local Check	I	-	1.80	3.90	3.13	15.32	16.80	-
136	CCH 20452	I	-	1.40	4.40	2.87	17.05	14.33	-
137	DHCC 2151	II	-	6.87	3.30	4.53	21.19	24.73	-

SU- Surat, KH- Khandwa

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. 02 a/b CC: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Aphid/3 leaves		Natural Enemies/ Plant*		Rosette flower (%) due to PBW		Green Boll Damage (%) due to ABW/SBW	
		SU	KH	SU	KH	SU	KH	SU	KH
131	CNH 21198	33.47	12.80	1.27	-	2.72	-	4.57	75.00
132	ZC (Phule Yamuna)	17.80	11.85	1.87	-	0.00	-	1.51	65.00
133	CNH 20449	18.67	18.14	1.60	-	0.00	-	1.92	55.00
134	LHCC 23	30.27	19.92	1.87	-	3.96	-	4.13	60.00
135	Local Check	17.27	12.24	1.47	-	0.00	-	1.91	65.00
136	CCH 20452	20.73	16.74	1.80	-	1.11	-	3.19	45.00
137	DHCC 2151	27.40	19.74	1.60	-	4.15	-	7.84	50.00

SU- Surat, KH- Khandwa

* Natural Enemies include coccinellids, chrysopids, syrphids and spider

** Fruiting Body damage includes damage in squares, flowers and boll



Table: 18. Ent1a Br. 02 a/b CC: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of Entry	Green Boll Damage (%) due to PBW		Open Boll damage Due (%) to PBW		Open Locule Damage (%) due to PBW		Good Open Bolls	
		SU	KH	SU	KH	SU	KH	SU	KH
131	CNH 21198	5.00	55.00	4.39	-	1.44	-	33.33	-
132	ZC (Phule Yamuna)	1.67	60.00	1.16	-	0.37	-	37.67	-
133	CNH 20449	1.67	65.00	0.83	-	0.17	-	40.00	-
134	LHCC 23	5.00	45.00	3.71	-	1.28	-	28.00	-
135	Local Check	0.00	70.00	0.67	-	0.17	-	36.33	-
136	CCH 20452	3.33	40.00	3.84	-	1.44	-	32.67	-
137	DHCC 2151	8.33	55.00	6.94	-	2.40	-	32.00	-

Table: 19. Ent1a. Br. 22 a/b IET: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Jassid Injury Grade(JIG)*		No. of Jassid/ 3leaves		Whitefly/ 3 leaves		Thrips / 3 leaves		Aphids/ 3 leaves		Natural Enemies/ Plant*		Rosette flower (%) due to PBW		Green Boll Damage (%) due to ABW/SBW		Green Boll Damage (%) due to PBW		Open Boll damage Due(%) to PBW	
		AK	KH	AK	KH	AK	KH	AK	KH	AK	KH	AK	KH	AK	KH	AK	KH	AK	KH	AK	KH
141	JLA 1204	-	-	-	3.15	-	11.34	-	-	-	11.40	-	-	-	-	-	50.0	-	60.0	-	-
142	PAIG 421	-	-	-	1.80	-	8.34	-	-	-	8.02	-	-	-	-	-	55.0	-	55.0	-	-
143	CNA19086	-	-	-	4.30	-	21.90	-	-	-	18.80	-	-	-	-	-	70.0	-	50.0	-	-
144	PA 908	-	-	-	3.25	-	25.92	-	-	-	16.75	-	-	-	-	-	40.0	-	65.0	-	-
145	ZC (AKA 7)	-	-	-	4.10	-	22.04	-	-	-	21.29	-	-	-	-	-	45.0	-	65.0	-	-
146	PA 907	-	-	-	3.74	-	21.20	-	-	-	18.70	-	-	-	-	-	35.0	-	50.0	-	-
147	CNA 1080	-	-	-	3.54	-	22.69	-	-	-	23.02	-	-	-	-	-	65.0	-	65.0	-	-
148	GAM 283	-	-	-	5.80	-	17.55	-	-	-	19.75	-	-	-	-	-	60.0	-	65.0	-	-
149	CNA 1081	-	-	-	3.00	-	21.25	-	-	-	20.57	-	-	-	-	-	75.0	-	55.0	-	-
150	QC (PA 255)	-	-	-	2.30	-	24.99	-	-	-	18.49	-	-	-	-	-	65.0	-	75.0	-	-
151	CNA 1077	-	-	-	2.25	-	24.65	-	-	-	20.80	-	-	-	-	-	65.0	-	50.0	-	-
152	GAM 276	-	-	-	2.35	-	22.20	-	-	-	16.69	-	-	-	-	-	55.0	-	50.0	-	-
153	PA 906	-	-	-	3.70	-	21.74	-	-	-	20.44	-	-	-	-	-	50.0	-	70.0	-	-
154	AKA 2016-11	-	-	-	3.39	-	22.29	-	-	-	19.85	-	-	-	-	-	85.0	-	65.0	-	-
155	LC	-	-	-	2.20	-	21.05	-	-	-	20.20	-	-	-	-	-	45.0	-	55.0	-	-
156	CNA1076	-	-	-	4.40	-	17.00	-	-	-	19.79	-	-	-	-	-	60.0	-	65.0	-	-
157	JLA 1440	-	-	-	5.80	-	23.65	-	-	-	18.44	-	-	-	-	-	65.0	-	50.0	-	-
158	PAIG 420	-	-	-	1.55	-	27.30	-	-	-	19.04	-	-	-	-	-	55.0	-	55.0	-	-

SU- Surat, KH- Khandwa;

AK- Akola, KH- Khandwa



Table: 20. Ent1a. Br. 32 b IET: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Jassid Injury Grade(JIG)*		No. of Jassid/ 3leaves		Whitefly/ 3 leaves		Thrips / 3 leaves	
		SU	BH	SU	BH	SU	BH	SU	BH
171	GShv 831/17	I	I	1.60	3.07	4.20	0.13	10.33	1.20
172	GVhv 1014	I	I	2.07	2.53	3.67	0.00	10.47	1.40
173	GShv 807/17	I	I	1.07	1.60	3.20	0.47	9.00	1.27
174	GVhv 1028	I	I	2.13	0.93	4.00	0.60	11.40	0.40
175	ZC (G Cot 23)	I	I	0.93	2.60	2.80	0.80	9.27	2.27
176	GVhv 1172	I	I	2.40	1.27	3.53	0.80	11.67	1.87
177	GShv 810/17	I	I	4.20	3.33	3.93	0.80	10.67	2.20
178	LC	I	I	1.00	2.60	3.00	0.47	8.53	1.80

SU- Surat, BH- Bharuch

Table: 21. Ent1a. Br. 32 b IET: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	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
171	GShv 831/17	13.73	13.47	1.07	0.13	5.67	0.00	8.94	0.00
172	GVhv 1014	15.13	10.33	1.27	0.27	4.70	0.00	10.00	0.00
173	GShv 807/17	11.20	17.33	1.47	0.40	2.58	0.83	3.08	0.00
174	GVhv 1028	13.07	17.73	1.20	0.33	8.59	0.00	10.24	3.33
175	ZC (G Cot 23)	12.27	11.20	1.33	0.27	1.11	0.83	3.10	0.00
176	GVhv 1172	14.60	13.73	1.07	0.40	5.28	0.00	11.10	0.00
177	GShv 810/17	14.07	11.53	1.13	0.33	7.54	1.67	10.42	0.00
178	LC	12.87	10.87	1.40	0.27	2.39	0.00	3.49	3.33

SU- Surat, BH- Bharuch



Table: 22. Ent1a. Br. 32 b IET: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Green Boll Damage (%) due to PBW		Open Boll damage Due (%) to PBW		Open Locule Damage (%) due to PBW		Good Open Bolls	
		SU	BH	SU	BH	SU	BH	SU	BH
171	GShv 831/17	6.67	0.00	9.76	0.00	3.84	0.00	31.67	49.17
172	GVhv 1014	5.00	0.00	9.44	0.00	3.95	0.00	28.33	50.00
173	GShv 807/17	5.00	3.33	5.94	3.33	2.82	1.67	37.00	49.17
174	GVhv 1028	5.00	0.00	9.63	3.33	3.84	1.67	28.33	49.17
175	ZC (G Cot 23)	3.33	3.33	7.02	0.00	3.16	0.00	39.00	50.00
176	GVhv 1172	8.33	3.33	10.41	3.33	4.18	1.67	27.67	48.33
177	GShv 810/17	5.00	3.33	9.22	0.00	3.72	0.00	27.33	49.17
178	LC	3.33	3.33	6.28	3.33	3.03	1.67	41.67	48.33

SU- Surat, BH- Bharuch

Table: 23. Ent1a. Br-03 a/b: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Jassid Injury Grade(JIG)*		No. of Jassid/ 3leaves		Whitefly/ 3 leaves		Thrips / 3 leaves	
		SU	KH	SU	KH	SU	KH	SU	KH
1111	CNH 19480	I	-	2.20	4.67	3.40	26.20	21.90	-
1112	Phule Yamuna (Zonal Check)	I	-	3.20	5.79	2.40	22.94	25.80	-
1113	CNH 18529	I	-	4.30	3.77	2.30	17.09	19.70	-
1114	DHCC 1901	II	-	6.70	3.12	3.60	22.45	23.30	-
1115	Local Check	I	-	4.00	6.19	4.80	22.27	33.60	-
1116	CNH 19325	I	-	4.50	3.10	4.60	30.20	28.60	-
1117	CNH 17395	I	-	3.60	6.98	2.30	26.29	26.60	-
1118	CNH 18528	II	-	5.20	2.10	3.50	23.25	24.50	-

SU- Surat, BH- Bharuch



Table: 24. Ent1a. Br-03 a/b: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Aphids/3 leaves		Natural Enemies/ Plant*		Rosette flower (%) due to PBW		Green Boll Damage (%) due to ABW/SBW	
		SU	KH	SU	KH	SU	KH	SU	KH
1111	CNH 19480	23.80	23.84	1.40	-	2.27	-	7.46	55.00
1112	Phule Yamuna (Zonal Check)	34.80	24.09	1.70	-	2.08	-	5.07	60.00
1113	CNH 18529	30.20	18.14	1.60	-	6.73	-	12.16	55.00
1114	DHCC 1901	33.10	23.59	1.30	-	6.63	-	14.78	70.00
1115	Local Check	24.70	22.72	1.40	-	0.00	-	7.67	85.00
1116	CNH 19325	22.30	23.15	1.20	-	1.92	-	6.71	65.00
1117	CNH 17395	37.40	23.19	1.30	-	0.00	-	6.55	75.00
1118	CNH 18528	31.90	21.89	1.70	-	7.83	-	9.84	60.00

SU- Surat, KH- Khandwa

Table: 25. Ent1a. Br-03 a/b: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Green Boll Damage (%) due to PBW		Open Boll damage Due(%) to PBW		Open Locule Damage (%) due to PBW		Good Open Bolls	
		SU	KH	SU	KH	SU	KH	SU	KH
1111	CNH 19480	2.50	55.00	6.52	-	2.94	-	42.50	-
1112	Phule Yamuna (Zonal Check)	2.50	45.00	6.11	-	2.77	-	53.00	-
1113	CNH 18529	7.50	60.00	11.61	-	5.00	-	40.00	-
1114	DHCC 1901	12.50	60.00	13.33	-	6.13	-	38.00	-
1115	Local Check	2.50	65.00	8.20	-	4.10	-	24.00	-
1116	CNH 19325	5.00	50.00	7.17	-	3.66	-	37.00	-
1117	CNH 17395	7.50	70.00	7.90	-	3.73	-	44.00	-
1118	CNH 18528	12.50	65.00	11.53	-	4.80	-	43.50	-

SU- Surat, KH- Khandwa



Table: 26. Ent1a. Br-04 a: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Jassid Injury Grade(JIG)*					No. of Jassid/ 3leaves					Whitefly/ 3 leaves					Thrips / 3 leaves				
		JU	SU	RA	KH	BW	JU	SU	RA	KH	BW	JU	SU	RA	KH	BW	JU	SU	RA	KH	BW
1121	GJHV 568	II	II	I	-	II	12.2	7.70	2.83	3.22	6.19	12.20	4.80	1.61	7.87	1.65	13.90	18.30	17.33	-	8.51
1122	TCH 1941	II	II	I	-	II	12.8	6.70	2.61	5.72	6.49	12.80	5.00	1.61	22.94	1.96	15.70	28.10	20.39	-	7.53
1123	Quality Check (Suraj)	II	II	II	-	I	11.6	7.40	3.33	1.84	4.38	11.60	4.00	1.72	7.59	1.56	13.60	32.40	21.94	-	6.31
1124	GJHV 566	II	I	II	-	0	16.5	5.60	3.22	2.14	3.85	16.50	3.60	2.00	22.45	1.53	18.40	21.90	17.89	-	6.86
1125	ZC (Phule Yamuna)	II	I	I	-	II	14.2	2.80	2.94	6.19	5.80	14.20	2.50	2.00	21.65	1.82	16.60	18.00	23.67	-	8.49
1126	GJHV 548	I	I	II	-	II	10.0	4.30	3.22	3.10	6.71	10.00	4.50	1.94	28.80	2.18	11.20	22.60	17.67	-	7.53
1127	LC	II	I	-	-	I	10.5	4.00	-	6.34	4.29	10.50	4.80	-	26.29	2.02	12.70	20.00	-	-	6.59
1128	GISV 328	II	I	II	-	I	12.9	2.40	3.06	1.79	4.29	12.90	2.90	2.00	22.70	1.69	16.10	24.40	19.50	-	7.53

JU- Junagadh, SU- Surat, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna

*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 leaves)

Table: 27. Ent1a Br-04 a: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Aphids/3 leaves					Natural Enemies/ Plant*					Rosette flower (%) due to PBW					Green Boll Damage (%) due to ABW/SBW				
		JU	SU	RA	KH	BW	JU	SU	RA	KH	BW	JU	SU	RA	KH	BW	JU	SU	RA	KH	BW
1121	GJHV 568	16.5	31.00	16.28	19.15	26.89	-	1.50	0.26	-	0.74	-	11.31	10.50	-	0.00	-	8.85	11.02	55.00	6.53
1122	TCH 1941	17.7	25.00	16.78	23.44	24.93	-	1.40	0.28	-	0.76	-	8.42	10.25	-	0.00	-	12.88	11.25	65.00	6.97
1123	Quality Check (Suraj)	16.2	35.40	16.17	10.72	12.64	-	1.20	0.30	-	0.89	-	6.92	8.20	-	0.00	-	14.74	9.86	70.00	6.46
1124	GJHV 566	20.6	26.00	14.67	23.94	16.24	-	1.40	0.44	-	0.87	-	5.95	9.60	-	0.00	-	7.46	10.38	75.00	5.03
1125	ZC (Phule Yamuna)	19.0	21.40	22.61	19.90	13.60	-	1.30	0.39	-	0.73	-	2.08	8.50	-	0.00	-	3.62	9.00	80.00	6.34
1126	GJHV 548	13.6	33.60	13.50	18.04	14.44	-	1.20	0.39	-	0.71	-	2.50	8.40	-	0.00	-	5.43	9.24	65.00	7.82
1127	LC	14.8	30.50	-	23.35	13.67	-	1.50	-	-	0.80	-	6.72	-	-	0.00	-	7.51	-	75.00	7.00
1128	GISV 328	18.0	24.50	14.94	19.39	15.63	-	1.30	0.33	-	0.91	-	2.08	10.10	-	0.00	-	4.53	10.17	55.00	6.07

JU- Junagadh, SU- Surat, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna

* Natural Enemies include coccinellids, chrysopids, syrphids and spider

** Fruiting Body damage includes damage in squares, flowers and boll



Table: 28. Ent1a. Br-04 a: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Green Boll Damage (%) due to PBW					Open Boll damage Due(%) to PBW					Open Locule Damage (%) due to PBW					Good Open Bolls				
		JU	SU	RA	KH	BW	JU	SU	RA	KH	BW	JU	SU	RA	KH	BW	JU	SU	RA	KH	BW
1121	GJHV 568	22.97	10.00	35.00	65.00	0.00	25.85	11.66	50.79	-	0.00	20.16	5.31	21.16	-	0.00	-	33.00	-	-	-
1122	TCH 1941	23.86	7.50	25.00	60.00	0.00	27.70	14.45	42.96	-	0.00	21.05	6.71	17.90	-	0.00	-	25.50	-	-	-
1123	Quality Check (Suraj)	22.64	7.50	20.00	60.00	0.00	25.63	15.49	34.27	-	0.00	20.05	7.59	14.28	-	0.00	-	24.50	-	-	-
1124	GJHV 566	32.74	7.50	25.00	55.00	0.00	36.64	8.67	41.07	-	0.00	26.92	3.93	17.08	-	0.00	-	37.00	-	-	-
1125	ZC (Phule Yamuna)	26.94	2.50	30.00	60.00	0.00	30.34	5.54	39.07	-	0.00	22.59	3.03	16.28	-	0.00	-	35.50	-	-	-
1126	GJHV 548	20.44	10.00	20.00	50.00	0.00	22.91	9.68	30.99	-	0.00	17.90	4.85	12.91	-	0.00	-	34.00	-	-	-
1127	LC	22.07	7.50	-	70.00	0.00	24.31	9.70	-	-	0.00	19.28	4.20	-	-	0.00	-	32.50	-	-	-
1128	GISV 328	23.83	2.50	25.00	55.00	0.00	27.78	6.89	35.21	-	0.00	21.55	3.06	14.67	-	0.00	-	35.00	-	-	-

JU- Junagadh, SU- Surat, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna

Table: 29. Ent1a. Br-04 b: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Jassid Injury Grade(JIG)*				No. of Jassid/ 3leaves				Whitefly/ 3 leaves				Thrips / 3 leaves			
		BA	BH	AK	NA	BA	BH	AK	NA	BA	BH	AK	NA	BA	BH	AK	NA
1131	ZC (NH 615)	II	I	II	II	5.00	3.93	4.60	3.70	14.00	0.40	2.50	6.73	-	2.27	-	8.13
1132	CNH 119	II	I	II	III	3.33	2.47	4.30	4.43	8.67	0.07	3.90	8.68	-	1.27	-	13.03
1133	Local Check	III	I	II	III	7.33	4.67	7.00	4.58	15.33	0.73	3.00	9.25	-	1.80	-	13.65
1134	TVH 007	II	I	II	III	5.33	4.60	4.40	4.28	13.67	0.87	3.00	7.98	-	0.53	-	10.58
1135	RAH 1081	II	I	II	III	4.00	4.33	5.50	4.75	11.00	1.40	2.80	10.35	-	3.00	-	16.05
1136	AKH 2013-2	III	I	I	III	6.70	3.60	2.70	4.50	15.00	1.40	4.30	9.00	-	2.07	-	11.65
1137	Quality Check (Suraj)	III	I	II	III	8.00	3.60	4.00	4.88	16.67	1.40	2.50	8.13	-	2.33	-	14.78
1138	AKH 2013-3	II	I	I	II	4.67	4.33	2.90	3.28	13.00	0.73	2.40	7.18	-	2.07	-	7.28

BA- Banswara, BH- Bharuch, AK- Akola, NA- Nanded

*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 leaves)



Table: 30. Ent1a Br-04 b: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Aphids/3 leaves				Natural Enemies/ Plant*				Rosette flower (%) due to PBW				Green Boll Damage (%) due to ABW/SBW			
		BA	BH	AK	NA	BA	BH	AK	NA	BA	BH	AK	NA	BA	BH	AK	NA
1131	ZC (NH 615)	-	15.67	-	17.85	-	0.27	-	1.05	-	0.83	-	11.27	-	6.67	-	2.50
1132	CNH 119	-	11.73	-	24.70	-	0.20	-	1.30	-	0.00	-	13.53	-	3.33	-	3.33
1133	Local Check	-	21.60	-	27.75	-	0.20	-	1.45	-	2.50	-	20.89	-	13.33	-	2.50
1134	TVH 007	-	21.93	-	23.10	-	0.40	-	1.25	-	0.00	-	15.56	-	3.33	-	3.33
1135	RAH 1081	-	13.67	-	31.30	-	0.33	-	1.45	-	2.50	-	14.00	-	10.00	-	5.00
1136	AKH 2013-2	-	16.60	-	23.70	-	0.27	-	1.25	-	0.83	-	14.17	-	10.00	-	4.17
1137	Quality Check (Suraj)	-	16.33	-	23.18	-	0.47	-	1.25	-	2.50	-	13.44	-	6.67	-	2.50
1138	AKH 2013-3	-	13.60	-	15.60	-	0.33	-	0.90	-	0.00	-	12.94	-	6.67	-	2.50

BA- Banswara, BH- Bharuch, AK- Akola, NA- Nanded

* Natural Enemies include coccinellids, chrysopids, syrphids and spider

** Fruiting Body damage includes damage in squares, flowers and boll

Table: 31. Ent1a. Br-04 b: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Green Boll Damage (%) due to PBW				Open Boll damage Due(%) to PBW				Open Locule Damage (%) due to PBW				Good Open Bolls			
		BA	BH	AK	NA	BA	BH	AK	NA	BA	BH	AK	NA	BA	BH	AK	NA
1131	ZC (NH 615)	-	3.33	-	26.65	-	0.00	51.02	23.25	-	0.00	33.16	11.90	95	47.50	-	65.15
1132	CNH 119	-	0.00	-	21.46	-	0.00	70.62	19.05	-	0.00	39.50	10.30	104	49.17	-	70.90
1133	Local Check	-	6.67	-	31.47	-	3.33	62.31	27.85	-	1.67	26.42	14.58	84	47.50	-	63.40
1134	TVH 007	-	6.67	-	17.75	-	0.00	54.83	14.45	-	0.00	25.75	8.15	90	45.83	-	75.25
1135	RAH 1081	-	6.67	-	32.25	-	3.33	53.30	28.40	-	1.67	26.98	14.75	93	47.50	-	62.63
1136	AKH 2013-2	-	6.67	-	20.10	-	3.33	64.03	16.15	-	1.67	31.05	8.80	89	44.17	-	74.85
1137	Quality Check (Suraj)	-	3.33	-	21.83	-	0.00	64.81	17.59	-	0.00	40.26	9.60	73	49.17	-	69.20
1138	AKH 2013-3	-	3.33	-	20.42	-	0.00	50.65	17.23	-	0.00	23.27	9.35	91	45.83	-	72.08

BA- Banswara, BH- Bharuch, AK- Akola, NA- Nanded



Table: 32. Ent1a. Br-24 b: Preliminary screening of breeding material for resistance to insect pest of cotton at Central Zone during 2021-22.

Entry code	Name of entry	Jassid Injury Grade(JIG)*		No. of Jassid/ 3leaves		Whitefly/ 3 leaves		Thrips / 3 leaves	
		AK	KH	AK	KH	AK	KH	AK	KH
1141	PA 873	I	-	1.70	3.85	7.00	22.75	-	-
1142	LC	I	-	2.20	3.65	4.90	12.30	-	-
1143	CNA 1072	I	-	2.00	4.30	6.50	21.90	-	-
1144	PA 904	I	-	2.40	4.15	5.50	25.92	-	-
1145	GAM 269	I	-	2.30	4.55	4.20	23.49	-	-
1146	QC (PA 255)	I	-	1.30	3.74	3.20	22.50	-	-
1147	PAIG 411	I	-	2.30	4.64	4.70	25.05	-	-
1148	NDLA 3116-3	I	-	1.80	4.60	4.50	18.65	-	-
1149	PA 869	I	-	2.00	3.00	3.50	22.65	-	-
1150	JLA-1430	I	-	2.00	2.30	3.70	26.60	-	-
1151	CNA 1075	-	-	-	2.25	-	24.65	-	-
1152	NDLA 3104-4	I	-	1.40	2.35	5.70	23.85	-	-
1153	GAM 266	I	-	2.10	3.70	5.10	24.05	-	-
1154	PAIG 410	I	-	2.70	3.39	4.00	22.29	-	-
1155	CNA 1071	I	-	2.80	3.30	3.50	24.15	-	-
1156	ZC (AKA 7)	I	-	2.30	3.70	3.00	17.00	-	-
1157	AKA 2013-8	I	-	3.20	5.80	4.20	25.70	-	-

AK- Akola, KH- Khandwa

*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 leaves)



Table: 33.Ent1a Br-24 b : Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at Central Zone.

Entry code	Name of entry	Aphids/ 3 leaves		Natural Enemies/ Plant*		Rosette flower (%) due to PBW		Green Boll Damage (%) due to ABW/SBW	
		AK	KH	AK	KH	AK	KH	AK	KH
1141	PA 873	-	20.65	-	-	-	-	-	55.00
1142	LC	-	8.79	-	-	-	-	-	55.00
1143	CNA 1072	-	18.80	-	-	-	-	-	60.00
1144	PA 904	-	16.75	-	-	-	-	-	45.00
1145	GAM 269	-	21.79	-	-	-	-	-	50.00
1146	QC (PA 255)	-	19.70	-	-	-	-	-	55.00
1147	PAIG 411	-	23.02	-	-	-	-	-	65.00
1148	NDLA 3116-3	-	20.20	-	-	-	-	-	75.00
1149	PA 869	-	20.79	-	-	-	-	-	65.00
1150	JLA-1430	-	20.44	-	-	-	-	-	70.00
1151	CNA 1075	-	21.15	-	-	-	-	-	45.00
1152	NDLA 3104-4	-	17.29	-	-	-	-	-	60.00
1153	GAM 266	-	20.44	-	-	-	-	-	45.00
1154	PAIG 410	-	19.85	-	-	-	-	-	75.00
1155	CNA 1071	-	22.15	-	-	-	-	-	45.00
1156	ZC (AKA 7)	-	19.79	-	-	-	-	-	60.00
1157	AKA 2013-8	-	20.89	-	-	-	-	-	65.00

AK- Akola, KH- Khandwa

* Natural Enemies include coccinellids, chrysopids, syrphids and spider

** Fruiting Body damage includes damage in squares, flowers and boll



Table: 34. Ent1a. Br-24 b: Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at Central Zone.

Entry code	Name of entry	Green Boll Damage (%) due to PBW		Open Boll damage Due(%) to PBW		Open Locule Damage (%) due to PBW		Good Open Bolls	
		AK	KH	AK	KH	AK	KH	AK	KH
1141	PA 873	-	40.0	43.13	-	18.23	-	-	-
1142	LC	-	45.0	37.53	-	15.85	-	-	-
1143	CNA 1072	-	50.0	68.36	-	45.76	-	-	-
1144	PA 904	-	30.0	42.26	-	20.58	-	-	-
1145	GAM 269	-	55.0	46.30	-	21.32	-	-	-
1146	QC (PA 255)	-	50.0	27.07	-	9.55	-	-	-
1147	PAIG 411	-	65.0	40.12	-	18.82	-	-	-
1148	NDLA 3116-3	-	55.0	36.70	-	16.38	-	-	-
1149	PA 869	-	55.0	55.27	-	25.50	-	-	-
1150	JLA-1430	-	75.0	61.97	-	27.98	-	-	-
1151	CNA 1075	-	45.0	NG	-	NG	-	-	-
1152	NDLA 3104-4	-	50.0	36.18	-	14.72	-	-	-
1153	GAM 266	-	70.0	59.34	-	25.73	-	-	-
1154	PAIG 410	-	55.0	46.88	-	20.45	-	-	-
1155	CNA 1071	-	65.0	74.57	-	26.80	-	-	-
1156	ZC (AKA 7)	-	20.0	21.13	-	9.01	-	-	-
1157	AKA 2013-8	-	35.0	63.24	-	20.04	-	-	-

AK- Akola, KH- Khandwa

Table: 35. Ent1a. Br-14 a: Preliminary screening of breeding material for resistance to insect pest of cotton at Rahuri (Central Zone) during 2021-22.

Entry Code	Name of entry	JIG	No. of Jassid/ 3leaves	Whitefly/ 3 leaves	Thrips/3 leaves	Aphids/ 3 leaves	Natural Enemies/ Plant*	Rosette flower (%) due to PBW	Green Boll Damage (%) due to ABW/SBW	Green Boll Damage (%) due to PBW	Open Boll damage Due(%) to PBW	Open Locule Damage (%) due PBW
1251	CCB 29	I	4.1	2.8	15.4	12.9	0.4	10.3	12.5	35.0	50.3	25.4
1252	CCB 26	II	4.0	2.4	16.9	14.3	0.3	7.2	8.8	20.0	28.4	12.8
1253	CCB 51	II	3.9	2.3	15.9	14.7	0.4	12.4	23.2	25.0	44.6	21.6
1254	DB 1901	II	3.9	2.4	16.9	13.9	0.3	11.4	31.1	25.0	36.8	17.9
1255	ZC (Suvini)	-	-	-	-	-	-	-	-	-	-	-
1256	SBSD 5-6	I	3.7	2.5	18.3	14.5	0.5	12.3	32.1	55.0	81.6	36.8
1257	CCB 2	I	3.2	2.1	15.6	14.9	0.4	7.5	9.0	60.0	80.2	36.1
1258	CCB 1	I	2.8	1.9	15.1	14.9	0.4	8.4	9.9	50.0	63.6	28.7
1259	CCB 6	I	3.6	1.9	16.7	13.0	0.4	7.1	8.7	55.0	65.7	29.6

Table: 36. Ent1a. Br-24b: Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at Central Zone.

Entry code	Name of entry	Jassid Injury Grade(JIG)*		No. of Jassid/ 3leaves		Whitefly/ 3 leaves		Thrips / 3 leaves	
		SU	KH	SU	KH	SU	KH	SU	KH
1161	CNA 1092	I	-	2.50	4.12	3.80	23.19	19.10	-
1162	DDCC 1902	I	-	2.80	5.22	2.60	24.47	21.40	-
1163	CNA 18562	I	-	2.30	3.22	2.90	29.79	19.10	-
1164	Local Check	I	-	2.50	5.24	2.60	21.52	20.40	-
1165	CNA 18563	I	-	2.80	8.29	3.10	21.84	25.70	-
1166	DDCC 1901	I	-	2.50	4.97	2.50	26.14	25.80	-
1167	CNA 19475	I	-	2.30	5.27	4.00	26.29	24.50	-
1168	DDCC 2001	I	-	2.10	5.07	3.60	22.20	21.30	-
1169	CNA 20402	I	-	2.40	6.00	3.60	19.75	18.70	-
1170	AKA 7 (Zonal Check)	I	-	2.40	5.25	3.70	21.25	17.20	-

SU- Surat, KH- Khandwa

*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 leaves)



Table: 37. Ent1a Br-24 b: Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at Central Zone.

Entry code	Name of entry	Aphids/ 3 leaves		Natural Enemies/ Plant*		Rosette flower (%) due to PBW		Green Boll Damage (%) due to ABW/SBW	
		SU	KH	SU	KH	SU	KH	SU	KH
1161	CNA 1092	20.30	21.17	1.30	-	2.17	-	7.72	55.00
1162	DDCC 1902	25.40	24.44	1.70	-	1.72	-	12.27	70.00
1163	CNA 18562	24.10	13.57	1.40	-	0.00	-	11.17	75.00
1164	Local Check	21.20	24.57	1.20	-	1.79	-	4.42	55.00
1165	CNA 18563	23.50	26.07	1.70	-	2.08	-	5.81	85.00
1166	DDCC 1901	24.50	22.42	1.20	-	4.20	-	7.56	70.00
1167	CNA 19475	22.70	23.35	1.20	-	2.00	-	6.37	80.00
1168	DDCC 2001	22.90	19.07	1.60	-	1.92	-	9.51	60.00
1169	CNA 20402	31.60	21.00	1.60	-	2.27	-	11.17	50.00
1170	AKA 7 (Zonal Check)	32.90	19.35	1.50	-	1.61	-	12.28	65.00

SU- Surat, KH- Khandwa

* Natural Enemies include coccinellids, chrysopids, syrphids and spider

** Fruiting Body damage includes damage in squares, flowers and boll

Table: 38. Ent1a. Br-24b: Preliminary screening of breeding material for resistance to insect pest of cotton (Sucking pests) at Central Zone.

Entry code	Name of entry	Green Boll Damage (%) due to PBW		Open Boll damage Due(%) to PBW		Open Locule Damage (%) due PBW		Good Open Bolls	
		SU	KH	SU	KH	SU	KH	SU	KH
1161	CNA 1092	10.00	75.00	12.67	-	5.42	-	29.00	-
1162	DDCC 1902	15.00	70.00	13.45	-	5.89	-	14.00	-
1163	CNA 18562	12.50	65.00	11.29	-	4.59	-	31.00	-
1164	Local Check	20.00	50.00	6.67	-	3.32	-	48.50	-
1165	CNA 18563	17.50	60.00	9.19	-	4.60	-	36.00	-
1166	DDCC 1901	15.00	50.00	10.29	-	5.01	-	32.00	-
1167	CNA 19475	15.00	85.00	10.26	-	5.06	-	14.00	-
1168	DDCC 2001	10.00	55.00	10.16	-	4.34	-	24.00	-
1169	CNA 20402	12.50	50.00	13.65	-	6.41	-	11.00	-
1170	AKA 7 (Zonal Check)	10.00	45.00	12.73	-	5.50	-	21.50	-

SU- Surat, KH- Khandwa



Table: 39. Ent1a. Br-03 a/b (CC) :Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

Entry code	Name of entry	Jassid Injury Grade(JIG)*					No. of Jassid/ 3leaves					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
1211	CCHC 19-2	II	I	-	-	-	5.00	4.80	-	-	-	2.37	17.60	-	-	-	7.80	22.60	-	-	-
1212	DHCC 2151	III	I	-	-	-	6.33	4.87	-	-	-	1.90	17.70	-	-	-	7.07	22.10	-	-	-
1213	DHCC 2001	III	I	-	-	-	8.23	5.73	-	-	-	2.33	18.90	-	-	-	6.67	33.50	-	-	-
1214	Suraj (ZC)	II	I	-	-	-	6.57	4.80	-	-	-	2.73	10.00	-	-	-	8.33	25.10	-	-	-
1215	DHCC 2002	III	II	-	-	-	6.57	6.20	-	-	-	1.83	22.20	-	-	-	5.77	36.60	-	-	-
1216	DHCC 1902	III	I	-	-	-	5.70	5.60	-	-	-	3.27	18.30	-	-	-	6.47	32.10	-	-	-
1217	CNH 18529	II	I	-	-	-	5.00	4.53	-	-	-	2.60	13.70	-	-	-	6.73	19.20	-	-	-
1218	DHCC 1901	III	I	-	-	-	6.00	5.07	-	-	-	2.40	11.10	-	-	-	6.63	21.90	-	-	-
1219	Local Check	II	I	-	-	-	5.40	4.80	-	-	-	2.83	19.30	-	-	-	6.00	22.40	-	-	-
1220	CCHC 19-1	II	I	-	-	-	5.70	4.87	-	-	-	3.07	11.10	-	-	-	6.80	19.20	-	-	-
1221	LHCC 23	III	I	-	-	-	6.23	4.27	-	-	-	2.53	14.20	-	-	-	7.03	18.20	-	-	-

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: 40. Ent1a Br-03 a/b (CC) :Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

Entry code	Name of entry	Aphid/3 leaves					Natural Enemies/ Plant*					Rosette flower (%) due to PBW					Green Boll Damage (%) due to ABW/SBW				
		LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE
1211	CCHC 19-2	4.03	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1212	DHCC 2151	2.67	-	-	-	-	-	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-
1213	DHCC 2001	1.20	-	-	-	-	-	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-
1214	Suraj (ZC)	3.27	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1215	DHCC 2002	1.23	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1216	DHCC 1902	2.30	-	-	-	-	-	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-
1217	CNH 18529	1.93	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1218	DHCC 1901	1.13	-	-	-	-	-	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-
1219	Local Check	2.27	-	-	-	-	-	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-
1220	CCHC 19-1	2.70	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1221	LHCC 23	1.87	-	-	-	-	-	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CBE- Coimbatore

* Natural Enemies include coccinellids, chrysopids, syrphids and spider

** Fruiting Body damage includes damage in squares, flowers and boll



Table: 41. Ent1a Br-03 a/b (CC) :Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

Entry code	Name of Entry	Green Boll Damage (%) due to PBW					Open Boll damage (%) Due to PBW					Open Locule Damage (%) due to PBW					Good Open Bolls				
		LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE	LG	ND	DW	RC	CBE
1211	CCHC 19-2	80.00	70.0	-	-	-	27.12	70.0	-	-	-	12.24	6.37	-	-	-	-	-	-	-	-
1212	DHCC 2151	30.00	50.0	-	-	-	30.86	45.0	-	-	-	13.55	3.80	-	-	-	-	-	-	-	-
1213	DHCC 2001	30.00	53.3	-	-	-	24.04	45.0	-	-	-	9.88	3.47	-	-	-	-	-	-	-	-
1214	Suraj (ZC)	60.00	56.7	-	-	-	23.53	51.7	-	-	-	11.37	4.13	-	-	-	-	-	-	-	-
1215	DHCC 2002	20.00	53.3	-	-	-	26.41	45.0	-	-	-	11.92	5.30	-	-	-	-	-	-	-	-
1216	DHCC 1902	30.00	55.0	-	-	-	26.60	55.0	-	-	-	11.59	6.30	-	-	-	-	-	-	-	-
1217	CNH 18529	30.00	66.7	-	-	-	31.14	61.7	-	-	-	10.28	5.87	-	-	-	-	-	-	-	-
1218	DHCC 1901	30.00	60.0	-	-	-	16.13	60.0	-	-	-	7.98	5.83	-	-	-	-	-	-	-	-
1219	Local Check	0.00	60.0	-	-	-	24.77	55.0	-	-	-	10.66	5.30	-	-	-	-	-	-	-	-
1220	CCHC 19-1	70.00	68.3	-	-	-	35.80	61.7	-	-	-	16.80	4.50	-	-	-	-	-	-	-	-
1221	LHCC 23	60.00	46.7	-	-	-	39.79	35.0	-	-	-	17.79	4.07	-	-	-	-	-	-	-	-

Table: 42. Ent1a. Br-04a: Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

Entry code	Name of entry	Jassid Injury Grade(JIG)*			No. of Jassid/ 3leaves			Whitefly/ 3 leaves			Thrips / 3 leaves		
		LG	RC	SVPR	LG	RC	SVPR	LG	RC	SVPR	LG	RC	SVPR
1231	TSH 383	II	II	IV	5.97	4.33	6.3	2.57	3.03	0.9	6.80	5.96	3.43
1232	TSH 387	II	II	II	6.10	2.67	4.5	3.83	2.64	0.6	7.30	13.88	3.23
1233	RAH 1083	III	II	III	6.30	6.00	5.9	2.10	5.07	0.9	7.30	6.95	3.6
1234	TCH 1941	II	III	III	5.53	5.33	5.9	2.17	3.45	0.6	6.93	7.94	3.5
1235	ZC (Suraj)	III	II	II	6.30	5.33	4.3	2.40	3.04	0.7	7.33	4.96	3.3
1236	SHSV 14	III	II	II	5.77	4.67	4.7	3.47	2.64	1.1	7.37	9.92	2.97
1237	CCH 19-2	II	II	III	5.47	4.00	5.9	3.00	4.26	1.2	8.97	9.92	3.7
1238	RAH 1082	II	II	IV	6.27	5.00	6.3	3.97	4.66	0.7	7.93	11.90	3.97
1239	LC	III	III	III	6.43	7.33	6.0	2.37	4.26	1.0	7.53	9.92	3.27
1240	CPD 1902	III	II	IV	5.37	9.33	6.1	2.07	4.83	1.2	7.70	3.97	3.43
1241	RAH 1046	III	IV	III	7.17	5.67	5.9	2.73	4.66	1.2	7.70	5.96	3.27
1242	RHC 1409	I	II	II	4.70	5.00	4.8	2.10	3.04	0.7	7.83	3.97	3.83
1243	RAH 1081	II	II	III	5.00	2.00	5.8	2.13	4.28	0.9	7.63	3.98	3.03

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CBE- Coimbatore; SVPR-Srivilliputtur



Table: 43. Ent1a. Br-04a: Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

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
1231	TSH 383	3.23	2.00	7.4	-	1.36	-	-	-	-	-	-	-
1232	TSH 387	2.57	3.33	6.3	-	1.65	-	-	-	-	-	-	-
1233	RAH 1083	2.57	2.00	9.4	-	1.14	-	-	-	-	-	-	-
1234	TCH 1941	2.37	4.00	9.87	-	1.39	-	-	-	-	-	-	-
1235	ZC (Suraj)	2.17	8.67	6.17	-	1.75	-	-	-	-	-	-	-
1236	SHSV 14	1.73	4.00	6.87	-	1.39	-	-	-	-	-	-	-
1237	CCH 19-2	3.03	4.00	8.53	-	1.65	-	-	-	-	-	-	-
1238	RAH 1082	2.83	2.00	9.23	-	1.78	-	-	-	-	-	-	-
1239	LC	2.90	3.33	7.5	-	1.63	-	-	-	-	-	-	-
1240	CPD 1902	2.70	4.67	9.57	-	1.59	-	-	-	-	-	-	-
1241	RAH 1046	2.37	2.00	9.33	-	1.28	-	-	-	-	-	-	-
1242	RHC 1409	3.23	2.00	6.4	-	1.78	-	-	-	-	-	-	-
1243	RAH 1081	3.33	3.00	7.9	-	1.69	-	-	-	-	-	-	-

Table: 44. Ent1a. Br-04a: Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

Entry code	Name of entry	Green Boll Damage (%) due to PBW			Open Boll damage Due(%) to PBW			Open Locule Damage (%) due to PBW			Good Open Bolls		
		LG	RC	SVPR	LG	RC	SVPR	LG	RC	SVPR	LG	RC	SVPR
1231	TSH 383	40.00	32.62	-	35.80	30.16	16.70	15.30	30.16	10.03	-	69.84	-
1232	TSH 387	30.00	29.68	-	22.81	29.17	17.93	12.57	29.17	11.27	-	70.83	-
1233	RAH 1083	20.00	32.08	-	35.97	28.79	16.00	15.10	28.79	9.33	-	71.21	-
1234	TCH 1941	45.00	39.19	-	36.98	21.74	16.67	15.14	21.74	10.00	-	78.26	-
1235	ZC (Suraj)	20.00	41.55	-	29.80	28.00	15.67	16.54	28.00	9.00	-	72.00	-
1236	SHSV 14	30.00	30.38	-	35.39	17.54	15.67	15.45	17.54	9.00	-	82.46	-
1237	CCH 19-2	50.00	34.79	-	34.28	24.66	15.33	15.79	24.66	8.67	-	75.34	-
1238	RAH 1082	10.00	30.56	-	22.62	18.07	16.67	10.67	18.07	10.00	-	81.93	-
1239	LC	0.00	24.22	-	22.34	13.43	15.33	10.58	13.43	8.67	-	86.57	-
1240	CPD 1902	20.00	48.18	-	25.10	45.83	15.67	13.44	45.83	9.00	-	54.17	-
1241	RAH 1046	20.00	29.59	-	23.03	10.77	19.33	11.55	10.77	12.67	-	89.23	-
1242	RHC 1409	40.00	33.97	-	21.95	26.32	18.00	9.67	26.32	11.33	-	73.68	-
1243	RAH 1081	30.00	21.59	-	15.72	13.46	15.33	9.38	13.46	8.67	-	86.54	-

LG-Lam Guntur; RC-Raichur; SVPR-Srivilliputtur



Table: 45. Ent1a. Br – 14 a: Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

Entry code	Name of entry	Jassid Injury Grade(JIG)*			No. of Jassid/ 3leaves			Whitefly/ 3 leaves			Thrips / 3 leaves		
		DW	CN	CBE	DW	CN	CBE	DW	CN	CBE	DW	CN	CBE
1251	CCB 29	III	-	III	5.70	-	5.75	-	-	0.81	-	-	3.39
1252	CCB 26	III	-	IV	6.10	-	6.42	-	-	0.64	-	-	3.59
1253	CCB 51	III	-	IV	8.00	-	5.75	-	-	0.93	-	-	3.85
1254	DB 1901	III	-	IV	9.70	-	6.08	-	-	0.74	-	-	3.47
1255	ZC (Suvini)	-	-	III	-	-	5.92	-	-	1.02	-	-	3.44
1256	SBSD 5-6	III	-	IV	11.0	-	6.17	-	-	1.08	-	-	8.03
1257	CCB 2	III	-	III	10.4	-	6.75	-	-	0.81	-	-	4.73
1258	CCB 1	III	-	III	8.80	-	6.33	-	-	0.79	-	-	6.54
1259	CCB 6	III	-	III	11.6	-	6.08	-	-	0.9	-	-	4.1

DW-Dharwad; CN- Chamarajanagar; CBE- Coimbatore

Table: 46. Ent1a. Br – 14 a: Preliminary screening of breeding material for resistance to insect pest of Cotton at South Zone during 2021-22.

Entry code	Name of entry	Aphids/3 leaves			Natural Enemies/ Plant*			Rosette flower (%) due to PBW			Green Boll Damage (%) due to ABW/SBW		
		DW	CN	CBE	DW	CN	CBE	DW	CN	CBE	DW	CN	CBE
1251	CCB 29	-	-	6.95	-	-	-	-	-	-	11.36	-	-
1252	CCB 26	-	-	7.64	-	-	-	-	-	-	9.19	-	-
1253	CCB 51	-	-	6.52	-	-	-	-	-	-	9.91	-	-
1254	DB 1901	-	-	7.58	-	-	-	-	-	-	10.98	-	-
1255	ZC (Suvini)	-	-	10.2	-	-	-	-	-	-	-	-	-
1256	SBSD 5-6	-	-	7.14	-	-	-	-	-	-	10.60	-	-
1257	CCB 2	-	-	8.57	-	-	-	-	-	-	7.53	-	-
1258	CCB 1	-	-	12.3	-	-	-	-	-	-	8.12	-	-
1259	CCB 6	-	-	8.13	-	-	-	-	-	-	7.78	-	-

DW-Dharwad; CN- Chamarajanagar; CBE- Coimbatore



Table: 47. Ent1a. Br – 14 a: Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

Entry code	Name of entry	Green Boll Damage (%) due to PBW			Open Boll damage (%) due to PBW			Open Locule Damage (%) due PBW			Good Open Bolls		
		DW	CN	CBE	DW	CN	CBE	DW	CN	CBE	DW	CN	CBE
1251	CCB 29	12.35	-	-	41.92	-	16.66	12.65	-	8.98	9.80	-	-
1252	CCB 26	10.27	-	-	22.58	-	17.25	10.27	-	9.65	27.10	-	-
1253	CCB 51	10.33	-	-	32.95	-	18.22	10.88	-	10.65	15.90	-	-
1254	DB 1901	10.94	-	-	29.20	-	16.25	10.77	-	9.47	17.70	-	-
1255	ZC (Suvin)	-	-	-	-	-	16.95	-	-	10.06	-	-	-
1256	SBSD 5-6	12.72	-	-	27.98	-	17.06	12.65	-	8.44	22.30	-	-
1257	CCB 2	10.36	-	-	33.51	-	19.21	11.76	-	9.58	15.90	-	-
1258	CCB 1	10.48	-	-	26.60	-	16.39	11.05	-	10.11	17.00	-	-
1259	CCB 6	10.44	-	-	28.52	-	18.45	11.19	-	10.68	15.20	-	-

DW-Dharwad; CN- Chamarajanagar; CBE- Coimbatore

Table: 48. Ent1a. Br-04 b: Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

Entry code	Name of entry	Jassid Injury Grade(JIG)*		No. of Jassid/ 3leaves		Whitefly/ 3 leaves		Thrips / 3 leaves	
		ND	DW	ND	DW	ND	DW	ND	DW
1261	NDLH 2071-2	I	II	4.27	6.18	17.20	-	21.80	-
1262	RAH 1081	I	II	3.73	6.40	11.20	-	10.40	-
1263	ZC (Sahana)	II	III	6.47	7.60	20.90	-	31.10	-
1264	CCH 19-2	II	III	6.67	6.80	16.20	-	31.80	-
1265	NDLH 2056-4	I	III	5.53	6.10	17.90	-	22.10	-
1266	LC	II	III	6.40	5.70	23.40	-	29.30	-
1267	CNH 119	I	II	4.60	5.70	15.20	-	15.80	-
1268	QC (Suraj)	II	III	6.20	7.80	27.10	-	30.00	-
1269	AKH 2013-3	I	I	4.13	5.20	18.10	-	12.60	-

ND- Nandyal; DW-Dharwad



Table: 49. Ent1a Br-04 b: Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

Entry code	Name of entry	Aphids/3 leaves		Natural Enemies/ Plant*		Rosette flower (%) due to PBW		Green Boll Damage (%) due to ABW/SBW	
		ND	DW	ND	DW	ND	DW	ND	DW
1261	NDLH 2071-2	-	-	0.00	-	-	-	-	8.08
1262	RAH 1081	-	-	0.07	-	-	-	-	8.40
1263	ZC (Sahana)	-	-	0.13	-	-	-	-	7.96
1264	CCH 19-2	-	-	0.13	-	-	-	-	10.46
1265	NDLH 2056-4	-	-	0.00	-	-	-	-	10.50
1266	LC	-	-	0.07	-	-	-	-	10.86
1267	CNH 119	-	-	0.20	-	-	-	-	8.20
1268	QC (Suraj)	-	-	0.00	-	-	-	-	9.14
1269	AKH 2013-3	-	-	0.13	-	-	-	-	8.08

ND- Nandyal; DW-Dharwad

Table: 50. Ent1a. Br-04 b: Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

Entry code	Name of entry	Green Boll Damage (%) due to PBW		Open Boll damage Due(%) to PBW		Open Locule Damage (%) due PBW		Good Open Bolls	
		ND	DW	ND	DW	ND	DW	ND	DW
1261	NDLH 2071-2	41.67	8.19	36.67	15.79	4.97	11.30	-	28.13
1262	RAH 1081	55.00	10.26	48.33	15.90	5.07	10.90	-	29.80
1263	ZC (Sahana)	53.33	7.85	51.67	19.73	5.47	10.74	-	25.60
1264	CCH 19-2	63.33	10.47	61.67	21.86	6.73	11.31	-	22.20
1265	NDLH 2056-4	58.33	10.04	56.67	19.01	5.27	10.88	-	30.60
1266	LC	53.33	12.98	51.67	15.14	3.23	11.80	-	28.00
1267	CNH 119	48.33	10.39	40.00	17.18	4.50	10.86	-	25.40
1268	QC (Suraj)	53.33	10.58	46.67	19.54	5.23	10.80	-	22.40
1269	AKH 2013-3	61.67	9.27	55.00	24.16	7.07	9.73	-	4.02

ND- Nandyal; DW-Dharwad



Table: 51. Ent1a. Br-24 b: Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

Entry code	Name of entry	Jassid Injury Grade(JIG)*		No. of Jassid/ 3leaves		Whitefly/ 3 leaves		Thrips / 3 leaves	
		ND	DW	ND	DW	ND	DW	ND	DW
1271	DWD 2051	-	I	-	3.90	-	-	-	-
1272	MDL 2674	-	I	-	4.10	-	-	-	-
1273	CNA 1072	-	I	-	4.50	-	-	-	-
1274	PA 887	-	I	-	3.40	-	-	-	-
1275	ZC (DLSa 17)	-	I	-	5.40	-	-	-	-
1276	NDLA 3104-4	-	I	-	4.50	-	-	-	-
1277	PA 888	-	I	-	3.75	-	-	-	-
1278	CNA 1075	-		-	-	-	-	-	-
1279	CNA 2034	-	I	-	3.70	-	-	-	-
1280	PA 898	-	I	-	3.20	-	-	-	-
1281	CNA 1071	-	I	-	4.40	-	-	-	-
1282	PAIG 411	-	I	-	3.90	-	-	-	-
1283	MDL ABB1	-	I	-	3.20	-	-	-	-
1284	LC	-	I	-	4.00	-	-	-	-

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 leaves)



Table: 52.Ent1a Br-24 b: Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

Entry code	Name of entry	Aphids/3 leaves		Natural Enemies/ Plant*		Rosette flower (%) due to PBW		Fruiting body damage (%) due to ABW/SBW	
		ND	DW	ND	DW	ND	DW	ND	DW
1271	DWD 2051	-	-	-	-	-	-	-	10.62
1272	MDL 2674	-	-	-	-	-	-	-	11.23
1273	CNA 1072	-	-	-	-	-	-	-	10.19
1274	PA 887	-	-	-	-	-	-	-	11.74
1275	ZC (DLSa 17)	-	-	-	-	-	-	-	7.01
1276	NDLA 3104-4	-	-	-	-	-	-	-	10.08
1277	PA 888	-	-	-	-	-	-	-	8.22
1278	CNA 1075	-	-	-	-	-	-	-	-
1279	CNA 2034	-	-	-	-	-	-	-	8.83
1280	PA 898	-	-	-	-	-	-	-	9.52
1281	CNA 1071	-	-	-	-	-	-	-	8.46
1282	PAIG 411	-	-	-	-	-	-	-	6.92
1283	MDL ABB1	-	-	-	-	-	-	-	9.78
1284	LC	-	-	-	-	-	-	-	9.23

ND- Nandyal; DW-Dharwad

* Natural Enemies include coccinellids, chrysopids, syrphids and spider

** Fruiting Body damage includes damage in squares, flowers and boll



Table: 53. Ent1a. Br-24 b: Preliminary screening of breeding material for resistance to insect pest of cotton at South Zone during 2021-22.

Entry code	Name of entry	Green Boll damage (%) due to PBW		Open Boll damage (%) due to PBW		Open Locule Damage (%) due PBW		Good Open Bolls	
		ND	DW	ND	DW	ND	DW	ND	DW
1271	DWD 2051	-	8.58	-	19.6	-	10.5	-	22.2
1272	MDL 2674	-	11.57	-	14.0	-	10.4	-	21.7
1273	CNA 1072	-	11.73	-	13.6	-	12.4	-	26.4
1274	PA 887	-	10.59	-	20.9	-	11.8	-	14.1
1275	ZC (DLS 17)	-	10.55	-	17.0	-	10.3	-	26.3
1276	NDLA 3104-4	-	10.41	-	13.2	-	10.9	-	28.9
1277	PA 888	-	8.37	-	21.7	-	10.5	-	18.4
1278	CNA 1075	-	-	-	-	-	-	-	-
1279	CNA 2034	-	10.58	-	10.7	-	10.4	-	28.5
1280	PA 898	-	10.57	-	13.6	-	11.0	-	22.9
1281	CNA 1071	-	10.77	-	10.0	-	11.1	-	37.7
1282	PAIG 411	-	11.36	-	13.1	-	11.2	-	28.2
1283	MDL ABB1	-	11.03	-	14.9	-	11.3	-	20.3
1284	LC	-	10.44	-	12.5	-	10.7	-	33.1

ND- Nandyal; DW-Dharwad



Table: 54. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests at North Zone during 2021-22.

Entry code	Entry Name	Mean Jassid grade(JIG)*					Leaf hopper / 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	RS 2946	II	II	II	II	I	3.80	6.86	2.57	2.05	2.17	7.93	10.75	12.63	6.74	8.27	14.20	-	38.17	23.17	40.10
2	RS 2943	II	II	I	I	I	4.70	5.03	2.00	1.78	1.63	8.67	8.67	14.07	7.71	9.27	18.73	-	39.03	23.72	30.00
3	RS 2013	II	II	I	I	I	4.93	5.56	2.30	4.42	0.83	9.10	6.53	12.13	8.05	10.43	14.18	-	37.73	34.88	37.00
4	PBH 197	II	III	I	II	I	5.60	5.03	1.73	1.98	1.40	9.47	7.26	11.17	8.76	6.73	17.07	-	38.77	24.83	30.50
5	PBH 139	II	III	I	II	I	4.47	4.38	1.20	2.40	1.53	8.93	10.02	9.43	9.04	9.43	18.57	-	40.43	24.74	35.30
6	L 1534	II	III	I	I	I	5.13	3.12	1.90	0.98	1.17	7.77	8.56	12.13	6.75	11.03	23.37	-	69.20	14.35	38.40
7	HS 310	II	III	I	I	I	4.51	5.19	2.23	2.72	0.83	8.15	7.61	12.77	8.90	13.53	15.73	-	36.23	25.66	35.70
8	H 1601	III	II	I	I	I	5.03	5.84	2.10	1.63	1.33	9.87	10.31	14.00	7.90	8.77	12.78	-	39.00	15.39	44.90
9	H 1528	II	II	I	II	I	4.13	2.78	2.07	2.29	1.90	8.63	6.36	10.87	8.21	8.73	17.50	-	35.73	23.01	35.70
10	GA	II	IV	II	II	I	5.43	4.62	2.93	4.46	3.60	9.43	6.91	17.17	9.29	9.30	17.73	-	43.60	30.61	38.10
11	F 2785	II	III	I	I	I	4.90	6.15	2.17	1.59	1.23	8.63	5.31	13.20	5.69	7.90	15.00	-	34.57	18.67	42.60
12	F 2772	II	II	I	I	I	4.40	4.37	1.87	2.45	1.70	9.37	13.04	14.13	7.02	9.83	12.17	-	40.67	19.47	37.40
13	F 2732	II	III	I	I	I	5.40	4.23	2.20	2.33	1.43	9.77	7.84	12.80	9.04	6.47	19.40	-	36.93	20.04	38.50
14	F 2720	II	II	I	I	I	4.97	7.64	2.20	2.09	1.80	9.60	6.12	12.03	8.66	10.73	17.40	-	36.40	21.30	37.20
15	F 2662	II	III	I	I	I	5.30	3.16	2.10	1.59	1.30	10.23	7.81	15.60	7.68	7.07	14.07	-	36.03	23.09	37.50
16	F 2462	II	II	I	I	I	5.17	5.81	1.43	1.08	2.33	9.77	6.53	14.50	8.12	9.17	17.57	-	33.60	16.55	39.20

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 leaf.



Table: 55. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests at Central Zone during 2021-22

Entry Name	Mean Jassid grade					Leaf hopper / 3 leaves					Whitefly / 3 leaves				
	JU	SU	AK	NA	RA	JU	SU	AK	NA	RA	JU	SU	AK	NA	RA
AKH-1302	II	I	-	II	I	5.64	3.37	-	4.68	3.97	4.87	2.30	-	10.69	2.43
DCH-32 (JS)	II	IV	-	IV	IV	7.98	12.07	-	9.78	8.02	6.83	3.70	-	13.07	2.66
DSC-1851	II	II	-	II	I	7.34	5.97	-	4.97	4.31	6.33	4.10	-	9.28	2.51
GISV-312	II	I	-	II	II	6.10	2.17	-	4.18	3.66	5.43	2.47	-	10.35	2.32
GISV-323	II	I	-	II	I	6.36	2.47	-	3.86	3.21	5.70	2.00	-	8.95	2.57
GJHV-522	I	I	-	II	III	5.18	2.83	-	4.38	4.2	4.03	2.67	-	9.66	2.6
GJHV-566	II	I	-	III	I	5.46	3.63	-	5.92	5.89	4.30	2.70	-	10.63	2.82
NDLH-1938 (JR)	II	I	-	II	II	6.94	3.00	-	2.68	3.04	6.07	3.27	-	8.46	2.09
NDLH-2035-5	II	II	-	II	II	8.26	5.47	-	5.07	3.47	7.53	4.60	-	8.71	2.38
NDLH-2057-1	II	II	-	II	I	8.68	5.77	-	4.45	3.61	8.17	3.47	-	10.2	2.27
RAH-1076	II	I	-	II	I	5.94	2.67	-	4.37	4.57	5.13	1.83	-	9.84	2.33
RHC-1409	III	I	-	II	II	9.40	3.83	-	4.97	3.37	8.57	3.00	-	10.41	2.27
TSH-367	I	II	-	III	I	4.98	5.20	-	6.29	4.28	3.90	4.33	-	10.85	2.12
TVH-007	III	I	-	II	III	11.80	3.20	-	5.57	2.96	9.80	3.93	-	11.54	2.07

Table: 56. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests at Central Zone during 2021-22.

Entry Name	Thrips/3 leaves					Aphid / 3 leaves				
	JU	SU	AK	NA	RA	JU	SU	AK	NA	RA
AKH-1302	-	22.47	-	-	-	-	22.77	-	-	-
DCH-32 (JS)	-	25.03	-	-	-	-	25.50	-	-	-
DSC-1851	-	27.07	-	-	-	-	24.93	-	-	-
GISV-312	-	21.33	-	-	-	-	21.10	-	-	-
GISV-323	-	21.80	-	-	-	-	22.40	-	-	-
GJHV-522	-	20.20	-	-	-	-	21.27	-	-	-
GJHV-566	-	22.33	-	-	-	-	23.23	-	-	-
NDLH-1938 (JR)	-	26.20	-	-	-	-	24.83	-	-	-
NDLH-2035-5	-	24.13	-	-	-	-	27.33	-	-	-
NDLH-2057-1	-	25.07	-	-	-	-	25.97	-	-	-
RAH-1076	-	20.30	-	-	-	-	24.73	-	-	-
RHC-1409	-	22.53	-	-	-	-	23.20	-	-	-
TSH-367	-	23.83	-	-	-	-	23.70	-	-	-
TVH-007	-	20.60	-	-	-	-	21.73	-	-	-

JU- Junagadh, SU- Surat, AK- Akola, NA- Nanded, RA- Rahuri



Table: 57. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests at South Zone during 2021-22

Entry Name	Mean Jassid grade					Leaf hopper / 3 leaves					Whitefly / 3 leaves				
	ND	DW	RC	CN	CBE	ND	DW	RC	CN	CBE	ND	DW	RC	CN	CBE
CPD 7003	-	-	III	-	-	-	-	10.33	-	-	-	-	6.24	-	-
DCH 32	-	IV	IV	-	-	-	7.20	11.76	-	-	-	-	5.04	-	-
DSC 1851	-	II	II	-	-	-	6.70	6.67	-	-	-	-	3.89	-	-
DWO 1802	-	I	I	-	-	-	1.60	3.11	-	-	-	-	3.81	-	-
DWO 2051	-	I	I	-	-	-	1.70	2.89	-	-	-	-	4.17	-	-
GISV 332	-	II	II	-	-	-	5.80	6.67	-	-	-	-	5.98	-	-
Jadoo -Bt	-	II	II	-	-	-	5.20	5.51	-	-	-	-	1.98	-	-
RAH 1076	-	II	II	-	-	-	5.70	2.78	-	-	-	-	5.12	-	-
RAHC 1031	-	II	II	-	-	-	6.60	5.11	-	-	-	-	5.03	-	-

ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamaranagar; CBE- Coimbatore

Table: 58. Ent 1 b. Advanced screening of promising entries for development of repository for sucking pests at South Zone during 2021-22

Entry Name	Thrips/3 leaves					Aphid / 3 leaves				
	ND	DW	RC	CN	CBE	ND	DW	RC	CN	CBE
CPD 7003	-	-	1.62	-	-	-	-	4.33	-	-
DCH 32	-	-	8.59	-	-	-	-	8.89	-	-
DSC 1851	-	-	2.62	-	-	-	-	3.11	-	-
DWO 1802	-	-	1.62	-	-	-	-	2.89	-	-
DWO 2051	-	-	1.62	-	-	-	-	3.11	-	-
GISV 332	-	-	3.61	-	-	-	-	3.11	-	-
Jadoo -Bt	-	-	3.89	-	-	-	-	2.36	-	-
RAH 1076	-	-	7.94	-	-	-	-	10.00	-	-
RAHC 1031	-	-	1.87	-	-	-	-	6.11	-	-

ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamaranagar; CBE- Coimbatore



Table: 59 .Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests & Natural Enemies) under unprotected condition to develop suitable forecasting model in North Zone during 2021-22 in RCH 650 BG- II.

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	-	0.00	-	-	0.27	-	0.00	-	-	0.93	-	0.00	-	-	0.13	-	0.00
23	-	-	0.27	-	0.10	-	-	0.67	-	0.33	-	-	4.13	-	0.47	-	-	0.27	-	0.00
24	1.20	0.0	0.93	0.00	0.23	1.80	2.8	1.00	1.20	0.56	6.46	3.6	1.60	0.00	1.00	0.40	0.00	0.27	0.23	0.20
25	2.06	0.2	3.07	0.00	0.10	6.53	3.9	2.13	1.30	1.11	12.80	4.2	14.80	3.80	3.17	0.20	0.00	0.67	0.20	0.10
26	1.80	1.4	6.87	0.40	2.00	5.60	2.5	3.47	6.30	1.11	21.00	28.4	25.20	34.90	3.67	1.40	0.00	0.67	0.16	0.10
27	0.86	11.9	5.33	1.40	2.77	8.46	5.0	6.73	8.90	2.00	22.26	14.5	96.73	38.90	14.76	1.80	0.00	0.53	0.16	0.10
28	1.80	2.5	6.47	2.10	1.00	6.60	10.9	13.60	9.30	2.87	39.66	39.8	113.6	41.30	38.77	3.00	0.70	0.40	0.14	0.40
29	2.53	4.2	3.73	6.80	3.33	8.20	11.2	7.33	8.20	2.76	43.86	29.5	96.40	42.00	57.23	3.20	2.60	1.07	0.16	0.30
30	7.40	6.0	6.00	5.20	3.76	5.60	10.7	12.60	9.70	4.23	41.60	18.9	21.27	39.90	65.66	4.60	4.10	0.80	0.17	0.50
31	10.60	3.1	6.53	9.40	2.87	5.80	1.8	8.27	7.30	3.11	24.93	5.8	28.87	39.40	83.56	5.00	6.20	0.80	0.20	0.70
32	8.53	4.3	7.80	3.00	2.00	5.93	2.8	7.33	9.40	2.76	15.53	6.0	12.33	14.60	72.33	4.70	6.20	0.80	0.14	1.00
33	6.60	6.0	1.60	2.80	0.33	15.20	3.2	22.27	4.60	5.11	12.66	5.2	12.27	7.70	36.23	3.30	5.50	0.27	0.15	1.00
34	4.20	2.6	3.93	2.50	1.11	8.53	5.4	24.13	4.40	3.17	14.80	10.0	15.00	0.90	14.33	2.70	9.20	0.53	0.16	0.60
35	6.26	1.6	1.67	1.00	0.76	8.00	4.1	16.07	9.00	8.43	13.86	5.4	5.07	0.50	9.76	2.40	8.60	0.93	0.21	0.80
36	2.53	0.9	1.13	1.90	0.33	6.00	4.9	12.33	9.90	10.43	8.66	4.7	2.67	0.00	3.76	2.90	6.60	0.27	0.25	0.80
37	1.53	3.4	0.87	3.30	1.22	4.80	4.4	9.47	12.10	5.33	7.20	0.7	1.40	0.00	2.87	2.30	8.30	0.27	0.11	0.70
38	8.06	1.4	1.40	2.60	0.57	7.60	3.1	12.40	13.70	11.27	4.60	0.2	4.00	0.00	3.21	2.00	7.60	0.27	0.21	0.60
39	3.53	2.6	0.73	0.80	0.53	4.13	2.2	6.67	6.20	13.33	0.56	0.8	1.40	0.00	2.53	1.20	6.20	0.27	0.26	0.60
40	5.13	1.4	1.07	1.60	0.80	5.26	3.2	3.80	6.00	17.43	0.13	0.4	0.33	0.00	2.20	1.00	4.00	0.67	0.16	0.50
41	2.98	2.1	1.00	0.30	1.53	4.86	3.6	5.53	2.60	8.37	0.00	0.3	0.87	0.00	3.11	0.80	3.40	0.67	0.15	0.40
42	4.00	-	0.60	0.40	1.73	4.13	-	2.13	3.20	2.33	0.00	-	0.67	0.00	2.20	0.60	-	0.80	0.22	0.40
43	-	-	0.40	0.00	0.73	-	-	0.60	2.80	3.20	-	-	0.60	0.00	1.53	-	-	0.93	0.16	0.20
44	-	-	-	-	0.67	-	-	-	-	2.47	-	-	-	-	1.33	0.00	-	-	-	0.20
45	-	-	-	-	0.40	-	-	-	-	1.87	-	-	-	-	0.63	-	-	-	-	0.10
46	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00

* Natural Enemies include coccinellids, chrysopids, syrphids and spider

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganagar



Table: 60 Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in North Zone during 2021-22 in RCH 650 BG- II.

Standard week	No. of Larvae /5plants															Fruiting Body Damage (%) **				
	H.armigera					Earias spp.					S.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	-	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	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	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	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	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	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	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	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	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	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	-	2.00	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	-	4.00	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	-	4.00	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	-	18.00	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	-	24.00	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	-	62.00	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	-	22.00	2.43	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	0.00	0.00	-	20.00	3.41	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	-	36.00	3.75	0.00
42	0.00	-	0.00	0.00	0.00	0.00	-	1.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	-	72.00	4.56	0.00
43	-	-	0.00	0.00	0.00	-	-	0.00	0.00	0.00	-	-	0.00	0.00	0.00	-	-	30.00	8.21	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
46	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00

** Fruiting Body damage includes damage in squares, flowers and boll

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganganagar

Population of bollworms based on 10 plants.



Table: 61 .Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests & Natural Enemies) under unprotected condition to develop suitable forecasting model in North Zone during 2021-22 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	-	0.00	-	-	0.27	-	8.20	-	-	1.00	-	11.87	-	-	0.27	-	0.20
23	-	-	0.67	-	0.67	-	-	0.87	-	10.66	-	-	2.47	-	15.33	-	-	0.13	-	0.00
24	0.20	0.80	0.53	0.20	0.30	0.80	3.60	1.00	0.30	0.40	7.00	1.90	1.47	0.80	1.00	0.40	0.00	0.27	0.22	0.00
25	0.46	1.00	3.60	0.30	0.50	1.73	5.00	3.13	1.40	0.80	4.86	2.80	12.47	2.90	1.90	0.60	0.00	0.40	0.11	0.10
26	2.33	0.90	6.33	0.60	2.11	6.13	3.50	4.07	2.80	0.40	7.20	24.50	27.53	38.30	1.67	2.20	0.00	0.80	0.04	0.00
27	2.13	8.40	5.60	1.40	2.70	6.26	8.00	7.07	6.60	2.40	31.20	18.40	98.13	45.40	15.70	2.80	0.00	0.40	0.15	0.30
28	1.93	3.10	6.87	2.40	3.00	9.33	9.30	19.53	8.10	1.50	28.00	26.00	121.07	43.50	45.20	3.40	0.80	0.40	0.04	0.20
29	2.83	6.40	1.67	8.20	2.57	7.90	9.90	5.60	28.00	1.78	44.66	25.30	92.07	42.70	66.33	1.80	3.10	0.27	0.00	0.40
30	2.53	9.40	10.40	5.90	4.33	7.86	10.30	16.40	12.80	2.00	55.29	21.60	37.47	42.10	75.27	2.00	5.20	1.20	0.11	0.40
31	10.64	3.90	5.67	4.50	2.57	5.46	2.10	7.93	8.80	3.11	42.53	4.90	25.53	54.10	95.43	2.80	7.10	1.07	0.26	0.70
32	10.00	3.60	6.00	4.50	2.33	5.13	2.40	9.80	9.90	6.56	19.56	4.50	19.33	11.70	42.00	3.40	5.80	0.80	0.07	0.80
33	9.33	3.50	2.27	2.40	1.47	6.53	2.80	28.27	4.00	3.87	16.93	4.00	12.60	7.80	34.27	1.70	4.50	0.67	0.00	1.20
34	6.76	1.50	6.60	2.30	1.67	16.46	4.10	29.40	6.10	5.00	12.33	9.30	16.47	1.00	16.78	1.00	8.80	0.80	0.07	0.80
35	4.90	1.70	2.73	1.10	2.67	11.12	4.60	19.20	12.00	19.00	16.00	3.50	7.60	0.20	12.33	1.40	8.30	0.40	0.26	0.50
36	9.13	2.00	1.40	0.60	0.47	8.93	3.50	13.13	17.90	7.90	13.80	3.60	2.07	0.00	3.57	0.80	6.10	0.40	0.22	0.80
37	2.86	3.60	1.40	3.70	0.33	6.80	3.30	13.80	17.00	38.67	9.66	0.90	2.13	0.00	3.47	0.70	6.50	0.53	0.04	0.70
38	7.53	1.40	1.67	3.00	1.78	5.13	2.30	12.60	15.00	12.00	5.40	0.00	3.80	0.00	2.78	1.60	6.50	0.40	0.00	0.90
39	6.60	1.60	0.80	1.30	0.78	5.26	2.30	7.20	7.80	21.00	0.00	0.70	1.87	0.00	4.90	0.80	5.10	0.27	0.22	0.60
40	6.26	0.60	1.20	1.20	0.78	4.53	2.10	4.33	6.20	24.00	0.00	0.00	1.00	0.00	4.00	0.80	2.90	0.80	0.07	1.30
41	3.26	0.80	0.80	0.80	1.13	4.20	3.00	5.67	3.20	13.67	0.00	0.00	0.53	0.00	5.47	0.40	3.40	0.80	0.00	0.90
42	4.86	-	0.67	0.40	1.87	3.70	-	2.00	2.80	6.33	0.00	-	0.40	0.00	3.27	0.00	-	1.06	0.30	0.70
43	-	-	0.60	0.00	1.76	-	-	0.67	2.10	2.00	-	-	0.40	0.00	2.47	-	-	1.07	0.07	0.70
44	-	-	-	-	0.78	-	-	-	-	1.78	-	-	-	-	2.23	0.00	-	-	-	0.20
45	-	-	-	-	0.33	-	-	-	-	0.87	-	-	-	-	1.67	-	-	-	-	0.60
46	-	-	-	-	0.20	-	-	-	-	1.00	-	-	-	-	0.47	-	-	-	-	0.20

* Natural Enemies include coccinellids, chrysopids, syrphids and spider

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganaganagar



Table: 62. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in North Zone during 2021-22 in HS-6.

Standard week	No. of Larvae /5plants															Fruiting Body Damage (%)**				
	<i>H.armigera</i>					<i>Earias spp.</i>					<i>S.litura</i>									
	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	-	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	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	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	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	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	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	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	0.00
31	0.00	-	0.00	0.00	0.00	0.00	-	-	0.00	1.00	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	6.00
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	0.00	8.00
33	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	1.00	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	10.00
34	0.00	-	0.00	0.00	0.00	0.00	-	1.00	0.00	1.00	0.00	-	0.00	0.00	0.00	0.00	-	4.00	0.00	9.00
35	0.00	-	0.00	0.00	0.00	0.00	-	1.00	0.20	2.00	0.00	-	0.00	0.00	0.00	0.00	-	4.00	5.14	12.00
36	0.00	-	0.00	0.00	0.00	0.00	0.10	0.00	0.10	3.00	0.00	-	0.00	0.00	0.00	0.00	0.50	36.00	16.53	14.00
37	0.00	-	0.00	0.00	0.00	0.00	0.30	1.00	0.40	3.00	0.00	-	0.00	0.00	0.00	0.00	0.96	50.00	8.93	17.00
38	0.00	-	0.00	0.00	0.00	0.00	0.10	2.00	0.40	6.00	0.00	-	0.00	0.00	0.00	0.00	0.21	60.00	3.08	23.00
39	0.00	-	0.00	0.00	0.00	0.00	-	1.00	0.30	10.00	0.00	-	0.00	0.00	0.00	0.00	0.00	32.00	9.05	31.00
40	0.00	-	0.00	0.00	0.00	0.00	0.30	0.00	0.20	7.00	0.00	-	0.00	0.00	0.00	0.00	0.90	18.00	5.26	36.00
41	0.00	-	0.00	0.00	0.00	0.00	0.30	1.00	0.50	9.00	0.00	-	0.00	0.00	0.00	0.00	0.62	40.00	9.26	29.00
42	0.00	-	0.00	0.00	0.00	0.00		4.00	0.10	4.00	0.00		0.00	0.00	0.00	0.00	-	80.00	10.15	16.00
43	-	-	0.00	0.00	0.00	-	-	1.00	0.20	2.00	-	-	0.00	0.00	0.00	-	-	34.00	13.25	10.00
44	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	2.00
45	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00
46	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00

** Fruiting Body damage includes damage in squares, flowers and boll

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganaganagar

Population of bollworms based on 10 plants.



Table: 63 .Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests & Natural Enemies) under unprotected condition to develop suitable forecasting model in North Zone during 2021-22 in GA.

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	-	0.00	-	-	0.20	-	0.00	-	-	0.80	-	0.00	-	-	0.13	-	0.00
23	-	-	0.60	-	0.00	-	-	0.40	-	0.00	-	-	3.47	-	0.87	-	-	0.13	-	0.00
24	1.00	0.80	0.87	0.00	0.00	3.73	0.90	0.33	5.75	0.30	5.13	1.90	1.20	1.20	2.23	0.00	0.00	0.13	0.19	0.10
25	2.06	1.60	2.93	0.10	0.20	4.80	2.70	2.93	7.55	2.11	8.73	2.50	20.67	1.40	5.60	0.80	0.00	0.27	0.19	0.00
26	3.00	1.50	6.73	0.40	3.50	6.80	2.00	4.47	10.66	0.60	35.20	25.60	32.33	4.30	4.60	1.40	0.00	1.07	0.15	0.10
27	1.93	6.30	8.47	1.60	2.00	8.66	4.70	8.40	17.97	2.00	28.00	15.90	110.40	37.20	13.20	2.60	0.30	0.93	0.19	0.10
28	1.76	6.90	1.80	2.50	3.57	6.06	9.90	16.27	17.40	2.47	52.30	19.10	113.40	52.40	35.67	3.40	0.20	0.80	0.17	0.40
29	10.20	8.60	1.00	7.70	6.67	9.26	7.60	4.53	23.72	2.00	46.46	12.40	79.07	54.10	56.40	3.80	0.30	0.80	0.07	0.20
30	11.93	10.60	3.27	4.70	7.23	6.06	5.20	9.00	25.09	3.11	36.86	8.10	25.00	48.10	67.43	1.60	1.60	1.07	0.15	0.40
31	10.93	7.70	7.87	8.80	2.66	6.86	2.90	5.87	19.69	3.22	22.13	3.70	25.80	48.20	77.56	2.20	1.80	0.53	0.22	0.70
32	8.13	7.90	6.53	3.40	2.23	15.24	2.80	10.53	18.33	3.47	18.86	3.20	24.20	10.70	52.78	3.30	1.70	1.20	0.07	0.70
33	7.90	8.90	1.73	2.90	2.22	18.93	3.10	23.40	18.09	5.87	16.32	2.40	11.27	8.10	34.33	3.60	3.50	0.53	0.07	1.20
34	5.80	4.30	4.00	2.60	1.00	9.33	1.80	29.93	12.81	6.67	16.66	1.30	11.73	1.70	15.97	2.60	2.50	0.67	0.11	1.00
35	9.60	2.70	1.80	1.60	1.40	8.33	2.20	17.67	14.21	5.13	14.33	4.00	6.00	0.70	7.57	2.40	2.60	0.80	0.04	0.70
36	3.06	2.60	1.20	1.00	0.57	5.26	2.60	12.33	22.53	8.17	8.26	0.60	2.40	0.00	6.87	3.00	2.80	0.40	0.07	1.20
37	3.46	6.80	2.00	3.40	0.53	6.73	1.90	14.93	19.81	6.47	9.80	0.00	3.47	0.00	2.23	2.60	2.30	0.53	0.07	1.20
38	10.00	4.10	0.93	2.80	1.00	6.93	1.20	7.33	23.74	13.57	4.13	0.00	1.40	0.00	3.53	2.80	3.00	0.27	0.15	0.60
39	4.46	3.60	0.80	1.20	1.00	6.46	1.70	5.60	20.29	17.43	0.30	0.00	1.40	0.00	2.11	1.80	5.80	0.40	0.15	0.90
40	7.86	2.70	1.20	1.70	1.33	4.80	1.00	5.40	14.23	17.87	0.00	0.10	0.53	0.00	5.67	0.60	1.90	0.93	0.16	1.40
41	4.80	2.00	0.40	0.20	1.47	4.40	1.60	3.93	13.25	3.96	0.00	0.00	0.40	0.00	3.43	0.20	2.00	0.53	0.07	0.30
42	4.20	-	0.33	0.20	1.90	4.00	-	1.20	10.97	2.78	0.00	-	0.20	0.00	2.40	0.10	-	0.54	0.11	0.40
43	-	-	0.33	0.10	1.74	-	-	0.67	4.50	3.33	-	-	0.13	0.00	2.00	-	-	0.67	0.07	0.60
44	-	-	-	-	1.57	-	-	-	-	1.27	-	-	-	-	2.57	0.00	-	-	-	0.50
45	-	-	-	-	0.87	-	-	-	-	1.67	-	-	-	-	0.45	-	-	-	-	0.40
46	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00

* Natural Enemies include coccinellids, chrysopids, syrphids and spider

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganaganagar



Table: 64. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in North Zone during 2021-22 in GA.

Standard week	No. of Larvae /5plants															Fruiting Body Damage (%) **				
	H.armigera					Earias spp.					S.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	-	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	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	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	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	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	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	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	0.00
31	0.00	-	0.00	0.00	0.00	0.00	-	-	0.00	1.00	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	6.00
32	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	2.00	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	10.00
33	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	3.00	0.00	-	0.00	0.00	0.00	0.00	-	14.00	0.00	14.00
34	0.00	-	0.00	0.00	0.00	0.00	-	2.00	0.00	2.00	0.00	-	0.00	0.00	0.00	0.00	-	16.00	2.32	11.00
35	0.00	-	0.00	0.00	0.00	0.00	-	1.00	0.10	2.00	0.00	-	0.00	0.00	0.00	0.00	-	6.00	2.95	15.00
36	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	2.00	0.00	-	0.00	0.00	0.00	0.00	-	18.00	13.08	10.00
37	0.00	-	0.00	0.00	0.00	0.00	-	1.00	0.20	4.00	0.00	-	0.00	0.00	0.00	0.00	-	26.00	8.29	13.00
38	0.00	-	0.00	0.00	0.00	0.00	-	1.00	0.40	5.00	0.00	-	0.00	0.00	0.00	0.00	-	64.00	8.07	16.00
39	0.00	-	0.00	0.00	0.00	0.00	-	2.00	0.10	9.00	0.00	-	0.00	0.00	0.00	0.00	-	48.00	8.72	28.00
40	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.60	11.00	0.00	-	0.00	0.00	0.00	0.00	-	20.00	2.94	37.00
41	0.00	-	0.00	0.00	0.00	0.00	-	1.00	0.10	8.00	0.00	-	0.00	0.00	0.00	0.00	-	34.00	3.25	32.00
42	0.00	-	0.00	0.00	0.00	0.00	-	3.00	0.50	6.00	0.00	-	0.00	0.00	0.00	0.00	-	76.00	6.22	14.00
43	-	-	0.00	0.00	0.00	-	-	1.00	0.20	3.00	-	-	0.00	0.00	0.00	-	-	42.00	5.24	12.00
44	0.00	-	-	-	0.00	0.00	-	-	-	2.00	0.00	-	-	-	0.00	0.00	-	-	-	4.00
45	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00
46	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00

** Fruiting Body damage includes damage in squares, flowers and boll

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganganagar

Population of bollworms based on 10 plants.



Table: 65 .Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests & Natural Enemies) under unprotected condition to develop suitable forecasting model in North Zone during 2021-22 in RS 2013.

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	-	0.00	-	-	0.47	-	0.00	-	-	0.87	-	0.53	-	-	0.13	-	0.00
23	-	-	0.73	-	0.00	-	-	0.60	-	0.00	-	-	1.93	-	1.07	-	-	0.13	-	0.00
24	0.56	0.80	0.53	0.10	0.10	3.26	1.40	0.93	0.30	0.10	5.33	1.20	2.13	0.90	3.11	0.80	0.00	0.27	0.18	0.10
25	1.66	1.50	2.13	0.50	0.40	6.73	2.70	2.27	1.00	0.70	7.46	2.00	10.67	2.10	3.80	1.00	0.00	0.27	0.21	0.10
26	1.93	1.40	6.87	0.70	0.80	5.53	3.10	3.53	6.90	0.70	26.73	16.20	29.33	4.40	4.00	1.80	0.00	0.80	0.16	0.10
27	1.23	13.30	7.07	2.00	2.10	8.64	4.40	8.33	10.90	2.33	26.40	19.10	106.60	34.40	17.20	2.20	0.00	1.07	0.15	0.30
28	4.06	3.10	6.27	2.30	2.43	7.93	12.50	17.20	11.60	1.87	46.00	24.80	118.47	51.40	28.40	2.10	0.30	0.40	0.19	0.40
29	2.60	3.80	2.20	6.70	4.47	9.86	9.60	8.07	11.60	2.11	46.60	22.40	96.60	51.50	43.33	3.80	2.30	0.93	0.08	0.40
30	12.33	4.50	4.20	7.40	2.00	5.33	8.40	16.53	10.80	3.78	42.73	19.30	36.80	49.60	60.47	3.60	3.70	1.20	0.11	0.50
31	11.73	3.50	6.40	9.20	1.67	5.80	1.90	10.87	9.30	3.84	23.46	5.70	24.93	45.00	84.43	3.90	5.60	0.67	0.07	0.60
32	7.53	3.20	4.67	3.20	0.47	6.98	2.40	10.33	9.40	3.78	18.26	4.20	16.53	11.70	69.67	3.00	5.10	0.93	0.23	0.60
33	7.86	2.90	3.93	2.70	0.43	18.00	3.10	25.47	5.30	4.87	11.66	3.90	12.93	8.30	29.17	2.60	4.40	1.07	0.16	1.00
34	5.06	2.20	1.93	1.20	1.00	10.00	3.00	25.53	3.70	5.27	16.00	6.90	15.13	0.40	17.43	2.40	8.30	0.40	0.07	0.60
35	7.33	1.30	2.53	1.50	0.57	8.93	3.90	16.53	13.30	8.33	14.80	4.00	8.13	0.30	8.67	2.60	8.10	0.27	0.15	1.10
36	2.06	1.50	0.93	0.90	0.43	5.96	2.80	11.53	19.60	7.33	9.13	2.30	1.53	0.00	2.78	1.40	5.70	0.40	0.12	0.70
37	3.00	2.30	1.20	3.20	0.33	7.13	3.60	12.40	19.10	9.78	9.26	0.90	2.33	0.00	3.67	1.60	6.20	0.67	0.15	0.60
38	8.93	1.00	1.13	2.50	0.33	6.06	2.20	10.00	15.40	15.13	3.87	0.40	2.80	0.00	4.47	1.20	7.60	0.27	0.12	1.20
39	6.40	2.20	0.80	1.20	0.76	5.06	1.80	5.93	7.90	13.11	0.00	0.70	1.13	0.00	4.00	1.10	6.20	0.27	0.24	0.90
40	6.66	1.20	1.00	1.80	1.20	4.46	2.30	4.33	6.20	4.33	0.48	0.00	0.33	0.00	3.11	0.40	3.50	0.80	0.08	0.50
41	4.02	1.80	0.67	0.30	1.73	3.86	3.00	5.20	4.10	2.00	0.00	0.00	0.87	0.00	2.17	0.60	3.00	1.07	0.11	0.70
42	4.33	-	0.67	0.40	1.11	4.86	-	1.67	3.40	2.11	0.00	-	0.60	0.00	1.43	0.00	-	0.80	0.21	0.70
43	-	-	0.53	0.20	0.78	-	-	0.87	3.50	1.67	-	-	0.40	0.00	2.33	-	-	0.80	0.06	0.60
44	-	-	-	-	1.11	-	-	-	-	1.00	-	-	-	-	0.87	-	-	-	-	0.40
45	-	-	-	-	0.53	-	-	-	-	0.87	-	-	-	-	0.76	-	-	-	-	0.20
46	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00

* Natural Enemies include coccinellids, chrysopids, syrphids and spider

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganganagar



Table: 66 Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in North Zone during 2021-22 in RS-2013.

Standard week	No. of Larvae /5plants															Fruiting Body Damage (%)**				
	H.armigera					Earias spp.					S.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	-	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	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	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	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	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	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	0.00
30	0.00	-	0.00	0.00	0.00	0.00	-	-	0.00	1.00	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	4.00
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	0.00
32	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	1.00	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	9.00
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	0.00	6.00
34	0.00	-	0.00	0.00	0.00	0.00	-	1.00	0.00	2.00	0.00	-	0.00	0.00	0.00	0.00	-	6.00	1.49	14.00
35	0.00	-	0.00	0.00	0.00	0.00	-	2.00	0.00	1.00	0.00	-	0.00	0.00	0.00	0.00	-	16.00	2.83	8.00
36	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.40	4.00	0.00	-	0.00	0.00	0.00	0.00	-	30.00	8.83	18.00
37	0.00	-	0.00	0.00	0.00	0.00	-	1.00	0.10	3.00	0.00	-	0.00	0.00	0.00	0.00	-	30.00	6.21	13.00
38	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.10	6.00	0.00	-	0.00	0.00	0.00	0.00	-	60.00	7.75	26.00
39	0.00	-	0.00	0.00	0.00	0.00	-	1.00	0.20	12.00	0.00	-	0.00	0.00	0.00	0.00	-	30.00	8.34	32.00
40	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	8.00	0.00	-	0.00	0.00	0.00	0.00	-	26.00	3.65	24.00
41	0.00	-	0.00	0.00	0.00	0.00	-	2.00	0.30	10.00	0.00	-	0.00	0.00	0.00	0.00	-	44.00	8.25	29.00
42	0.00	-	0.00	0.00	0.00	0.00	-	3.00	0.50	4.00	0.00	-	0.00	0.00	0.00	0.00	-	76.00	12.63	15.00
43	-	-	0.00	0.00	0.00	-	-	0.00	0.30	2.00	-	-	0.00	0.00	0.00	-	-	38.00	15.24	10.00
44	-	-	-	-	0.00	-	-	-	-	1.00	-	-	-	-	0.00	-	-	-	-	6.00
45	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00
46	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	0.00

** Fruiting Body damage includes damage in squares, flowers and boll

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganganagar

Population of bollworms based on 10 plants.



Table: 67 .Ent 2. Seasonal dynamics of key pests of cotton (Open Boll and Locule damage) under Unprotected condition to develop suitable forecasting model in North Zone during 2021-22. (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
RCH-650	12.00	-	10.55	7.69	12.00	14.75	-	3.22	2.65	7.28
HS-6	8.00	-	8.47	29.77	30.00	17.90	-	2.86	9.80	14.15
GA	11.00	-	10.04	22.05	36.00	12.50	-	4.31	8.35	16.67
RS-2013	9.00	-	9.69	15.30	22.00	11.00	-	3.30	5.05	9.18

BT- Bathinda; **FA-** Faridkot; **HI** – Hisar; **SR-** Sirsa; **SG-** Sriganaganagar



Table: 68 .Ent 2. Seasonal dynamics of key pests of cotton at North Zone – Weekly Trap Catches

SMW	<i>Helicoverpa armigera</i>					<i>Pectinophora gossypiella</i>					<i>Earias insulana</i>					<i>Spodoptera litura</i>				
	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		1.00			2.20		0.00			0.00		0.00			25.80		0.00
24	0.00	14.0	3.00	0.78	5.00	0.00	0.0	1.20	0.00	0.00	0.00	0.0	4.00	0.00	0.00	0.00	37.0	42.60	0.94	6.00
25	0.00	12.0	1.00	1.07	0.00	0.00	0.0	1.80	0.00	1.00	0.00	0.0	2.60	0.00	0.00	0.00	35.0	60.40	0.82	13.00
26	0.00	18.0	0.60	0.60	0.00	0.00	0.0	5.00	0.00	0.00	0.00	0.0	1.80	0.00	2.00	0.00	40.0	82.00	0.57	54.00
27	0.00	8.0	0.80	0.34	2.00	0.00	0.0	2.00	0.00	0.00	0.00	0.0	1.00	0.00	4.00	0.00	38.0	78.20	0.31	76.50
28	0.00	13.0	1.00	0.34	0.00	0.00	0.0	4.20	0.00	0.00	0.00	0.0	0.00	0.00	1.00	0.00	42.0	2.60	0.20	26.00
29	0.00	9.0	1.40	0.17	1.00	0.00	0.0	1.80	0.00	0.50	0.00	0.0	1.80	0.00	2.00	0.00	21.0	151.60	0.14	104.00
30	0.00	5.0	0.00	0.00	2.00	0.00	0.0	0.00	0.00	2.00	0.00	0.0	0.00	0.00	4.00	0.00	10.0	75.40	0.11	54.50
31	0.00	0.0	0.00	0.26	3.00	0.00	0.0	0.00	0.00	0.00	0.00	0.0	1.60	0.00	5.00	0.00	0.0	12.40	0.23	84.00
32	0.00	0.0	2.20	0.17	1.00	2.00	0.0	2.20	0.05	17.00	0.00	0.0	4.40	0.00	5.50	0.00	32.0	31.80	0.25	38.00
33	0.00	2.0	1.20	0.03	1.00	4.00	0.0	1.20	0.06	6.00	0.00	0.0	1.60	0.06	1.50	0.00	28.0	13.20	0.11	119.00
34	0.00	0.0	0.00	0.11	2.50	5.00	0.0	2.40	0.21	8.50	0.00	6.0	0.80	0.06	11.00	0.00	11.0	17.00	0.40	57.50
35	0.00	0.0	1.40	0.13	2.00	12.00	0.0	0.80	1.03	0.00	0.00	0.0	2.20	0.40	2.50	0.00	28.0	21.00	1.01	145.50
36	0.00	0.0	0.20	0.03	0.00	7.00	0.0	0.80	1.30	7.00	0.00	7.0	1.60	1.34	19.00	0.00	23.0	11.60	0.49	69.00
37	0.00	0.0	1.00	0.00	1.00	6.00	0.0	1.00	15.10	4.50	0.00	15.0	2.40	6.77	28.00	0.00	22.0	15.60	0.29	96.50
38	0.00	1.0	1.40	0.71	4.50	8.00	0.0	1.00	64.79	5.00	0.00	20.0	1.60	5.60	67.50	0.00	18.0	11.80	0.17	137.50
39	0.00	0.0	1.60	0.20	2.50	9.00	0.0	4.20	135.17	57.00	0.00	15.0	3.80	12.23	406.00	0.00	35.0	11.20	15.11	104.50
40	0.00	1.0	5.20	0.06	7.00	10.00	0.0	245.60	95.17	45.50	0.00	9.0	140.00	37.09	228.00	0.00	18.0	34.40	55.43	79.50
41	0.00	3.0	11.20	1.31	31.00	6.00	0.0	106.00	96.07	148.50	0.00	6.0	127.80	45.23	33.00	0.00	12.0	53.60	44.40	218.50
42	0.00		14.00	0.54	8.50	10.00		60.60	85.86	241.50	0.00		87.20	32.86	88.50	0.00		34.00	45.77	124.00
43	-		20.40	0.40	27.50	-		38.00	91.06	1145.00	-		59.60	39.00	93.00	-		22.60	31.69	83.50
44	0.00				3.50	7.00				460.00	0.00				52.00	0.00				254.50
45					0.00					30.50					21.50					98.50
46					0.00					16.00					14.50					104.00

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganaganagar



Table:69 .Ent 2. Seasonal dynamics of key pests of cotton (Abiotic factors) under Unprotected condition to develop suitable forecasting model in North Zone during 2021-22.

SMW	Temperature(°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					24.00	38.40			23.74	40.69					75.30	40.30			66.14	36.29
23					28.10	40.20			26.06	42.46					64.40	37.40			70.86	27.43
24	25.17	36.05	26.93	36.71	25.10	37.90	27.80	37.40	25.99	39.49	81.29	62.71	69.14	45.00	80.40	56.20	68.70	44.10	73.43	46.43
25	25.54	38.92	24.99	37.11	26.30	37.00	28.60	39.10	24.91	40.54	83.28	53.42	70.57	36.29	72.60	44.60	66.30	41.30	69.29	34.86
26	26.45	41.54	27.51	39.14	26.80	40.00	29.70	41.70	24.17	40.99	71.42	46.42	58.50	35.13	62.60	34.70	57.60	31.90	63.00	44.00
27	27.18	40.58	27.99	39.03	27.90	41.40	30.50	40.30	28.29	41.26	74.42	48.28	61.57	37.86	65.00	37.60	58.40	37.30	59.43	39.86
28	26.88	35.47	27.63	35.26	28.10	37.80	28.50	37.90	27.69	39.49	80.00	65.85	75.71	68.71	79.30	61.10	68.60	54.40	71.14	40.00
29	23.94	36.55	28.14	34.30	26.90	35.90	27.10	37.40	27.39	38.51	79.42	67.85	82.29	66.57	85.90	62.60	79.00	55.60	69.00	48.14
30	25.85	34.04	27.24	33.67	27.40	33.70	27.10	33.80	26.77	36.71	87.14	70.85	86.14	70.29	91.70	75.70	85.30	73.10	72.86	56.43
31	25.41	34.92	26.57	33.73	26.50	31.90	26.70	34.50	26.26	37.40	83.29	63.85	85.86	71.57	94.00	78.60	87.40	67.40	68.57	54.00
32	24.48	35.72	26.41	33.84	26.60	35.60	27.60	37.10	26.00	38.23	79.57	57.14	83.14	64.00	87.80	58.20	70.40	52.00	70.00	44.29
33	26.01	37.42	28.10	36.31	26.30	37.10	28.90	38.40	26.60	38.93	74.42	49.42	76.00	53.43	79.60	53.90	66.40	48.30	61.14	43.57
34	25.42	33.24	27.32	33.90	26.70	34.70	26.30	35.10	25.53	36.71	84.85	70.85	82.33	66.33	85.80	69.40	82.70	62.40	70.29	57.71
35	24.97	35.28	26.01	34.17	25.90	35.90	25.60	34.60	25.90	37.46	84.71	66.00	82.71	59.14	87.90	65.50	83.00	60.90	66.29	47.57
36	24.92	32.75	25.99	32.53	25.80	32.70	24.90	33.10	24.79	35.29	86.14	72.42	85.57	73.71	94.60	75.40	90.90	70.60	81.86	62.14
37	23.67	32.34	25.14	31.17	25.20	31.80	23.91	32.30	24.01	32.99	84.28	73.57	89.14	72.43	89.20	71.80	81.90	67.60	83.14	69.29
38	24.11	33.08	24.71	31.40	25.20	32.30	24.50	32.60	23.36	34.46	88.14	71.14	84.86	70.29	89.50	75.80	79.40	67.70	78.86	57.43
39	24.08	34.29	24.34	33.26	25.40	31.90	23.81	33.50	23.64	34.47	84.14	58.00	86.43	64.00	90.50	71.30	86.90	65.60	85.00	55.57
40	23.34	34.2	24.33	33.96	25.30	33.30	24.51	34.60	23.37	35.13	86.14	59.14	85.14	58.14	92.60	65.70	85.40	57.00	80.29	54.71
41	20.14	34.91	20.30	34.60	21.60	34.80	22.20	35.71	19.57	36.11	77.71	53.28	82.86	37.57	86.20	36.90	71.90	36.10	76.57	38.29
42	16.39	31.87			18.40	31.30	20.20	32.90	15.31	33.39	82.42	63.28			85.50	50.00	64.10	38.30	78.57	43.00
43					15.90	29.80	17.40	30.00	15.21	29.54					86.00	44.40	82.40	42.90	85.14	52.86
44									12.83	30.36									84.57	42.86
45									12.70	30.10									79.57	37.14
46									12.06	28.91									87.29	46.57

AM-Morning, PM-Evening

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganaganagar



Table: 70 .Ent 2. Seasonal dynamics of key pests of cotton (Abiotic factors) under Unprotected condition to develop suitable forecasting model in North Zone during 2021-22.

SMW	Rainfall in mm				
	BT	FA	HI	SR	SG
22	-	-	13.20	-	8.40
23	-	-	0.00	-	0.00
24	23.80	26.60	51.80	127.70	15.90
25	0.00	31.00	0.00	9.60	0.00
26	2.00	0.00	8.90	0.00	58.20
27	4.40	1.00	0.00	0.00	0.00
28	9.20	7.00	18.50	3.50	0.00
29	45.00	47.00	9.00	1.80	13.20
30	22.00	65.40	56.00	46.50	0.20
31	58.00	15.00	149.90	1.50	0.50
32	24.00	78.60	0.00	0.00	0.00
33	0.00	0.00	0.00	2.60	0.00
34	36.00	18.20	0.50	30.50	1.40
35	2.40	0.00	15.70	0.00	0.00
36	42.00	38.40	100.20	19.70	2.20
37	91.10	40.20	44.30	41.10	104.10
38	0.00	98.40	142.00	32.70	1.70
39	0.00	0.00	126.00	0.00	3.80
40	51.00	7.20	5.50	4.00	3.20
41	0.00	0.00	0.00	0.00	0.00
42	0.00		0.00	0.00	0.00
43	-	-	0.00	6.00	27.60
44	-	-	-	-	0.00
45	-	-	-	-	0.00
46	-	-	-	-	0.00

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganaganagar



Table: 71 .Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition to develop suitable forecasting model in Central Zone in RCH 2 BG II / *Ajeet -155 BG II

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
29	-	-	-	0	-	0.0	3.1	-	-	-	-	-	0.0	-	0.0	0.0	-	-
30	-	0.2	0.4	0	-	5.2	7.7	-	-	0.3	1.4	1.2	0.0	-	0.0	0.5	-	-
31	-	0.4	0.2	0	-	76.7	8.5	-	-	0.3	2.8	1.2	0.0	-	2.5	1.0	-	-
32	-	0.5	0.3	0	-	59.1	9.5	-	-	0.7	3.1	1.6	0.0	-	5.6	0.3	-	-
33	-	0.6	1.4	0	-	10.2	31.6	-	-	0.7	5.5	2.0	0.0	-	6.3	1.8	-	-
34	-	0.8	1.5	0	3.10	24.1	15.8	-	-	1.3	7.7	2.8	0.0	6.90	9.6	1.4	-	-
35	-	1.1	6.9	0	2.30	20.4	40.8	-	-	1.6	8.2	3.0	0.0	3.80	10.7	2.5	-	-
36	-	1.4	9.4	0	0.70	18.6	17.0	-	-	3.0	6.9	3.9	0.0	5.20	8.8	2.7	-	-
37	-	2.2	5.0	2.9	0.50	4.0	7.1	-	-	5.7	9.6	5.0	3.0	3.50	4.9	4.2	-	-
38	-	1.4	9.2	2.2	0.50	3.5	22.6	-	-	6.0	8.6	5.8	3.5	1.40	3.0	5.0	-	-
39	-	1.6	14.9	3.5	0.00	2.0	12.1	-	-	6.3	7.6	7.9	3.8	0.80	4.3	3.1	-	-
40	-	2.1	21.5	4.2	0.50	5.7	16.1	-	-	4.3	8.9	9.0	3.6	1.90	4.8	3.3	-	-
41	-	1.8	25.2	3.5	0.00	5.0	13.0	-	-	3.0	7.2	9.3	4.4	2.70	7.2	3.1	-	-
42	-	2.3	30.0	3.7	0.00	6.8	14.7	-	-	5.3	6.2	10.0	3.4	1.00	8.1	2.5	-	-
43	-	2.9	26.0	4.6	0.00	3.1	22.2	-	-	7.3	6.5	12.7	4.2	1.90	8.4	3.2	-	-
44	-	4.1	32.3	4.7	0.00	2.0	27.8	-	-	4.0	5.5	15.3	4.4	2.40	8.5	3.8	-	-
45	-	6.2	35.2	4.7	1.80	4.5	47.7	-	-	4.3	6.7	13.5	4.7	3.00	9.2	5.7	-	-
46	-	8.3	40.0	4.8	7.90	6.0	54.2	-	-	3.3	5.4	9.7	6.2	1.10	10.8	5.8	-	-
47	-	10.0	45.2	6.1	8.00	10.8	63.6	-	-	2.0	7.8	7.6	5.3	1.10	7.8	4.7	-	-
48	-	11.2	49.4	5.9	11.50	13.0	30.1	-	-	1.3	6.6	6.0	6.6	0.70	5.0	4.2	-	-
49	-	16.5	51.3	7.0	14.00	18.2	48.4	-	-	1.0	7.6	6.2	6.2	1.10	4.9	5.0	-	-
50	-	18.8	43.3	8.2	23.10	33.8	65.6	-	-	-	8.2	3.3	8.5	0.70	3.1	3.7	-	-
51	-	19.4	40.3	6.2	26.70	63.3	81.6	-	-	-	7.8	2.3	6.0	0.80	1.5	4.1	-	-
52	-	23.8	32.6	6.6	24.60	82.3	119.9	-	-	-	6.8	1.2	6.0	0.50	1.8	5.4	-	-
1	-	-	25.4	-	12.60	-	-	-	-	-	-	0.0	-	1.10	-	-	-	-
2	-	-	18.8	-	18.90	-	-	-	-	-	-	0.0	-	1.30	-	-	-	-

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 (Sucking Pests) under unprotected condition to develop suitable forecasting model in Central Zone in RCH 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
29	-	-	-	0.0	-	0.0	0.3	-	-	-	-		0	-	0.0	0.0	-	-
30	-	0.7	0.0	0.0	-	0.0	0.2	-	-	-	2.7	0.3	0	-	0.0	0.2	-	-
31	-	0.8	0.2	0.0	-	0.0	0.3	-	-	-	4.8	1.0	0	-	2.9	0.4	-	-
32	-	0.7	1.3	0.0	-	0.3	0.6	-	-	-	7.5	2.0	0	-	16.8	0.2	-	-
33	-	2.2	1.0	0.0	-	0.6	1.4	-	-	-	10.0	2.4	0	-	32.3	24.6	-	-
34	-	3.7	2.3	0.0	3.50	1.9	2.2	-	-	-	12.7	3.9	0	5.80	52.8	11.9	-	-
35	-	4.3	3.3	0.0	1.90	2.8	2.2	-	-	-	13.3	4.7	0	2.60	37.5	49.9	-	-
36	1.3	3.3	3.2	0.0	2.90	3.4	2.0	-	-	-	8.9	2.7	0	3.80	21.5	57.5	-	-
37	3.0	5.1	1.3	2.1	4.50	3.0	2.1	-	-	-	9.4	5.6	3.4	2.80	53.0	2.9	-	-
38	6.3	6.7	1.5	2.7	4.90	2.0	1.6	-	-	-	7.1	14.6	2.9	1.80	36.0	0.2	-	-
39	10.3	9.9	2.3	2.7	3.10	3.5	1.1	-	-	-	7.8	20.3	3.1	0.90	5.2	2.1	-	-
40	12.3	8.1	3.0	3.6	2.70	4.1	0.9	-	-	-	8.4	26.0	3.6	2.10	4.3	0.4	-	-
41	15.7	7.3	3.7	3.4	3.00	4.3	2.5	-	-	-	7.1	33.2	3.9	0.60	4.1	2.3	-	-
42	14.3	5.1	4.3	4.0	3.90	9.5	1.5	-	-	-	6.9	32.9	3.6	1.00	5.3	1.7	-	-
43	15.7	6.0	7.9	4.2	3.80	15.5	3.5	-	-	-	6.3	30.8	3.9	0.20	5.5	3.0	-	-
44	16.0	5.6	8.0	4.2	2.40	20.2	3.4	-	-	-	6.8	24.4	5.9	0.40	4.8	4.0	-	-
45	8.7	4.6	7.5	4.3	3.00	30.5	5.0	-	-	-	5.9	18.2	4.4	0.60	3.8	1.2	-	-
46	11.3	3.8	6.4	3.2	2.10	26.8	5.8	-	-	-	6.0	15.3	4	0.90	4.3	1.2	-	-
47	12.3	3.5	6.0	4.7	1.60	22.0	5.5	-	-	-	4.0	10.7	4.9	0.80	2.5	0.6	-	-
48	12.7	3.0	4.4	4.7	2.10	30.2	3.0	-	-	-	5.9	6.8	8	0.90	1.1	0.4	-	-
49	0.7	2.8	4.3	5.5	4.70	21.4	3.5	-	-	-	4.7	3.5	5.9	0.30	2.0	1.3	-	-
50	-	2.5	4.8	5.7	1.60	15.8	2.8	-	-	-	3.8	2.7	4.8	1.00	2.5	0.7	-	-
51	-	3.7	3.5	5.9	1.10	16.6	3.9	-	-	-	3.2	1.2	6.7	0.40	0.0	5.0	-	-
52	-	2.4	1.2	5.9	1.90	3.1	5.1	-	-	-	2.4	1.0	5.9	0.30	0.0	4.5	-	-
1	-	-	1.0	-	2.10	-	-	-	-	-	-	0.0	-	0.90	-	-	-	-
2	-	-	0.0	-	2.10	-	-	-	-	-	-	0.0	-	0.80	-	-	NA	NA

BA- Banswara, JU- Junagadh, SU- Surat, BH- Bharuch, AK- Akola, NA- Nanded, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna



Table: 73. Ent 2. Seasonal dynamics of key pests of cotton (Natural Enemies & Bollworms) under unprotected condition to develop suitable forecasting model in Central Zone in RCH 2 BG II/ Ajeet -155 BG II

	Natural Enemies/plant*									No. of Larval Recovery/5plants								
										<i>H.armigera</i>								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA [#]	RA	KH	BW
29	-	-	-	0.0	-	0.0	0.0	-	-	-	-	-	0.0	-	0.0	-	-	-
30	-	0.02	0.1	0.0	-	0.1	0.1	-	-	-	0.0	0.0	0.0	-	0.0	-	0	-
31	-	0.03	0.0	0.0	-	0.7	0.2	-	-	-	0.0	0.0	0.0	-	0.0	-	0	-
32	-	0.1	0.0	0.0	-	1.1	0.1	-	-	-	0.0	0.0	0.0	-	0.0	-	0	-
33	-	0.1	0.2	0.0	-	1.2	0.7	-	-	-	0.0	0.0	0.0	-	0.0	-	0	-
34	-	0.1	0.4	0.0	0.30	1.3	0.9	-	-	-	0.0	0.0	0.0	0.10	0.0	-	0	-
35	-	0.1	0.2	0.0	0.12	1.4	1.7	-	-	-	0.0	0.0	0.0	0.00	0.0	-	0	-
36	0.2	0.1	0.6	0.0	0.13	1.0	1.4	-	-	-	0.0	0.0	0.0	0.00	0.0	-	0	-
37	0.2	0.1	1.0	0.0	0.15	0.7	0.7	-	-	-	0.3	0.0	0.0	0.10	0.0	-	0	-
38	0.2	0.1	1.6	0.1	0.13	0.5	0.5	-	-	-	0.3	0.0	0.3	0.20	1.0	-	0	-
39	0.3	0.1	1.6	0.1	0.17	0.3	1.0	-	-	-	0.3	0.0	0.3	0.00	2.0	-	0	-
40	0.3	0.1	2.4	0.1	0.37	0.7	0.5	-	-	-	0.5	0.0	0.0	0.00	0.0	-	0.4	-
41	0.5	0.1	2.6	0.2	0.18	0.9	0.3	-	-	-	0.5	0.0	0.0	0.00	0.0	-	0.2	-
42	0.5	0.1	2.9	0.1	0.23	0.6	0.6	-	-	-	0.0	0.0	0.0	0.00	0.0	-	0.2	-
43	0.4	0.1	3.0	0.2	0.18	0.9	0.6	-	-	-	0.3	0.0	0.0	0.00	0.0	-	0.2	-
44	0.3	0.1	3.1	0.4	0.13	1.1	0.7	-	-	-	0.5	0.0	0.0	0.00	0.0	-	0.4	-
45	0.5	0.1	3.2	0.2	0.03	1.1	1.2	-	-	-	0.3	0.0	0.0	0.00	0.0	-	0.2	-
46	0.4	0.1	3.2	0.1	0.13	1.3	1.6	-	-	-	0.5	0.0	0.0	0.00	0.0	-	0	-
47	0.4	0.03	2.8	0.1	0.12	1.1	1.7	-	-	-	0.3	0.0	0.0	0.00	0.0	-	0.6	-
48	0.4	0.1	3.2	0.1	0.25	1.6	1.3	-	-	-	0.3	0.0	0.0	0.00	0.0	-	0	-
49	0.5	0.1	3.4	0.0	0.22	1.5	1.9	-	-	-	0.0	0.0	0.0	0.00	0.0	-	0	-
50	-	0.03	3.0	0.0	0.18	1.5	1.3	-	-	-	0.0	0.0	0.0	0.00	0.0	-	0	-
51	-	0.1	2.2	0.0	0.13	1.6	1.7	-	-	-	0.0	0.0	0.0	0.00	0.0	-	-	-
52	-	0.1	1.6	0.0	0.07	1.4	2.3	-	-	-	0.0	0.0	0.0	0.00	0.0	-	-	-
1	-	-	1.2	-	0.15	-	-	-	-	-	-	0.0	-	0.00	-	-	-	-
2	-	-	0.8	-	0.10	-	-	-	-	-	-	0.0	-	0.00	-	-	-	-

BA- Banswara, JU- Junagadh, SU- Surat, BH- Bharuch, AK- Akola, NA- Nanded, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna

#-NA- No. of Larvae Recovery/ 10 plants



Table: 74 .Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in Central Zone in RCH 2 BG II.

	No. of Larvae/5plants																	
	<i>Earias spp.</i>									<i>S.litura</i>								
	BA	JU	SU	BH	AK	NA [#]	RA	KH	BW	BA	JU	SU	BH	AK	NA [#]	RA	KH	BW
29	-	-	-	0.0	-	0.0	-	-	-	-	-	-	0.0	-	0.0	-	-	-
30	-	0.0	0.0	0.0	-	0.0	-	0	-	-	0.0	0.0	0.0	-	0.0	-	-	-
31	-	0.0	0.0	0.0	-	0.0	-	0	-	-	0.0	0.0	0.0	-	0.0	-	-	-
32	-	0.0	0.0	0.0	-	0.0	-	0.2	-	-	0.0	0.0	0.0	-	0.0	-	-	-
33	-	0.0	0.0	0.0	-	0.0	-	0	-	-	0.0	0.0	0.0	-	0.0	-	-	-
34	-	0.0	0.0	0.0	0.00	0.0	-	0	-	-	0.0	0.0	0.0	-	1.0	-	-	-
35	-	0.0	0.0	0.0	0.00	0.0	-	0.2	-	-	0.0	0.0	0.0	-	0.0	-	-	-
36	-	0.0	0.0	0.0	0.00	0.0	-	0	-	-	0.0	0.0	0.0	-	0.0	-	-	-
37	-	0.0	0.0	0.0	0.00	0.0	-	0	-	-	0.0	0.0	0.0	-	0.0	-	-	-
38	-	0.0	0.0	0.0	0.00	0.0	-	0	-	-	0.0	0.0	0.0	-	0.0	-	-	-
39	-	0.0	0.0	0.0	0.00	0.0	-	0.2	-	-	0.0	0.0	0.0	-	0.0	-	-	-
40	-	0.0	0.0	0.0	0.00	0.0	-	0.2	-	-	0.0	0.0	0.0	-	0.0	-	-	-
41	-	0.0	0.0	0.3	0.00	0.0	-	0	-	-	1.0	0.0	0.0	-	0.0	-	-	-
42	-	0.0	0.0	0.0	0.00	0.0	-	0	-	-	1.0	0.0	0.0	-	0.0	-	-	-
43	-	0.0	0.0	0.3	0.00	0.0	-	0.2	-	-	0.0	0.0	0.0	-	0.0	-	-	-
44	-	0.3	0.0	0.0	0.00	0.0	-	0	-	-	0.0	0.0	0.5	-	0.0	-	-	-
45	-	0.0	0.0	0.0	0.00	0.0	-	0	-	-	1.0	0.0	0.5	-	0.0	-	-	-
46	-	0.0	0.0	0.0	0.10	0.0	-	0	-	-	0.0	0.0	0.0	-	0.0	-	-	-
47	-	0.0	0.0	0.0	0.00	0.0	-	0	-	-	0.0	0.0	0.0	-	0.0	-	-	-
48	-	0.0	0.0	0.0	0.00	0.0	-	0	-	-	0.0	0.0	0.5	-	0.0	-	-	-
49	-	0.0	0.0	0.0	0.10	0.0	-	0	-	-	1.0	0.0	0.0	-	0.0	-	-	-
50	-	0.0	0.0	0.0	0.20	0.0	-	0	-	-	0.0	0.0	0.0	-	0.0	-	-	-
51	-	0.0	0.0	0.0	0.00	0.0	-	-	-	-	0.0	0.0	0.0	-	0.0	-	-	-
52	-	0.0	0.0	0.0	0.10	0.0	-	-	-	-	1.0	0.0	0.0	-	0.0	-	-	-
1	-	-	0.0	-	0.00	-	-	-	-	-	-	0.0	-	-	-	-	-	-
2	-	-	0.0	-	0.10	-	-	-	-	-	-	0.0	-	-	-	-	-	-

BA- Banswara, JU- Junagadh, SU- Surat, BH- Bharuch, AK- Akola, NA- Nanded, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna

#-NA- No. of Larvae Recovery/ 10 plants



Table: 75. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in Central Zone 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
29	-	-		-	-	--	--		-	-	-		-	-	-	-	-	-
30	-	-	0.0	-	-	--	--	0.0	-	-	-	0.0	-	-	-	-	-	-
31	-	-	0.0	-	-	--	--	0.0	-	-	-	0.0	-	-	-	-	-	-
32	-	-	0.0	-	-	--	--	0.0	-	-	-	0.0	-	-	-	-	-	-
33	-	-	0.0	-	-	--	--	0.0	-	-	-	0.0	-	-	-	-	-	-
34	-	-	0.0	-	0.0	--	--	0.0	-	-	-	0.0	-	-	-	-	-	-
35	-	-	0.0	-	0.0	0.0	--	0.0	-	-	-	0.0	-	-	-	-	-	-
36	-	-	0.0	-	0.0	0.0	--	0.0	-	-	-	0.0	-	-	-	-	-	-
37	-	-	0.0	-	0.0	0.0	--	0.0	-	-	-	0.0	-	-	-	-	-	-
38	-	-	1.0	-	0.6	1.2	3.1	0.0	-	-	-	0.0	-	-	-	-	-	-
39	-	-	2.2	-	2.2	0.0	5.7	0.0	-	-	-	0.0	-	-	-	-	-	-
40	-	-	2.5	-	0.0	0.0	7.7	40.0	-	-	-	0.0	-	-	-	-	-	-
41	-	-	4.0	-	0.0	0.0	11.5	40.0	-	-	-	0.0	-	-	-	-	-	-
42	-	-	5.6	-	0.0	0.0	26.9	60.0	-	-	-	0.0	-	-	-	-	-	-
43	-	-	8.1	-	0.0	0.0	37.4	30.0	-	-	-	0.0	-	-	-	-	-	-
44	-	-	8.9	-	0.0	0.0	32.8	60.0	-	-	-	0.0	-	-	-	-	-	-
45	-	-	7.5	-	0.0	0.0	36.0	80.0	-	-	-	0.0	-	-	-	-	-	-
46	-	-	8.1	-	0.0	0.0	43.2	40.0	-	-	-	0.0	-	-	-	-	-	-
47	-	-	6.1	-	0.2	0.0	50.3	60.0	-	-	-	0.0	-	-	-	-	-	-
48	-	-	5.2	-	0.0	0.0	55.1	60.0	-	-	-	0.0	-	-	-	-	-	-
49	-	-	3.0	-	0.0	0.0	64.5	50.0	-	-	-	0.0	-	-	-	-	-	-
50	-	-	1.2	-	0.7	0.0	73.9	40.0	-	-	-	0.0	-	-	-	-	-	-
51	-	-	0.0	-	1.1	0.0	85.3	-	-	-	-	0.0	-	-	-	-	-	-
52	-	-	0.0	-	0.4	0.0	88.7	-	-	-	-	0.0	-	-	-	-	-	-
1	-	-	0.0	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-
2	-	-	0.0	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-

BA- Banswara, JU- Junagadh, SU- Surat, BH- Bharuch, AK- Akola, NA- Nanded, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna



Table: 76. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in Central Zone in RCH 2 BG II/ Ajeet -155 BG II.

SMW	Pink bollworm/20 green bolls																	
	GBD (%)									Larvae								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
29	-	-		-	-	--	-	-	-	-	-	-	0.0	-	--	--	-	-
30	-	-	0.0	-	-	--	-	-	-	-	0.0	0.0	0.0	-	--	--	0.0	-
31	-	-	0.0	-	-	--	-	-	-	-	0.0	0.0	0.0	-	--	--	0.0	-
32	-	-	0.0	-	-	--	-	-	-	-	0.0	0.0	0.0	-	--	--	0.0	-
33	-	-	0.0	-	-	--	-	-	-	-	0.0	0.0	0.0	-	--	--	0.0	-
34	-	-	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	-
36	-	-	0.0	-	0.0	--	-	-	-	-	0.0	0.0	0.0	0.0	--	--	0.0	-
37	-	-	0.0	-	0.0	--	-	-	-	-	0.0	0.0	0.0	0.0	--	--	0.0	-
38	-	-	0.0	-	0.0	--	-	-	-	-	0.0	0.0	0.0	0.0	--	1.2	0.0	-
39	-	-	0.0	-	10.0	0.0	-	-	-	-	0.0	0.0	0.0	4.0	0.0	2.4	0.0	-
40	-	-	0.0	-	20.0	--	-	-	-	-	0.0	0.0	0.0	4.0	--	2.9	0.4	-
41	-	-	5.0	-	35.0	2.5	-	-	-	-	0.0	0.0	0.0	7.0	1.0	2.2	0.4	-
42	-	-	10.0	-	45.0	--	-	-	-	-	1.0	1.0	0.0	9.0	--	4.4	0.6	-
43	-	-	10.0	-	40.0	5.0	-	-	-	-	1.0	1.0	0.0	12.0	2.0	11.9	0.3	-
44	-	-	10.0	-	60.0	--	-	-	-	-	1.0	2.0	0.0	15.0	--	12.8	0.6	-
45	-	-	15.0	-	55.0	5.0	-	-	-	-	2.0	2.0	0.0	16.0	1.0	13.0	0.8	-
46	-	-	30.0	-	75.0		-	-	-	-	2.0	6.0	0.0	26.0		13.8	0.4	-
47	-	-	30.0	-	60.0	27.5	-	-	-	-	3.0	5.0	0.0	21.0	4.0	18.6	0.6	-
48	-	-	40.0	-	75.0	--	-	-	-	-	4.0	10.0	0.0	30.0	--	23.6	0.6	-
49	-	-	25.0	-	65.0	35	-	-	-	-	3.0	7.0	1.0	28.0	11.0	25,18	0.5	-
50	-	-	25.0	-	75.0	--	-	-	-	-	4.0	6.0	0.0	32.0	--	29.2	0.4	-
51	-	-	20.0	-	70.0	--	-	-	-	-	6.0	4.0	0.0	27.0	--	31.6	-	-
52	-	-	20.0	-	70.0	--	-	-	-	-	4.0	5.0	0.0	21.0	--	37.6	-	-
1	-	-	10.0	-	55.0		-	-	-	-	-	1.0	-	16.0	-	-	-	-
2	-	-	0.0	-	65.0		-	-	-	-	-	0.0	-	17.0	-	-	-	-



Table: 77 .Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition to develop suitable forecasting model in Central Zone 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
29	-			0.0	-	0.0	5.2	-	-	0.3	-	-	0.0	-	0.0	0.2	-	-
30	-	0.1	0.0	0.0	-	5.4	8.7	-	0.6	0.3	3.2	1.7	0.0	-	0.4	0.5	-	0.0
31	-	0.2	0.0	0.0	-	80.5	10.0	26.4	4.3	0.7	4.2	2.5	0.0	-	5.7	0.5	0.0	0.0
32	-	0.5	0.6	0.0	-	61.3	11.4	21.4	28.8	1.3	6.6	4.0	0.0	-	9.3	0.3	0.0	0.0
33	-	0.6	2.2	0.0	-	10.5	36.9	17.2	32.9	2.7	8.5	5.5	0.0	-	10.8	2.4	1.8	0.0
34	-	0.7	2.6	0.0	1.1	25.7	24.7	20.0	38.4	4.0	10.1	6.3	0.0	4.3	12.2	2.5	2.5	0.7
35	-	0.8	3.0	0.0	0.4	22.9	50.2	27.0	6.6	3.7	10.4	4.8	5.7	8.9	16.3	3.5	3.0	0.7
36	-	1.1	3.3	0.0	0.5	21.3	25.4	15.6	10.8	5.7	12.1	3.4	6.8	1.5	11.3	3.8	3.8	1.6
37	-	1.4	4.0	3.1	0.1	4.8	10.7	25.2	7.1	6.3	18.8	3.9	9.5	5.0	9.4	5.5	6.0	4.6
38	-	1.3	6.8	5.2	0.1	4.3	26.2	20.0	6.1	8.7	17.1	6.0	10.1	1.0	7.0	10.2	4.1	7.5
39	-	2.1	10.6	9.7	0.0	0.0	15.3	24.1	2.7	5.0	16.6	10.6	10.5	0.9	7.3	8.8	2.4	5.1
40	-	2.2	14.9	12.6	0.0	5.0	25.6	16.4	2.0	3.7	15.8	11.8	10.4	3.0	8.1	5.8	4.7	6.6
41	-	2.6	20.7	11.9	0.0	6.5	15.5	20.2	0.7	4.0	14.3	15.7	10.8	4.3	10.5	3.4	6.4	10.1
42	-	3.2	24.9	11.6	0.0	7.1	20.4	23.2	0.0	6.7	15.2	18.4	12.1	6.2	11.2	5.3	7.4	14.6
43	-	3.7	31.7	13.8	0.0	5.1	29.2	18.1	0.4	8.3	13.7	21.9	8.7	5.5	11.7	5.7	7.0	15.0
44	-	4.4	33.8	11.5	0.0	2.0	31.6	25.3	1.2	5.0	15.6	22.8	8.6	4.9	13.3	5.4	5.7	8.1
45	-	6.6	40.6	10.5	0.4	5.3	35.7	28.2	2.5	4.3	14.4	24.3	10.2	5.2	16.1	6.1	6.3	5.4
46	-	9.4	45.9	11.2	0.5	7.4	43.1	13.2	2.2	3.7	13.9	20.4	11.2	2.1	18.3	6.3	3.8	4.1
47	-	12.8	54.7	12.9	1.1	12.9	61.2	15.8	1.6	2.0	14.2	22.0	7.8	2.9	14.8	5.7	2.2	3.8
48	-	15.1	48.7	9.9	2.5	15.1	23.5	12.0	1.1	1.0	12.4	18.4	7.9	1.9	10.3	4.1	1.8	1.1
49	-	19.0	40.3	10.0	3.1	21.3	42.7	7.7	0.5	1.0	9.7	15.4	6.6	1.5	8.4	5.2	0.7	0.6
50	-	22.8	50.6	10.1	3.3	41.2	65.3	1.6	0.0	-	10.0	11.3	7.0	2.3	6.2	5.0	2.0	0.0
51	-	24.3	46.0	6.9	15.3	72.8	89.2	-	0.0	-	9.0	8.5	6.2	1.4	5.3	5.3	-	0.0
52	-	26.3	32.0	6.8	4.5	93.6	110.1	-	0.0	-	8.4	4.7	6.3	1.6	2.1	6.1	-	0.0
1	-	-	26.0	-	10.5	-	-	-	-	-	-	2.0	-	2.1	-	-	-	-
2	-	-	20.0	-	4.0	-	-	-	-	-	-	0.0	-	1.5	-	-	-	-



Table: 78.Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition to develop suitable forecasting model in Central Zone 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
29	-		-	0.0	-	0.0	0.4	-	-	-	-	-	0.0	-	0.0	0.8	-	-
30	-	0.9	0.2	0.0	-	0.0	0.3	-	0.0	-	5.3	3.4	0.0	-	0.0	0.6	-	0.0
31	-	0.8	0.2	0.0	-	0.0	0.3	0.0	0.0	-	7.8	5.3	0.0	-	2.1	0.3	-	0.0
32	-	1.1	0.5	0.0	-	0.0	0.7	9.2	0.0	-	9.3	6.6	0.0	-	11.2	0.8	-	0.0
33	-	2.8	1.0	0.0	-	0.4	2.2	12.2	0.0	-	15.5	7.3	0.0	-	25.5	27.1	-	0.0
34	-	3.5	2.1	0.0	3.8	1.8	1.3	14.0	0.0	-	21.5	8.4	0.0	2.9	41.8	23.0	-	0.9
35	-	3.8	1.2	0.0	3.3	2.1	3.5	22.6	0.2	-	17.0	10.7	0.0	2.3	33.6	56.6	-	1.5
36	2.0	4.4	2.1	2.2	9.5	2.8	2.9	7.2	1.0	-	14.7	13.9	1.9	4.1	18.3	67.3	-	5.1
37	3.7	6.3	2.2	2.3	4.0	2.1	2.8	26.4	0.6	-	15.2	14.9	2.4	2.3	39.6	4.6	-	8.3
38	9.0	7.3	2.0	2.1	2.6	1.7	3.5	24.2	0.5	-	14.5	19.3	10.3	0.9	25.4	0.6	-	10.2
39	12.3	10.8	2.9	3.2	3.6	2.3	1.5	18.3	0.5	-	10.7	26.6	3.5	0.5	3.7	2.8	-	6.1
40	16.7	9.8	3.6	3.5	2.3	3.3	0.7	23.8	1.5	-	9.2	28.4	4.0	1.4	3.1	0.4	-	4.0
41	20.7	10.1	4.5	3.9	2.9	3.5	2.4	26.0	1.1	-	6.5	33.4	5.8	0.5	2.7	2.3	-	2.0
42	15.3	8.1	5.7	4.9	3.1	7.3	2.6	17.2	0.2	-	5.5	32.9	8.3	1.3	3.1	2.9	-	0.3
43	16.0	7.3	3.6	5.2	2.7	13.4	4.4	13.6	1.0	-	4.3	37.5	6.7	0.6	3.3	5.0	-	0.0
44	18.7	8.1	4.8	6.0	2.7	17.2	4.7	12.2	1.2	-	4.3	34.7	6.7	0.6	2.9	4.4	-	0.4
45	10.3	6.7	5.7	2.8	2.7	26.6	5.4	30.4	1.6	-	3.1	26.7	5.0	0.4	2.5	3.1	-	0.3
46	12.3	6.2	6.2	5.2	2.2	20.3	6.6	14.3	2.1	-	2.4	19.4	4.6	0.7	2.8	0.8	-	0.2
47	13.0	5.6	5.3	4.7	2.3	17.3	5.1	16.2	2.4	-	3.0	11.0	6.5	0.6	2.0	0.4	-	0.0
48	3.3	5.9	4.3	5.5	1.6	21.0	3.9	8.2	1.1	-	2.1	6.5	5.5	0.6	0.7	0.5	-	0.0
49	1.0	4.7	2.2	5.4	2.0	16.3	4.2	7.6	0.2	-	1.9	3.4	6.4	0.5	1.0	0.5	-	0.0
50	-	4.3	1.3	4.8	2.1	9.2	3.3	4.3	0.0	-	1.8	5.7	7.0	0.4	1.0	0.9	-	0.0
51	-	2.9	0.9	7.2	1.8	4.4	4.9	-	0.0	-	0.9	3.6	6.5	0.7	0.0	5.3	-	0.0
52	-	3.1	0.5	6.2	2.0	2.0	3.7	-	0.0	-	0.4	1.0	6.0	0.5	0.0	2.9	-	0.0
1	-	-	0.0	-	2.2	-	-	-	-	-	-	0.0	-	0.7	-	-	-	-
2	-	-	0.0	-	1.7	-	-	-	-	-	-	0.0	-	0.8	-	-	-	-



Table: 79 Ent 2. Seasonal dynamics of key pests of cotton (Natural Enemies & Bollworms) under unprotected condition to develop suitable forecasting model in Central Zone in DCH 32.

	Natural Enemies/plant*									No. of Larval Recovery/5plants								
										H.armigera								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA [#]	RA	KH	BW
29	-	-	-	0.0	-	0.0	0.4	-	-	-	-	-	0.0	-	0.0	0.0	-	-
30	-	0.1	0.0	0.0	-	0.2	0.5	-	0.1	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0
31	-	0.1	0.0	0.0	-	0.7	0.3	0.0	0.2	-	0.0	0.0	0.0	-	0.0	0.5	0.0	0.0
32	-	0.1	0.0	0.1	-	1.3	0.2	1.6	0.7	-	0.0	0.0	0.0	-	0.0	0.8	0.0	0.0
33	-	0.1	0.0	0.03	-	1.4	1.2	1.0	1.1	-	0.0	0.0	0.0	-	0.0	1.0	0.0	0.0
34	-	0.1	0.0	0.1	0.3	1.5	0.9	1.2	2.7	-	0.0	0.0	0.0	0.2	0.0	1.4	0.0	0.0
35	-	0.03	0.1	0.1	0.1	1.6	1.7	1.4	3.1	-	0.3	0.0	0.0	0.1	0.0	0.9	0.0	0.0
36	-	0.03	0.1	0.1	0.1	1.2	1.7	1.4	2.4	-	0.0	0.0	0.0	0.0	0.0	0.7	0.0	1.0
37	-	0.03	0.2	0.1	0.1	0.8	1.2	1.0	1.6	-	0.3	0.0	0.0	0.0	0.0	0.6	0.0	2.0
38	-	0.1	0.2	0.1	0.1	0.6	0.7	1.4	1.1	-	0.3	0.0	0.5	0.6	2.0	0.5	0.0	2.0
39	-	0.1	0.2	0.1	0.2	0.4	0.6	1.7	1.2	-	0.5	1.0	0.5	0.2	1.0	0.1	0.6	3.0
40	-	0.03	0.6	0.1	0.3	0.9	0.3	1.0	1.3	-	0.5	1.0	1.0	0.4	1.0	0.0	0.5	1.0
41	-	0.1	0.6	0.7	0.3	1.1	0.3	1.3	2.3	-	0.3	2.0	1.0	0.0	6.0	0.0	0.4	0.0
42	-	0.02	0.8	0.5	0.4	1.2	0.3	0.6	2.1	-	0.3	1.0	0.0	0.0	12.0	0.0	0.2	0.0
43	-	0.1	1.2	0.6	0.3	1.1	0.4	0.6	0.9	-	0.5	2.0	0.0	0.0	14.0	0.0	0.5	0.0
44	-	0.1	1.4	0.4	0.2	1.3	0.4	1.6	0.6	-	0.5	3.0	0.0	0.0	12.0	0.0	0.2	0.0
45	-	0.03	1.6	0.6	0.2	1.4	1.1	0.8	0.4	-	0.5	4.0	0.3	0.0	5.0	0.0	0.5	0.0
46	-	0.02	1.6	0.4	0.1	1.6	1.5	0.8	0.0	-	0.8	3.0	0.3	0.0	0.0	0.0	0.2	0.0
47	-	0.03	2.0	0.4	0.2	1.3	2.2	1.6	0.2	-	0.8	2.0	0.5	0.0	0.0	0.0	0.0	0.0
48	-	0.1	2.8	0.2	0.1	1.9	1.4	0.9	0.2	-	0.5	2.0	0.5	0.0	0.0	0.0	0.0	0.0
49	-	0.1	2.6	0.2	0.2	1.8	1.5	0.0	0.2	-	0.0	1.0	0.3	0.0	0.0	0.0	0.0	0.0
50	-	0.1	2.2	0.1	0.1	1.7	1.4	0.0	0.0	-	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
51	-	0.1	2.4	0.0	0.2	1.7	1.3	-	0.0	-	0.5	0.0	0.0	0.0	0.0	0.0	-	0.0
52	-	0.1	2.0	0.0	0.1	1.6	2.4	-	0.0	-	0.0	0.0	0.3	0.0	0.0	0.0	-	0.0
1	-	-	1.6	-	0.1	-	-	-	-	-	-	0.0	-	0.0	-	-	-	-
2	-	-	1.6	-	0.1	-	-	-	-	-	-	0.0	-	0.0	-	-	-	-

#-NA- No. of Larvae Recovery/ 10 plants



Table: 80. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in Central Zone in DCH 32.

	No. of Larvae/5plants																	
	<i>Earias spp.</i>									<i>S.litura</i>								
	BA	JU	SU	BH	AK	NA [#]	RA	KH	BW	BA	JU	SU	BH	AK	NA [#]	RA	KH	BW
29		-	-	0.0	-	0.0	0.0	-	-	-	-	-	0.0	-	0.0	0.0	-	-
30	-	0.0	0.0	0.0	-	0.0	0.4	-	0.0	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0
31	-	0.0	0.0	0.0	-	0.0	0.8	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0
32	-	0.0	0.0	0.0	-	0.0	1.1	0.2	0.0	-	0.0	0.0	0.0	-	0.0	0.8	-	0.0
33	-	0.0	0.0	0.0	-	0.0	1.5	0.2	0.0	-	0.0	0.0	0.0	-	0.0	1.5	-	0.0
34	-	0.0	0.0	0.0	0.0	0.0	1.6	0.4	1.0	-	0.0	1.0	0.0	-	2.0	1.6	-	0.0
35	-	0.0	0.0	0.0	0.0	0.0	1.0	0.6	2.0	-	0.0	0.0	0.0	-	0.0	1.5	-	0.0
36	-	0.0	0.0	0.0	0.0	0.0	0.9	0.8	0.0	-	0.0	1.0	0.0	-	1.0	1.4	-	2.5
37	-	0.3	0.0	0.3	0.0	2.0	1.3	0.6	0.0	-	0.0	1.0	0.0	-	0.0	1.3	-	3.5
38	-	0.0	2.0	0.5	0.0	1.0	0.9	0.7	0.0	-	0.0	1.0	0.5	-	0.0	1.5	-	1.0
39	-	0.0	2.0	0.5	0.0	0.0	0.1	0.2	1.0	-	0.0	1.0	1.0	-	0.0	0.3	-	3.0
40	-	0.0	3.0	1.0	0.0	0.0	0.1	0.6	2.0	-	0.0	2.0	1.0	-	0.0	0.2	-	0.5
41	-	0.0	2.0	0.5	0.2	0.0	0.0	0.4	3.0	-	2.0	2.0	0.5	-	0.0	0.0	-	0.5
42	-	0.5	1.0	1.0	0.0	0.0	0.0	0.8	0.0	-	1.0	2.0	1.0	-	0.0	0.1	-	0.0
43	-	0.0	1.0	1.0	0.2	1.0	0.0	0.6	0.0	-	1.0	2.0	0.5	-	0.0	0.0	-	0.0
44	-	0.3	2.0	1.0	0.0	0.0	0.0	0.0	0.5	-	0.0	3.0	1.0	-	0.0	0.1	-	0.0
45	-	0.0	1.0	0.5	0.7	0.0	0.0	0.0	1.5	-	3.0	2.0	0.5	-	0.0	0.0	-	0.0
46	-	0.0	0.0	1.0	0.2	0.0	0.0	0.0	1.0	-	0.0	2.0	1.0	-	0.0	0.0	-	0.0
47	-	0.3	0.0	1.0	0.1	0.0	0.0	0.0	0.0	-	0.0	1.0	1.0	-	0.0	0.0	-	0.0
48	-	0.0	0.0	1.0	0.5	0.0	0.0	0.0	0.0	-	0.0	0.0	1.0	-	0.0	0.1	-	0.0
49	-	0.0	0.0	2.0	0.4	0.0	0.0	0.0	0.0	-	3.0	0.0	1.0	-	0.0	0.0	-	0.0
50	-	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0	-	1.0	0.0	0.0	-	0.0	0.0	-	0.0
51	-	0.0	0.0	0.5	0.2	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0
52	-	0.0	0.0	0.0	0.1	0.0	0.0	-	0.0	-	2.0	0.0	0.0	-	0.0	0.0	-	0.0
1	-	-	0.0	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-
2	-	-	0.0	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-

#-NA- No. of Larvae Recovery/ 10 plants



Table: 81. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in Central Zone 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
29	-	-		-	-	--	0.0	-	-	-	-		-	-	-	-	-	-
30	-	-	0.0	-	-	--	0.0	-	-	-	-	0.0	-	-	-	-	-	-
31	-	-	0.0	-	-	--	0.0	0.0	-	-	-	0.0	-	-	-	-	-	-
32	-	-	0.0	-	-	--	0.0	0.0	-	-	-	0.0	-	-	-	-	-	-
33	-	-	0.0	-	-	--	1.0	0.0	-	-	-	0.0	-	-	-	-	-	-
34	-	-	0.0	-	1.4	--	1.7	0.0	0.0	-	-	0.0	-	-	-	-	-	-
35	-	-	0.0	-	0.0	0.0	3.6	0.0	3.3	-	-	0.0	-	-	-	-	-	-
36	-	-	2.1	-	0.0	0.0	4.8	0.0	3.5	-	-	0.0	-	-	-	-	-	-
37	-	-	2.7	-	0.0	3.8	5.5	0.0	1.5	-	-	0.0	-	-	-	-	-	-
38	-	-	5.6	-	2.1	8.0	5.4	0.0	3.3	-	-	0.0	-	-	-	-	-	-
39	-	-	6.0	-	0.0	3.2	6.8	60.0	2.7	-	-	0.0	-	-	-	-	-	-
40	-	-	7.9	-	0.9	3.0	11.5	50.0	3.4	-	-	0.0	-	-	-	-	-	-
41	-	-	11.3	-	0.3	4.8	12.8	45.0	3.6	-	-	2.0	-	-	-	-	-	-
42	-	-	13.2	-	0.1	9.2	29.2	45.0	2.6	-	-	5.6	-	-	-	-	-	-
43	-	-	24.3	-	0.4	11.5	39.9	60.0	1.8	-	-	7.9	-	-	-	-	-	-
44	-	-	28.5	-	0.0	10.2	44.4	70.0	2.0	-	-	13.5	-	-	-	-	-	-
45	-	-	16.4	-	0.2	6.6	42.6	80.0	1.2	-	-	18.3	-	-	-	-	-	-
46	-	-	12.4	-	1.6	2.5	46.5	80.0	0.0	-	-	22.2	-	-	-	-	-	-
47	-	-	7.6	-	0.9	0.0	53.1	90.0	0.0	-	-	17.0	-	-	-	-	-	-
48	-	-	6.5	-	0.5	0.0	60.3	85.0	0.0	-	-	15.2	-	-	-	-	-	-
49	-	-	3.2	-	1.3	0.0	66.2	95.0	0.0	-	-	10.6	-	-	-	-	-	-
50	-	-	0.0	-	0.0	0.0	75.6	85.0	0.0	-	-	6.4	-	-	-	-	-	-
51	-	-	0.0	-	0.6	0.0	88.6	-	0.0	-	-	0.0	-	-	-	-	-	-
52	-	-	0.0	-	0.2	0.0	89.1	-	0.0	-	-	0.0	-	-	-	-	-	-
1	-	-	0.0	-	0.4	-	-	-	-	-	-	0.0	-	-	-	-	-	-
2	-	-	0.0	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-



Table: 82. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in Central Zone in DCH 32.

SMW	Pink bollworm/20 green bolls																	
	GBD (%)									Larvae								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
29	-	-		-	-	--	-	-	-	-	-	-	0.0	-	--	-	-	-
30	-	-	0.0	-	-	--	-	-	0.0	-	0.0	0.0	0.0	-	--	-	-	0.0
31	-	-	0.0	-	-	--	-	-	0.0	-	0.0	0.0	0.0	-	--	-	0.0	0.0
32	-	-	0.0	-	-	--	-	-	0.0	-	0.0	0.0	0.0	-	--	-	0.0	0.0
33	-	-	0.0	-	-	--	-	-	0.0	-	0.0	0.0	0.0	-	--	-	0.0	0.0
34	-	-	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	--	-	0.0	0.0
36	-	-	0.0	-	0.0	--	-	-	0.0	-	0.0	0.0	0.0	0.0	--	-	0.0	0.0
37	-	-	0.0	-	0.0	--	-	-	0.0	-	0.0	0.0	0.0	0.0	--	-	0.0	0.0
38	-	-	0.0	-	10.0	--	-	-	0.0	-	0.0	0.0	0.0	2.0	--	2.1	0.0	0.0
39	-	-	0.0	-	20.0	0	-	-	0.0	-	1.0	0.0	0.0	4.0	0.0	3.9	0.5	0.0
40	-	-	0.0	-	15.0	--	-	-	0.0	-	1.0	0.0	0.0	5.0	--	3.7	0.6	0.0
41	-	-	0.0	-	30.0	5	-	-	0.0	-	1.0	0.0	0.0	11.0	1.0	4.6	0.4	0.0
42	-	-	5.0	-	45.0	--	-	-	0.0	-	2.0	1.0	0.0	19.0	--	6.3	0.5	0.0
43	-	-	10.0	-	60.0	12.5	-	-	0.0	-	2.0	2.0	0.0	23.0	2.0	14.9	0.6	0.0
44	-	-	10.0	-	55.0	--	-	-	0.0	-	2.0	3.0	0.0	15.0	--	16.4	0.7	0.0
45	-	-	15.0	-	70.0	12.5	-	-	0.0	-	3.0	4.0	0.0	19.0	2.0	18.2	0.8	0.0
46	-	-	20.0	-	80.0		-	-	0.0	-	4.0	5.0	0.0	29.0		21.5	0.8	0.0
47	-	-	25.0	-	65.0	32.5	-	-	0.0	-	6.0	5.0	1.0	27.0	5.0	23.6	0.8	0.0
48	-	-	40.0	-	70.0	--	-	-	0.0	-	9.0	8.0	1.0	31.0	--	30.5	1.0	0.0
49	-	-	45.0	-	75.0	52.5	-	-	0.0	-	11.0	9.0	1.0	28.0	14.0	32.4	1.0	0.0
50	-	-	35.0	-	80.0	--	-	-	0.0	-	13.0	8.0	2.0	33.0	--	36.5	0.9	0.0
51	-	-	25.0	-	60.0	--	-	-	0.0	-	12.0	5.0	0.0	24.0	--	38.4		0.0
52	-	-	20.0	-	70.0	--	-	-	0.0	-	13.0	5.0	0.0	16.0	--	40.3		0.0
1	-	-	10.0	-	70.0	-	-	-	-	-	-	2.0		18.0	-	-	-	-
2	-	-	10.0	-	75.0	-	-	-	-	-	-	2.0		17.0	-	-	-	-



Table:83 . Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition to develop suitable forecasting model in Central Zone 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
29	-	-	-	0.0	-	0.00	4.8	-	-	-	-		0.0	-	0.0	0.0	-	-
30	-	-	0.0	0.0	-	1.90	8.6	-	-	-	-	0.3	0.0	-	0.0	0.8	-	-
31	-	-	0.4	0.0	-	71.3	8.9	-	-	-	-	0.5	0.0	-	2.8	1.4	-	-
32	-	-	0.7	0.0	-	56.6	10.7	-	-	-	-	1.2	0.0	-	5.7	0.5	-	-
33	-	-	1.3	0.0	-	9.60	34.6	-	-	-	-	1.4	0.0	-	4.3	2.2	-	-
34	-	-	2.5	0.0	1.3	21.4	18.2	-	-	-	-	2.5	0.0	4.5	8.8	1.7	-	-
35	-	-	3.0	0.0	0.9	18.2	45.9	-	-	-	-	2.5	0.0	2.5	6.1	4.0	-	-
36	-	-	3.8	0.0	1.6	15.4	17.8	-	-	-	-	3.0	0.0	3.8	3.5	4.1	-	-
37	-	-	5.9	2.6	0.2	3.75	10.1	-	-	-	-	3.6	9.3	5.6	2.2	4.6	-	-
38	-	-	7.2	4.6	0.0	3.10	23.7	-	-	-	-	4.8	10.8	1.4	2.1	6.9	-	-
39	-	-	6.6	7.6	0.0	0.00	17.5	-	-	-	-	6.5	9.4	0.6	2.5	5.4	-	-
40	-	-	6.0	11.5	0.1	3.25	26.5	-	-	-	-	5.4	10.2	1.7	3.1	5.8	-	-
41	-	-	10.4	8.3	0.0	4.05	18.4	-	-	-	-	6.0	8.3	2.9	5.5	3.7	-	-
42	-	-	17.7	9.4	0.0	5.80	12.5	-	-	-	-	7.6	10.2	2.9	6.2	3.8	-	-
43	-	-	23.7	10.3	0.0	2.75	17.7	-	-	-	-	6.5	7.7	4.1	6.1	3.0	-	-
44	-	-	30.9	11.7	0.0	1.50	25.5	-	-	-	-	7.0	9.4	5.1	5.8	3.7	-	-
45	-	-	35.0	7.6	2.3	3.10	31.0	-	-	-	-	5.6	7.6	5.0	6.3	4.0	-	-
46	-	-	39.8	12.1	6.7	5.20	38.5	-	-	-	-	4.0	9.0	3.2	8.0	4.0	-	-
47	-	-	34.7	9.9	8.6	8.55	51.2	-	-	-	-	3.2	7.7	1.4	4.2	4.6	-	-
48	-	-	40.3	8.7	17.6	11.7	20.8	-	-	-	-	2.8	7.5	1.4	4.3	3.9	-	-
49	-	-	43.9	6.5	21.5	16.8	47.5	-	-	-	-	1.0	4.9	1.2	4.0	2.8	-	-
50	-	-	49.7	4.3	24.5	29.0	63.3	-	-	-	-	0.5	4.0	0.5	2.4	4.4	-	-
51	-	-	45.5	5.7	18.3	54.3	88.2	-	-	-	-	0.0	5.9	1.1	1.5	3.5	-	-
52	-	-	39.5	5.4	20.0	70.8	117.4	-	-	-	-	0.0	5.5	0.9	1.3	4.1	-	-
1	-	-	30.3	-	12.9	-	-	-	-	-	-	0.0	-	3.2	-	-	-	-
2	-	-	22.4	-	15.5	-	-	-	-	-	-	0.0	-	1.3	-	-	-	-



Table: 84. Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition to develop suitable forecasting model in Central Zone 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
29	-	-	-	0.0	-	0.00	0.3	-	-	-	-	-	0.0	-	0.0	0.0	-	-
30	-	-	0.2	0.0	-	0.00	0.2	-	-	-	-	1.0	0.0	-	0.0	0.4	-	-
31	-	-	0.4	0.0	-	0.00	0.3	-	-	-	-	2.2	0.0	-	2.0	0.6	-	-
32	-	-	0.4	0.0	-	0.00	0.8	-	-	-	-	6.9	0.0	-	10.5	0.3	-	-
33	-	-	0.6	0.0	-	0.50	1.5	-	-	-	-	7.0	0.0	-	22.6	26.3	-	-
34	-	-	1.2	0.0	3.8	1.75	2.4	-	-	-	-	6.5	0.0	7.8	31.2	14.3	-	-
35	-	-	0.6	0.0	2.6	2.30	3.3	-	-	-	-	7.6	0.0	4.3	28.5	57.5	-	-
36	-	-	1.0	0.0	3.2	3.05	2.2	-	-	-	-	12.6	0.0	3.7	15.4	65.6	-	-
37	-	-	1.2	2.8	4.4	2.50	2.2	-	-	-	-	18.3	2.6	1.8	31.8	4.5	-	-
38	-	-	1.0	2.9	5.9	1.75	3.5	-	-	-	-	24.4	7.2	2.4	20.2	0.2	-	-
39	-	-	2.0	3.8	3.3	2.50	1.2	-	-	-	-	35.5	3.0	1.0	3.2	2.5	-	-
40	-	-	3.2	4.0	2.6	3.70	0.7	-	-	-	-	22.0	3.7	2.6	2.8	0.2	-	-
41	-	-	4.7	4.2	3.0	3.85	2.3	-	-	-	-	21.3	4.3	1.2	2.4	2.7	-	-
42	-	-	5.3	4.4	3.7	8.20	3.0	-	-	-	-	31.5	7.3	1.0	2.9	3.0	-	-
43	-	-	6.4	2.7	3.6	14.5	2.5	-	-	-	-	35.7	3.6	0.3	3.0	3.4	-	-
44	-	-	7.9	5.4	2.4	18.8	3.3	-	-	-	-	28.6	4.3	0.4	2.5	3.9	-	-
45	-	-	7.7	3.6	3.1	27.4	2.7	-	-	-	-	24.3	6.4	0.7	2.0	2.5	-	-
46	-	-	7.0	5.5	2.1	24.1	5.0	-	-	-	-	17.0	6.3	2.0	2.5	1.3	-	-
47	-	-	6.1	3.3	2.0	18.8	4.7	-	-	-	-	12.7	5.0	0.6	2.0	0.5	-	-
48	-	-	4.4	6.5	2.2	26.4	3.0	-	-	-	-	7.8	5.6	0.8	0.6	0.4	-	-
49	-	-	3.0	5.3	2.1	19.7	2.6	-	-	-	-	2.0	5.8	1.1	0.5	0.4	-	-
50	-	-	2.2	7.2	2.0	12.2	2.9	-	-	-	-	2.0	4.3	0.7	0.0	0.7	-	-
51	-	-	0.7	5.2	2.2	5.20	3.0	-	-	-	-	0.0	6.3	0.4	0.0	3.4	-	-
52	-	-	0.0	6.2	1.8	2.75	3.5	-	-	-	-	0.0	5.1	0.4	0.0	4.0	-	-
1	-	-	0.0	-	2.1	-	-	-	-	-	-	0.0	-	2.0	-	-	-	-
2	-	-	0.0	-	1.7	-	-	-	-	-	-	0.0	-	0.7	-	-	-	-



Table: 85. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in Central Zone in Suraj.

	Natural Enemies/plant*									No. of Larvae /5plants								
										<i>H.armigera</i>								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA [#]	RA	KH	BW
29	-	-		0.0	-	0.0	0.0	-	-	-	-		0.0	-	0.0	0.0	-	-
30	-	-	0.0	0.0	-	0.1	0.1	-	-	-	-	0.0	0.0	-	0.0	0.0	-	-
31	-	-	0.2	0.0	-	0.6	0.2	-	-	-	-	0.0	0.0	-	0.0	1.2	-	-
32	-	-	0.2	0.0	-	1.0	0.2	-	-	-	-	0.0	0.0	-	0.0	1.4	-	-
33	-	-	0.3	0.0	-	1.1	0.9	-	-	-	-	0.0	0.0	-	0.0	2.6	-	-
34	-	-	0.6	0.1	0.3	1.2	1.0	-	-	-	-	0.0	0.0	0.0	0.0	6.6	-	-
35	-	-	0.7	0.1	0.2	1.4	1.1	-	-	-	-	0.0	0.0	0.0	0.0	2.6	-	-
36	-	-	0.9	0.1	0.2	1.0	1.3	-	-	-	-	0.0	0.0	0.0	0.0	1.8	-	-
37	-	-	1.2	0.1	0.1	0.7	0.8	-	-	-	-	0.0	0.0	0.0	0.0	1.4	-	-
38	-	-	1.4	0.1	0.2	0.5	0.5	-	-	-	-	0.0	0.0	0.3	3.0	1.7	-	-
39	-	-	1.6	0.1	0.2	0.3	0.3	-	-	-	-	0.0	0.3	0.2	1.0	1.3	-	-
40	-	-	2.2	0.1	0.2	0.7	0.3	-	-	-	-	1.0	0.5	0.5	2.0	0.8	-	-
41	-	-	2.4	0.4	0.2	0.9	0.1	-	-	-	-	1.0	0.0	0.5	8.0	3.4	-	-
42	-	-	2.9	0.5	0.2	1.0	0.2	-	-	-	-	2.0	0.0	0.0	13.0	0.3	-	-
43	-	-	2.7	0.8	0.2	0.9	0.2	-	-	-	-	2.0	0.0	0.0	17.0	0.0	-	-
44	-	-	3.0	0.6	0.2	1.2	0.5	-	-	-	-	3.0	0.5	0.0	14.0	0.0	-	-
45	-	-	3.0	0.4	0.2	1.2	1.0	-	-	-	-	3.0	0.3	0.0	8.0	0.0	-	-
46	-	-	3.2	0.4	0.2	1.4	3.0	-	-	-	-	3.0	0.5	0.0	2.0	0.0	-	-
47	-	-	3.8	0.4	0.2	1.1	1.4	-	-	-	-	3.0	0.3	0.0	0.0	0.0	-	-
48	-	-	3.7	0.1	0.1	1.5	1.8	-	-	-	-	2.0	0.3	0.0	0.0	0.0	-	-
49	-	-	3.6	0.1	0.2	1.4	1.6	-	-	-	-	2.0	0.3	0.0	0.0	0.0	-	-
50	-	-	2.7	0.1	0.1	1.5	1.3	-	-	-	-	0.0	0.0	0.0	0.0	0.0	-	-
51	-	-	2.3	0.0	0.0	1.5	1.1	-	-	-	-	0.0	0.0	0.0	0.0	0.0	-	-
52	-	-	1.7	0.0	0.1	1.4	0.8	-	-	-	-	0.0	0.0	0.0	0.0	0.0	-	-
1	-	-	1.3	-	0.2	-	-	-	-	-	-	0.0	-	0.0	-	-	-	-
2	-	-	1.0	-	0.1	-	-	-	-	-	-	0.0	-	0.0	-	-	-	-

#-NA- No. of Larvae Recovery/ 10 plants



Table:86. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in Central Zone in Suraj.

	No. of Larval Recovery/5plants																	
	<i>Earias</i> spp.									<i>S.litura</i>								
	BA	JU	SU	BH	AK	NA [#]	RA	KH	BW	BA	JU	SU	BH	AK	NA [#]	RA	KH	BW
29	-	-	-	0.0	-	0.0	0.0	-	-	-	-	-	0.0	-	0.0	0.0	-	-
30	-	-	0.0	0.0	-	0.0	0.0	-	-	-	-	0.0	0.0	-	0.0	0.0	-	-
31	-	-	0.0	0.0	-	0.0	0.7	-	-	-	-	0.0	0.0	-	0.0	0.0	-	-
32	-	-	0.0	0.0	-	0.0	2.8	-	-	-	-	0.0	0.0	-	0.0	1.4	-	-
33	-	-	0.0	0.0	-	0.0	3.0	-	-	-	-	0.0	0.0	-	0.0	3.1	-	-
34	-	-	0.0	0.0	0.0	0.0	4.2	-	-	-	-	0.0	0.0	-	1.0	3.6	-	-
35	-	-	0.0	0.0	0.0	0.0	2.3	-	-	-	-	0.0	0.0	-	0.0	2.9	-	-
36	-	-	0.0	0.0	0.0	0.0	1.9	-	-	-	-	0.0	0.0	-	1.0	2.8	-	-
37	-	-	0.0	0.0	0.0	3.0	2.8	-	-	-	-	1.0	0.0	-	0.0	2.6	-	-
38	-	-	2.0	0.0	0.0	2.0	1.5	-	-	-	-	2.0	0.0	-	0.0	2.8	-	-
39	-	-	2.0	1.0	0.0	0.0	0.7	-	-	-	-	2.0	0.5	-	0.0	0.8	-	-
40	-	-	2.0	0.5	0.0	1.0	0.5	-	-	-	-	3.0	0.5	-	0.0	0.5	-	-
41	-	-	3.0	0.5	0.0	0.0	0.0	-	-	-	-	4.0	0.5	-	0.0	0.0	-	-
42	-	-	2.0	0.3	0.2	0.0	0.0	-	-	-	-	3.0	0.0	-	0.0	0.2	-	-
43	-	-	2.0	0.5	0.1	1.0	0.0	-	-	-	-	3.0	0.5	-	0.0	0.0	-	-
44	-	-	2.0	1.0	0.1	0.0	0.0	-	-	-	-	4.0	0.5	-	0.0	0.2	-	-
45	-	-	1.0	0.3	0.0	0.0	0.0	-	-	-	-	3.0	0.5	-	0.0	0.0	-	-
46	-	-	0.0	0.0	0.1	0.0	0.0	-	-	-	-	2.0	0.0	-	0.0	0.0	-	-
47	-	-	0.0	0.3	0.5	0.0	0.0	-	-	-	-	1.0	0.5	-	0.0	0.0	-	-
48	-	-	0.0	0.5	0.1	0.0	0.0	-	-	-	-	0.0	1.0	-	0.0	0.0	-	-
49	-	-	0.0	1.0	0.2	0.0	0.0	-	-	-	-	0.0	1.0	-	0.0	0.0	-	-
50	-	-	0.0	0.5	0.0	0.0	0.0	-	-	-	-	0.0	1.0	-	0.0	0.0	-	-
51	-	-	0.0	0.3	0.1	0.0	0.0	-	-	-	-	0.0	0.0	-	0.0	0.0	-	-
52	-	-	0.0	0.0	0.0	0.0	0.0	-	-	-	-	0.0	0.0	-	0.0	0.0	-	-
1	-	-	0.0	-	0.1	-	-	-	-	-	-	0.0	-	-	-	-	-	-
2	-	-	0.0	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-

#-NA- No. of Larvae Recovery/ 10 plants



Table: 87. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in Central Zone 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
29	-	-	-	-	-	--	0.0	-	-	-	-	-	-	-	-	-	-	-
30	-	-	0.0	-	-	--	0.0	-	-	-	-	0.0	-	-	-	-	-	-
31	-	-	0.0	-	-	--	0.0	-	-	-	-	0.0	-	-	-	-	-	-
32	-	-	0.0	-	-	--	0.0	-	-	-	-	0.0	-	-	-	-	-	-
33	-	-	0.0	-	-	--	1.5	-	-	-	-	0.0	-	-	-	-	-	-
34	-	-	0.0	-	0.0	--	2.0	-	-	-	-	0.0	-	-	-	-	-	-
35	-	-	0.0	-	0.0	0.0	4.1	-	-	-	-	0.0	-	-	-	-	-	-
36	-	-	0.0	-	0.0	0.0	6.8	-	-	-	-	0.0	-	-	-	-	-	-
37	-	-	0.0	-	0.0	6.7	7.4	-	-	-	-	0.0	-	-	-	-	-	-
38	-	-	3.5	-	2.1	13.6	7.2	-	-	-	-	0.0	-	-	-	-	-	-
39	-	-	5.0	-	3.8	4.0	8.2	-	-	-	-	0.0	-	-	-	-	-	-
40	-	-	6.8	-	2.8	3.5	13.4	-	-	-	-	1.2	-	-	-	-	-	-
41	-	-	9.3	-	1.0	10.0	16.3	-	-	-	-	2.3	-	-	-	-	-	-
42	-	-	12.2	-	0.5	14.3	32.5	-	-	-	-	4.6	-	-	-	-	-	-
43	-	-	21.4	-	0.1	16.8	42.4	-	-	-	-	7.0	-	-	-	-	-	-
44	-	-	24.7	-	0.1	15.6	56.8	-	-	-	-	11.2	-	-	-	-	-	-
45	-	-	14.3	-	0.0	8.8	58.2	-	-	-	-	13.2	-	-	-	-	-	-
46	-	-	10.8	-	0.1	3.7	67.8	-	-	-	-	22.2	-	-	-	-	-	-
47	-	-	6.4	-	1.4	0.0	69.3	-	-	-	-	21.8	-	-	-	-	-	-
48	-	-	5.2	-	0.2	0.0	73.3	-	-	-	-	19.2	-	-	-	-	-	-
49	-	-	3.0	-	0.5	0.0	75.2	-	-	-	-	11.2	-	-	-	-	-	-
50	-	-	0.0	-	0.0	0.0	79.6	-	-	-	-	6.4	-	-	-	-	-	-
51	-	-	0.0	-	0.4	0.0	90.2	-	-	-	-	0.0	-	-	-	-	-	-
52	-	-	0.0	-	0.0	0	92.2	-	-	-	-	0.0	-	-	-	-	-	-
1	-	-	0.0	-	0.2	-	-	-	-	-	-	0.0	-	-	-	-	-	-
2	-	-	0.0	-	0.0	-	-	-	-	-	-	0	-	-	-	-	-	-



Table: 88 . Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in Central Zone in Suraj.

SMW	Pink bollworm/20 green bolls																	
	GBD (%)									Larvae								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
29	-	-	-	-	-	--	-	-	-	-	-	-	0.0	-	--	--	-	-
30	-	-	0.0	-	-	--	-	-	-	-	-	0.0	0.0	-	--	--	-	-
31	-	-	0.0	-	-	--	-	-	-	-	-	0.0	0.0	-	--	--	-	-
32	-	-	0.0	-	-	--	-	-	-	-	-	0.0	0.0	-	--	--	-	-
33	-	-	0.0	-	-	--	-	-	-	-	-	0.0	0.0	-	--	--	-	-
34	-	-	0.0	-	0.0	--	-	-	-	-	-	0.0	0.0	0.0	--	--	-	-
35	-	-	0.0	-	0.0	--	-	-	-	-	-	0.0	0.0	0.0	--	--	-	-
36	-	-	0.0	-	0.0	--	-	-	-	-	-	0.0	0.0	0.0	--	--	-	-
37	-	-	0.0	-	0.0	--	-	-	-	-	-	0.0	0.0	0.0	--	--	-	-
38	-	-	0.0	-	0.0	--	-	-	-	-	-	0.0	0.0	0.0	--	2.1	-	-
39	-	-	0.0	-	5.0	0.0	-	-	-	-	-	0.0	0.0	2.0	0.0	3.5	-	-
40	-	-	0.0	-	10.0	--	-	-	-	-	-	0.0	0.0	3.0	--	3.3	-	-
41	-	-	0.0	-	5.0	10.0	-	-	-	-	-	0.0	0.0	4.0	1.0	3.9	-	-
42	-	-	5.0	-	20.0	--	-	-	-	-	-	1.0	0.0	4.0	--	6.3	-	-
43	-	-	5.0	-	40.0	20.0	-	-	-	-	-	1.0	0.0	10.0	4.0	15.3	-	-
44	-	-	5.0	-	65.0	--	-	-	-	-	-	2.0	0.0	18.0	--	18.8	-	-
45	-	-	10.0	-	55.0	20.0	-	-	-	-	-	3.0	0.0	16.0	3.0	19.3	-	-
46	-	-	15.0	-	70.0		-	-	-	-	-	3.0	0.0	23.0		24.3	-	-
47	-	-	20.0	-	80.0	42.5	-	-	-	-	-	5.0	0.0	34.0	8.0	25.8	-	-
48	-	-	30.0	-	65.0	--	-	-	-	-	-	7.0	1.0	32.0	--	34.2	-	-
49	-	-	30.0	-	75.0	64.5	-	-	-	-	-	7.0	1.0	30.0	17.0	36.4	-	-
50	-	-	30.0	-	70.0	--	-	-	-	-	-	8.0	1.0	27.0	--	39.6	-	-
51	-	-	20.0	-	65.0	--	-	-	-	-	-	4.0	0.0	27.0	--	42.5	-	-
52	-	-	20.0	-	75.0	--	-	-	-	-	-	4.0	0.0	19.0	--	44.8	-	-
1	-	-	10.0	-	65.0	-	-	-	-	-	-	2.0	-	21.0	-	-	-	-
2	-	-	5.0	-	70.0	-	-	-	-	-	-	1.0	-	17.0	-	-	-	-



Table: 89. Ent 2. Seasonal dynamics of key pests of cotton in Central Zone- Weekly Trap Catches

	ABW									PBW								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
29				0	-	-	2	-	-		-	-	0	-	-	0	-	-
30	-	0	0	0	-	-	5	-	-	-	0	1	0	-	-	0	-	-
31	-	0	0	0	-	0	7	-	-	-	0	2	0	-	0	0	-	-
32	-	0	1	0	-	0	8	-	-	-	0	3	0	-	0	0	-	-
33	-	0	2	0	-	0	5	-	-	-	0	3	0	-	1	1	-	-
34	-	0	5	0	-	0	12	-	-	-	0	2	0	-	1	3	-	-
35	2	0	11	0	-	0	23	-	-	-	2	5	0	-	0	5	-	-
36	5	1	14	0	-	1	31	-	-	-	3	3	0	-	4	2	-	-
37	3	1	20	0	-	0	34	-	-	-	3	5	0	-	0	2	-	-
38	2	1	14	0	-	0	26	-	0	-	5	4	0	-	0	6	-	0
39	-	2	18	0	-	0	14	-	1	-	8	10	0	-	0	3	-	0
40	-	4	24	6	-	1	3	-	0	-	9	9	3	-	0	2	-	0
41	-	8	22	7	-	0	2	-	1	-	12	12	3	-	1	3	-	0
42	-	13	29	7	-	3	1	-	1	-	11	21	2	-	9	8	-	0
43	-	19	45	8	-	0	3	-	0	-	14	35	7	-	14	19	-	0
44	-	21	49	6	-	2	5	-	0	1	16	48	7	-	4	34	-	0
45	-	9	51	9	-	0	1	-	0	3	19	57	10	-	20	40	-	0
46	-	8	33	8	-	0	0	-	-	2	21	149	7	-	11	102	-	0
47	-	4	16	7	-	0	0	-	-	2	96	129	10	-	6	124	-	0
48	-	8	11	7	-	0	0	-	-	-	112	161	10	-	16	136	-	0
49	-	9	13	7	-	0	0	-	-	-	110	209	7	-	5	418	-	0
50	-	5	8	7	-	0	0	-	-	-	126	212	8	-	29	142	-	0
51	-	3	7	6	-	0	0	-	-	-	114	240	10	-	17	135	-	0
52	-	1	3	8	-	0	0	-	-	-	130	161	12	-	11	118	-	-
1	-	-	0	-	-	0	-	-	-	-	-	155	-	-	13	-	-	-
2	-	-	0	-	-	0	-	-	-	-	-	124	-	-	18	-	-	-

BA- Banswara, JU- Junagadh, SU- Surat, BH- Bharuch, AK- Akola, NA- Nanded, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna



Table: 90 . Ent 2. Seasonal dynamics of key pests of cotton in Central Zone- Weekly Trap catches.

	<i>E. Insulana</i>									TC								
	BA	JU	SU	BH	AK	NA	RA	KH	BW	BA	JU	SU	BH	AK	NA	RA	KH	BW
29	-	-	-	0	-	-	0	-	-	-	-	-	0	-	-	0	-	-
30	-	0	0	0	-	-	0	-	-	5	0	0	0	-	-	0	-	-
31	-	0	1	0	-	0	0	-	-	13	0	2	0	-	0	0	-	-
32	2	0	1	0	-	0	0	-	-	21	0	2	0	-	0	5	-	-
33	3	0	0	0	-	0	42	-	-	26	15	2	0	-	0	63	-	-
34	1	0	0	0	-	0	17	-	-	35	28	8	0	-	0	93	-	-
35	2	0	2	0	-	0	24	-	0	39	14	16	0	-	0	3	-	0
36	-	0	3	0	-	0	8	-	1	22	20	26	0	-	0	2	-	0
37	-	0	1	0	-	0	2	-	2	19	12	56	0	-	2	33	-	0
38	-	1	2	6	-	0	4	-	1	31	23	75	0	-	1	44	-	2
39	-	0	8	6	-	0	2	-	3	34	28	103	7	-	1	3	-	4
40	-	0	11	7	-	0	1	-	3	43	38	135	6	-	1	3	-	3
41	-	1	19	10	-	0	1	-	2	47	58	165	8	-	0	2	-	3
42	-	0	20	6	-	0	0	-	2	48	43	140	10	-	0	13	-	3
43	-	3	15	7	-	0	0	-	1	12	28	159	4	-	0	1	-	3
44	-	0	14	6	-	0	0	-	0	8	39	125	6	-	0	19	-	3
45	-	4	12	0	-	0	0	-	0	3	45	122	8	-	0	13	-	1
46	-	0	10	2	-	0	0	-	-	-	33	88	6	-	0	0	-	0
47	-	5	17	4	-	0	0	-	-	-	38	69	7	-	0	0	-	0
48	-	3	10	6	-	0	0	-	-	-	32	55	6	-	0	10	-	-
49	-	2	9	0	-	0	0	-	-	-	44	30	8	-	0	5	-	-
50	-	0	5	6	-	0	0	-	-	-	35	25	8	-	0	5	-	-
51	-	0	0	4	-	0	0	-	-	-	38	21	4	-	0	6	-	-
52	-	0	0	6	-	0	0	-	-	-	41	20	6	-	0	0	-	-
1	-	-	0	-	-	0	-	-	-	-	-	8	-	-	0	-	-	-
2	-	-	0	-	-	0	-	-	-	-	-	4	-	-	0	-	-	-

BA- Banswara, JU- Junagadh, SU- Surat, BH- Bharuch, AK- Akola, NA- Nanded, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna



Table: 91. Ent 2. Seasonal dynamics of key pests of cotton (Abiotic factors) under Unprotected condition to develop suitable forecasting model in Central Zone during 2021-22

	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.
29	27	33	-	-	-	-	26	32	-	-	18	31	24	30	-	-	-	-
30	25	30	25	30	27	31	27	31	-	-	18	31	25	29	-	-	24	27
31	25	28	25	31	27	31	27	30	-	-	18	33	24	27	-	-	24	31
32	25	30	24	33	27	31	27	34	-	-	19	34	24	29	-	-	25	34
33	25	33	24	33	27	32	26	34	-	-	17	29	23	30	-	-	24	32
34	25	30	24	32	25	31	26	31	23	29	18	32	22	27	-	-	24	34
35	24	33	23	32	24	31	26	32	24	31	19	31	23	31	-	-	23	32
36	25	33	24	30	23	31	26	31	23	31	18	29	23	29	-	-	23	32
37	25	31	25	29	26	31	25	31	23	31	20	31	24	29	-	-	23	31
38	25	30	25	30	26	30	25	30	23	30	19	30	24	30	-	-	23	33
39	25	32	24	31	26	32	25	30	23	30	17	29	23	28	-	-	24	32
40	25	34	25	33	25	31	26	33	23	33	20	32	23	30	-	-	23	34
41	24	35	24	34	26	34	26	35	22	34	21	33	23	31	-	-	22	33
42	19	33	20	35	23	34	22	35	20	31	19	31	22	32	-	-	23	33
43	18	32	20	33	21	35	21	35	16	32	17	31	19	32	-	-	18	32
44	13	32	16	34	21	34	18	34	14	31	17	31	18	31	-	-	21	31
45	13	32	17	34	21	34	18	33	14	31	17	32	20	31	-	-	17	30
46	14	30	16	33	23	33	19	33	19	31	18	29	16	30	-	-	22	30
47	17	30	21	33	23	33	21	34	20	32	18	32	22	31	-	-	21	31
48	15	30	16	32	24	34	17	32	15	31	16	30	18	30	-	-	14	29
49	15	27	17	29	15	24	18	28	16	28	16	29	22	24	-	-	17	25
50	11	27	15	30	20	31	17	29	13	29	15	29	19	28	-	-	15	27
51	8	26	11	29	20	29	12	28	9	28	14	29	20	26	-	-	9	26
52	12	25	15	28	16	30	15	28	13	27	16	30	14	30	-	-	16	27
1	-	-	-	-	18	28	-	-	13	27	-	-	-	-	-	-	-	-
2	-	-	-	-	17	27	-	-	15	26	-	-	-	-	-	-	-	-

AM-Morning, PM-Evening



Table: 92 . Ent 2. Seasonal dynamics of key pests of cotton (Abiotic factors) under Unprotected condition to develop suitable forecasting model in Central Zone during 2021-22.

	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
29	75	50	-	-	-	-	85	78	-	-	84	73	87	63	-	-	-	-
30	89	77	92	82	98	78	85	76	-	-	79	67	84	64	-	-	73	82
31	91	80	85	71	93	78	80	72	-	-	80	64	83	68	-	-	82	78
32	87	69	88	65	93	76	74	51	-	-	75	59	80	55	-	-	76	78
33	84	59	84	57	94	68	81	60	-	-	92	87	83	60	-	-	87	82
34	88	72	90	73	96	73	87	71	91	70	83	68	94	78	-	-	75	81
35	83	58	89	69	98	74	91	70	90	63	86	79	89	59	-	-	83	83
36	85	91	94	83	97	72	90	74	94	71	90	82	91	67	-	-	82	79
37	87	69	96	88	99	77	94	81	89	69	82	79	88	70	-	-	90	83
38	88	71	94	77	99	81	89	82	90	68	90	70	82	64	-	-	83	82
39	86	66	92	80	98	72	89	79	93	74	92	86	94	71	-	-	82	76
40	84	56	86	61	100	77	81	67	92	64	83	74	92	68	-	-	84	60
41	80	52	81	68	99	63	86	64	88	43	75	66	94	67	-	-	85	54
42	76	48	72	35	100	61	76	35	83	51	77	72	87	45	-	-	90	62
43	74	44	78	39	95	32	72	37	83	40	75	61	84	31	-	-	85	45
44	77	32	69	32	93	36	61	28	80	36	65	56	80	33	-	-	93	59
45	76	34	63	28	66	28	60	29	81	32	67	54	82	40	-	-	88	43
46	71	40	68	35	62	28	60	43	77	49	83	78	83	36	-	-	90	74
47	72	37	73	49	61	37	75	53	86	51	83	68	89	57	-	-	92	60
48	73	47	77	49	90	47	73	53	73	29	65	62	88	42	-	-	91	39
49	73	43	70	45	81	49	83	55	85	44	69	57	95	56	-	-	95	74
50	75	43	59	35	92	89	74	49	79	36	67	59	72	46	-	-	93	48
51	76	35	60	32	82	78	77	42	83	29	72	57	87	46	-	-	91	33
52	77	45	77	48	82	93	80	47	87	50	65	51	98	89	-	-	91	54
1	-	-	-	-	84	62	-	-	92	47	-	-	-	-	-	-	-	-
2	-	-	-	-	83	65	-	-	87	62	-	-	-	-	-	-	-	-



Table: 93. Ent 2. Seasonal dynamics of key pests of cotton (Abiotic factors) under Unprotected condition to develop suitable forecasting model in Central Zone during 2021-22.

SMW	Rainfall in mm								
	BA	JU	SU	BH	AK	NA	RA	KH	BW
29	19.4	-	-	30.00	-	233.2	51.2	-	-
30	151.4	123.80	96.50	68.50	-	65.8	5.2	-	56.40
31	28.2	2.00	15.00	6.00	-	51.4	3.2	-	34.00
32	29.5	7.60	19.00	0.00	-	0.0	1.6	-	16.40
33	23.4	8.10	13.00	22.40	-	10.2	5.0	-	87.40
34	35.5	14.40	66.00	50.60	26.90	52.8	79.6	-	6.60
35	60.9	69.20	31.00	33.00	50.50	8.4	1.2	-	55.40
36	52.7	179.30	48.00	69.80	80.00	3.8	104.0	-	88.60
37	89.8	393.40	245.50	67.00	7.60	76.8	99.2	-	118.60
38	36.2	55.70	117.50	95.80	28.90	36.6	1.8	-	80.00
39	90.9	156.60	15.50	264.80	68.10	17.2	100.8	-	6.00
40	35.4	16.70	185.15	7.00	17.10	277.8	40.6	-	0.00
41	0.0	60.90	7.50	8.40	0.00	25.0	57.6	-	1.00
42	12.8	0.00	14.50	0.00	54.90	0.0	0.0	-	1.20
43	0.0	0.00	0.00	0.00	0.00	36.2	0.0	-	0.00
44	0.0	0.00	0.00	0.00	0.00	0.0	0.0	-	26.00
45	0.0	0.00	0.00	0.00	0.00	4.4	0.0	-	0.00
46	0.0	0.00	0.00	13.60	0.00	0.0	0.0	-	6.00
47	0.0	0.00	0.00	37.60	1.40	0.0	5.0	-	1.60
48	1.5	0.00	4.50	2.40	0.00	0.0	45.4	-	0.00
49	-	0.00	56.00	0.00	0.00	0.0	1.0	-	4.40
50	-	0.00	0.00	0.00	0.00	0.0	0.0	-	0.00
51	-	0.00	0.00	0.00	0.00	0.0	0.0	-	0.00
52	3.0	0.00	0.00	0.00	42.60	0.0	1.0	-	0.00
1	-	-	0.00	-	0.00	-	-	-	-
2	-	-	0.00	-	0.00	-	-	-	-

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 (Sucking Pests) under unprotected condition to develop suitable forecasting model in South Zone in Jadoo BG

	Sucking Pests																											
	Aphids/ 3 leaves							Jassid/ 3 leaves							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	SVPR	LG	ND	DW	RC	CN	CBE	SVPR
29	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-
30	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-
31	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-
32	-	-	0.2	6.9	-	-	-	-	-	0.8	0.0	-	-	-	-	-	0.0	0.0	-	-	-	-	-	6.9	14.5	-	-	-
33	-	-	1.2	4.9	-	-	-	-	-	1.6	0.2	-	-	-	-	-	0.0	0.0	-	-	-	-	-	11.8	15.5	-	-	-
34	2.2	-	3.2	8.9	-	-	-	2.9	-	3.2	7.8	-	-	-	0.8	-	0.1	0.0	-	-	-	12.0	-	28.5	19.5	-	-	-
35	2.7	-	4.0	4.8	-	-	-	3.1	-	3.8	6.2	-	-	-	1.4	-	0.2	0.0	-	-	-	12.3	-	31.8	23.1	-	-	-
36	0.6	-	6.2	2.6	-	-	-	2.0	-	6.4	7.6	-	-	-	0.7	-	0.4	0.4	-	-	-	8.3	-	38.8	17.1	-	-	-
37	1.2	-	6.8	0.0	-	-	-	3.5	6.6	8.1	11.3	-	-	-	0.4	-	0.6	1.3	-	-	-	9.7	28.6	47.3	27.7	-	-	-
38	1.0	-	8.2	0.9	-	-	6.0	4.7	7.2	8.7	15.9	-	-	2.0	0.5	-	1.0	9.4	-	-	0.2	8.4	30.3	43.5	29.8	-	-	1.2
39	7.5	-	9.9	0.0	-	3.2	13.8	6.7	8.6	10.4	12.1	-	0.0	5.4	0.7	-	1.2	6.1	-	0.0	0.8	8.1	33.2	38.1	22.5	-	0.1	4.4
40	1.3	-	14.2	6.9	-	8.3	2.0	6.4	7.5	11.7	14.8	-	0.0	0.8	1.5	-	1.4	5.4	-	0.1	1.2	12.2	20.6	36.7	30.1	-	1.3	0.0
41	3.4	-	17.4	2.5	-	8.9	1.8	5.6	9.6	10.0	7.8	-	1.9	2.2	3.0	-	1.6	1.9	-	0.5	0.8	17.5	18.8	30.3	10.5	-	2.4	2.2
42	0.6	-	20.2	0.5	-	9.5	1.2	0.4	8.8	9.4	8.9	-	5.3	3.0	0.3	-	0.8	8.4	-	1.9	0.0	0.8	28.7	28.6	12.2	-	4.4	2.8
43	0.8	-	22.0	0.0	-	2.8	4.8	2.7	9.1	8.6	10.3	-	2.1	0.8	4.2	-	1.0	9.0	-	1.3	0.0	3.0	32.3	20.5	17.4	-	6.3	0.2
44	10.2	-	24.6	0.0	-	2.4	5.6	11.4	6.6	7.1	9.2	-	2.9	1.6	8.5	-	1.2	6.7	-	2.9	2.6	13.6	22.2	16.2	16.5	-	2.7	0.6
45	6.3	-	29.2	0.0	-	4.8	4.8	2.4	6.2	6.6	11.2	-	3.3	0.8	3.1	-	0.8	10.4	-	1.8	1.2	2.0	20.3	13.8	8.5	-	1.3	0.2
46	7.1	-	31.4	0.0	-	6.3	6.2	9.0	8.4	6.0	16.2	-	4.9	2.8	5.0	-	0.4	8.3	-	1.3	0.4	8.3	16.7	8.2	6.4	-	0.0	0.4
47	16.1	-	33.6	0.0	-	3.2	6.1	4.0	7.5	5.2	14.2	-	3.5	2.6	2.8	-	0.6	7.4	-	1.7	1.4	2.4	17.2	4.6	5.5	-	0.6	0.6
48	3.4	-	36.2	0.0	-	4.3	5.2	1.4	5.4	3.8	8.0	-	1.3	1.2	0.3	-	0.5	5.4	-	0.6	0.2	1.5	11.2	2.2	8.3	-	0.2	0.2
49	2.0	-	30.8	0.0	-	2.6	4.2	4.2	4.2	5.0	7.2	-	2.4	0.5	3.7	-	0.2	4.5	-	0.2	1.2	1.7	10.8	1.5	7.4	-	0.1	0.2
50	2.0	-	14.2	0.0	-	3.9	7.2	11.1	8.6	4.6	6.3	-	3.3	3.5	0.5	-	0.0	3.6	-	0.1	1.4	0.2	11.2	1.0	6.6	-	0.2	1.4
51	3.1	-	9.4	0.0	-	2.7	9.2	8.9	7.7	3.2	5.4	-	4.6	5.2	5.0	-	0.0	2.7	-	0.1	0.0	2.4	21.2	0.9	5.7	-	1.3	0.8
52	0.3	-	5.2	0.0	-	2.6	9.0	5.5	9.2	3.0	4.5	-	3.5	5.0	6.1	-	0.0	1.8	-	0.1	0.0	2.4	24.6	0.5	4.8	-	0.0	0.8
1	1.6	-	-	-	-	2.1	7.2	6.2	7.2	-	-	-	4.3	3.2	3.0	-	-	-	-	0.0	0.0	4.5	29.7	-	-	-	0.0	0.5
2	4.7	-	-	-	-	1.3	6.2	6.6	-	-	-	-	3.6	2.2	2.9	-	-	-	-	0.0	0.0	3.0	-	-	-	-	0.0	0.0

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table: 95. Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition to develop suitable forecasting model in South Zone in Jadoo BG

	Natural Enemies/plant*							No. of Larval Recovery/5plants																				
								<i>H.armigera</i>							<i>Earias</i> spp.							<i>S.litura</i>						
	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN*	CBE	SVPR	LG	ND	DW	RC	CN*	CBE	SVPR	LG	ND	DW	RC	CN*	CBE	SVPR
29	-	-	0.0	-	-	-	-	-	-	0.0	-	0.0	-	-	-	-	0.0	-	0.0	-	-		-	-		0.0	-	-
30	-	-	0.0	-	-	-	-	-	-	0.0	-	0.0	-	-	-	-	0.0	-	0.0	-	-		-	-		0.0	-	-
31	-	-	0.0	-	-	-	-	-	-	0.0	-	0.0	-	-	-	-	0.0	-	0.0	-	-		-	-		0.0	-	-
32	-	-	0.2	1.2	-	-	-	-	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-		-	-	0.0	0.0	-	-
33	-	-	0.4	2.3	-	-	-	-	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-		-	-	2.0	0.0	-	-
34	0.0	-	0.6	2.2	-	-	-	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	1.0	0.0	-	-
35	0.0	-	1.0	2.8	-	-	-	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
36	0.0	-	0.2	2.6	-	-	-	0.0	-	0.1	0.0	0.0	-	-	-	-	0.1	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
37	0.2	-	0.1	5.0	-	-	-	0.0	-	0.1	0.0	0.0	-	-	-	-	0.2	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
38	0.0	-	0.5	3.2	-	-	0.00	0.0	-	0.2	0.0	0.0	-	-	-	-	0.1	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
39	0.1	-	0.4	1.4	-	0.0	0.00	0.0	-	0.2	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	1.0	0.0	-	-
40	0.0	-	0.5	6.0	-	0.1	0.10	0.0	-	0.0	0.0	0.0	-	-	-	-	0.1	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
41	0.3	-	0.9	4.9	-	0.2	0.20	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	1.0	0.0	-	-
42	0.0	-	0.5	2.6	-	0.2	0.20	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
43	0.2	-	0.8	4.2	-	0.5	0.40	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	1.0	0.0	-	-
44	0.6	-	0.8	1.4	-	0.5	1.30	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.2	-	-	0.0	0.0	-	-
45	0.6	-	0.7	4.2	-	0.5	0.40	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
46	0.5	-	0.8	2.4	-	0.3	1.50	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	1.0	0.0	-	-
47	0.3	-	1.0	1.0	-	0.4	0.20	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
48	0.1	-	0.7	1.4	-	0.4	0.20	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.2	-	-	2.0	0.0	-	-
49	0.4	-	0.6	0.5	-	0.3	0.30	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
50	0.2	-	0.3	0.0	-	0.2	0.40	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
51	0.2	-	0.1	0.0	-	0.2	0.80	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
52	0.0	-	0.0	0.0	-	0.2	1.00	0.0	-	--	0.0	0.0	-	-	-	-		0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
1	0.0	-	0.0	-	-	0.2	0.00	0.0	-	0.0	-	-	-	-	-	-	0.0			-	-	0.0	-	-			-	-
2	0.0	-	0.0	-	-	0.1	0.00	0.0	-	0.0	-	-	-	-	-	-	0.0			-	-	0.0	-	-			-	-

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur
CN*- Bahubali BG-II Sown at Chamarajanagar



Table: 96. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in South Zone in Jadoo BG

	Fruiting Body Damage (%) **							GBD (%) by ABW/ TC/SBW							Pink bollworm/20 green bolls													
															GBD (%)							Larvae						
	LG	ND	DW	RC	CN*	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR
29	-	-	-		0.0	-	-	-	-	-	-	-	-	-	-	-	0.0		-	-	-	-	-	0.0		-	-	-
30	-	-	-		0.0	-	-	-	-	-	-	-	-	-	-	-	0.0		-	-	-	-	-	0.0		-	-	-
31	-	-	-		0.0	-	-	-	-	-	-	-	-	-	-	-	0.0		-	-	-	-	-	0.0		-	-	-
32	-	-	-	0.0	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	0.0	-	-	-	-	-	0.0	0.0	-	-	-
33	-	-	-	0.0	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	0.0	-	-	-	-	-	0.0	0.0	-	-	-
34	-	-	-	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	-	0.0	0.0	-	-	-
36	-	-	-	0.0	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	0.0	0.0	-	-	-	0.0	-	0.0	0.0	-	-	-
37	-	-	-	87.5	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	0.0	0.0	-	-	-	0.0	-	0.0	0.0	-	-	-
38	-	-	-	87.7	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	0.0	0.0	-	-	-	0.0	-	0.0	0.0	-	-	-
39	-	-	-	82.9	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	0.0	12.0	-	-	-	0.0	-	0.0	0.0	-	-	-
40	-	-	-	86.5	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	0.0	15.0	-	-	-	0.0	-	0.0	1.0	-	-	-
41	-	-	-	84.4	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	0.8	15.0	-	-	-	0.0	-	0.0	1.0	-	-	-
42	-	-	-	85.5	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	4.2	20.0	-	-	-	0.0	-	2.0	2.0	-	-	-
43	-	20.0	-	82.8	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	5.1	25.0	-	-	-	0.0	5.0	4.0	2.0	-	-	-
44	-	15.0	-	86.3	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	6.6	30.0	-	-	-	0.0	3.0	7.0	3.0	-	-	-
45	-	40.0	-	88.0	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	7.3	35.0	-	-	-	0.0	9.0	10.0	4.0	-	-	-
46	-	60.0	-	87.2	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	8.4	38.0	-	-	-	0.0	10.0	14.0	6.0	-	-	-
47	-	70.0	-	87.9	0.0	-	-	-	-	-	0.0	-	-	-	10.0	-	4.1	35.0	-	-	-	6.0	11.0	17.0	5.0	-	-	-
48	-	65.0	-	89.1	0.0	-	-	-	-	-	0.0	-	-	-	40.0	-	3.8	45.0	-	-	-	18.0	9.0	28.0	7.0	-	-	-
49	-	55.0	-	88.8	0.0	-	-	-	-	-	0.0	-	-	-	70.0	-	2.6	55.0	-	-	-	9.0	9.0	18.0	6.0	-	-	-
50	-	75.0	-	90.3	0.0	-	-	-	-	-	0.0	-	-	-	100	-	1.8	60.0	-	-	-	9.0	14.0	10.0	11.0	-	-	-
51	-	65.0	-	92.4	0.0	-	-	-	-	-	0.0	-	-	-	90.0	-	1.0	80.0	-	-	-	9.0	14.0	8.0	12.0	-	-	-
52	-	50.0	-	93.0	0.0	-	-	-	-	-	0.0	-	-	-	70.0	-		85.0	-	-	-	4.0	16.8	-	14.0	-	-	-
1	-	60.0	-	-	-	-	-	-	-	-	-	-	-	-	80.0	-	0.6	-	-	-	-	4.0	17.3	5.0	-	-	-	-
2	-	70.0	-	-	-	-	-	-	-	-	-	-	-	-	80.0	-	0.0	-	-	-	-	9.0	16.0	2.0	-	-	-	-

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur

CN* - Bahubali BG-II Sown at Chamarajanagar



Table: 97. Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition to develop suitable forecasting model in South Zone in DCH 32 NBt.

	Sucking Pests																												
	Aphids/ 3 leaves							Jassid/ 3 leaves							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	SVPR	LG	ND	DW	RC	CN	CBE	SVPR	
29	-	-	0.0	-	8.5	-	-	-	-	0.0	-	2.8	-	-	-	-	0.0	-	0.0	-	-	-	-	-	0.0	-	3.5	-	-
30	-	-	0.0	-	15.2	-	-	-	-	0.0	-	4.5	-	-	-	-	0.0	-	0.0	-	-	-	-	-	0.0	-	6.8	-	-
31	-	-	0.0	-	20.2	-	-	-	-	0.0	-	4.8	-	-	-	-	0.0	-	1.5	-	-	-	-	-	0.0	-	7.5	-	-
32	-	-	0.0	8.5	12.3	-	-	-	-	1.2	0.0	3.5	-	-	-	-	0.1	0.0	2.3	-	-	-	-	-	8.5	12.5	2.5	-	-
33	-	-	0.6	6.5	18.5	-	-	-	-	2.8	0.5	2.5	-	-	-	-	0.4	0.0	2.5	-	-	-	-	-	14.9	13.5	2.2	-	-
34	0.0	-	3.6	10.5	15.3	-	-	4.6	-	3.4	8.1	2.3	-	-	1.3	-	0.4	0.0	1.5	-	-	10.7	-	31.8	17.5	3.1	-	-	
35	0.0	-	4.8	6.4	32.5	-	-	3.4	-	4.6	6.5	4.5	-	-	1.1	-	0.6	0.0	1.0	-	-	12.0	-	36.6	21.1	4.1	-	-	
36	0.0	-	6.6	4.2	40.3	-	-	2.2	-	7.2	7.9	3.4	-	-	0.5	-	1.0	0.5	1.3	-	-	5.1	-	46.3	15.1	3.4	-	-	
37	0.0	-	7.4	0.0	38.5	-	-	4.3	12.8	8.6	11.6	7.5	-	-	0.8	-	1.4	1.4	1.3	-	-	7.0	32.8	51.8	25.7	4.5	-	-	
38	0.0	-	8.8	2.5	32.0		4.7	3.6	15.8	9.4	16.2	6.5	-	2.7	0.7	-	1.8	9.5	2.8	-	-	9.4	36.2	48.2	27.8	4.5	-	-	
39	0.1	-	11.2	0.0	25.1	7.0	8.2	3.5	18.4	10.8	12.4	4.5	1.5	14.6	0.4	-	2.0	6.2	2.8	0.0	0.7	20.0	36.8	41.7	20.5	3.2	3.4	1.7	
40	0.0	-	15.4	8.5	30.6	3.4	3.5	7.6	12.3	11.2	15.1	3.5	7.6	1.5	3.7	-	1.8	5.5	2.3	0.1	3.0	12.5	24.2	38.8	28.1	3.8	5.7	7.2	
41	0.1	-	18.8	4.1	24.8	5.8	8.6	9.8	15.3	12.4	8.1	3.3	14.4	7.2	1.8	-	2.3	2.0	0.8	0.2	0.2	12.3	26.2	36.5	8.5	3.5	1.1	0.5	
42	0.0	-	21.6	2.1	19.2	1.9	6.2	0.4	14.7	11.6	9.2	2.8	13.7	5.6	0.1	-	1.2	8.5	0.3	0.8	2.2	0.5	32.2	32.3	10.2	2.5	0.9	5.6	
43	0.2	-	23.4	0.0	25.1	3.7	4.0	5.0	14.1	9.2	10.6	2.2	10.0	2.0	2.9	-	1.4	9.1	0.0	1.0	1.8	9.8	38.8	27.3	15.4	1.5	6.2	3.2	
44	0.6	-	28.2	0.0	20.2	6.2	5.2	20.1	15.2	8.4	9.5	1.3	8.7	3.2	6.1	-	1.6	6.8	0.0	1.8	0.0	14.2	23.3	20.8	14.5	1.2	6.3	1.0	
45	0.3	-	30.9	1.4	15.2	7.1	4.0	8.4	16.4	7.8	11.5	1.2	10.7	2.0	2.9	-	1.0	10.5	0.0	2.5	1.2	1.1	20.7	18.3	6.5	0.8	3.6	2.2	
46	0.4	-	33.5	0.0	12.3	3.6	4.6	10.2	13.0	7.2	16.5	1.0	9.9	2.6	5.9	-	0.8	8.4	0.0	2.2	0.0	7.5	15.4	15.2	4.4	0.5	4.4	1.0	
47	0.5	-	37.8	0.0	10.3	4.8	4.2	6.9	7.6	6.4	14.5	0.0	5.6	2.2	0.4	-	1.2	7.5	0.0	2.4	0.6	3.1	16.7	9.4	3.5	0.2	1.6	1.6	
48	0.2	-	41.6	0.0	5.4	1.6	3.0	1.5	8.3	4.2	8.3	0.0	3.8	1.0	0.2	-	0.6	5.5	0.0	2.2	0.2	0.9	11.6	8.3	6.3	0.0	3.2	1.2	
49	0.2	-	34.8	0.0	6.3	3.6	3.5	11.1	7.8	5.6	7.5	0.0	5.7	0.5	0.5	-	0.8	4.6	0.0	2.1	0.0	0.2	11.7	6.0	5.5	0.0	4.6	0.0	
50	0.2	-	22.6	0.0	2.3	5.3	7.0	8.4	13.8	5.0	6.6	0.0	6.9	5.0	7.3	-	0.4	3.7	0.0	2.0	0.2	2.4	11.7	3.0	4.6	0.0	6.1	0.5	
51	0.0	-	13.4	0.0	1.3	3.1	6.8	7.4	14.2	4.0	5.8	0.0	4.6	9.5	3.4	-	0.1	2.9	0.0	1.8	3.0	2.2	26.3	2.8	3.7	0.0	1.3	4.0	
52	0.0	-	6.4	0.0	2.2	1.3	6.0	11.5	15.2	3.8	4.9	0.0	5.3	9.6	1.8	-	0.0	2.0	0.0	1.2	3.2	2.7	31.3	2.2	2.9	0.0	3.6	6.2	
1	0.0	-	-	-	-	4.2	6.2	13.2	11.2	-	-	-	3.3	10.2	5.6	-	-	-	-	0.5	1.8	1.1	32.8	-	-	-	-	4.1	6.0
2	0.0	-	-	-	-	2.1	7.2	8.1	-	-	-	-	4.2	5.2	2.2	-	0.0	-	0.0	0.1	1.2	3.1	-	-	-	-	2.3	5.2	

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamaraajanagar; CBE- Coimbatore; SVPR-Srivilliputtur



Table: 98. Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in South Zone in DCH 32 NBt.

	Natural Enemies/plant*							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	LG	ND	DW	RC	CN	CBE	SVPR
29	-	-	0.0	-	-	-	-	-	-	0.0	-	0.0	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	0.0	-	-
30	-	-	0.0	-	1.1	-	-	-	-	0.0	-	0.0	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	0.0	-	-
31	-	-	0.2	-	2.3	-	-	-	-	0.0	-	0.0	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	0.0	-	-
32	-	-	0.6	4.4	1.8	-	-	-	-	0.0	2.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	-	-	-	1.0	0.0	-	-
33	-	-	0.9	6.8	1.8	-	-	-	-	0.4	2.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	-	-	-	2.0	0.0	-	-
34	0.0	-	1.0	14.8	2.3	-	-	0.0	-	0.8	4.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	1.0	0.0	-	-
35	0.0	-	1.4	2.2	3.5	-	-	0.0	-	1.2	3.0	0.0	-	-	-	-	0.4	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
36	0.0	-	1.0	1.6	4.5	-	-	0.0	-	1.6	5.0	0.0	-	-	-	-	1.0	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
37	0.0	-	0.6	4.0	3.8	-	-	0.0	-	2.5	6.0	0.0	-	-	-	-	1.6	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
38	0.0	-	0.7	2.2	2.3	-	0.00	0.0	-	3.6	2.0	0.0	-	-	-	-	2.2	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
39	0.0	-	1.1	0.8	2.0	0.02	0.00	0.0	-	4.8	4.0	0.0	-	-	-	-	0.8	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
40	0.0	-	0.9	4.6	2.5	0.17	0.30	0.0	-	5.4	1.0	0.0	-	-	-	-	0.6	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
41	0.0	-	1.2	3.1	2.6	0.56	0.50	0.0	-	3.6	6.0	0.0	-	-	-	-	0.1	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
42	0.0	-	0.9	2.2	2.2	0.99	0.70	0.0	-	2.8	7.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	-
43	0.1	-	1.4	3.6	1.1	1.79	2.20	0.0	-	1.4	2.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0	-	-
44	0.2	-	1.1	4.8	0.8	2.74	2.20	0.0	-	1.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.2	0.0	-	0.0	0.0	-	-
45	0.1	-	1.6	3.6	0.0	2.22	2.30	0.0	-	1.8	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0	-	-
46	0.1	-	2.0	1.8	0.0	2.96	2.20	0.0	-	1.4	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0	-	-
47	0.1	-	1.6	0.4	0.0	2.39	1.80	0.0	-	0.8	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0	-	-
48	0.1	-	1.2	0.8	0.0	2.17	1.50	0.0	-	0.2	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.2	0.0	-	0.0	0.0	-	-
49	0.0	-	1.0	0.0	0.0	1.73	1.10	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0	-	-
50	0.1	-	1.3	0.0	0.0	1.15	0.90	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0	-	-
51	0.0	-	1.5	0.0	0.0	0.89	1.10	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0	-	-
52	0.0	-	1.2	0.0	0.0	1.19	0.70	0.0	-	-	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0	-	-
1	0.0	-	0.6	-	-	0.75	0.40	0.0	-	0.0	-	-	-	-	-	-	0.0			-	-	0.0	0.0	-	-	-	-	-
2	0.0	-	0.2	-	-	0.40	0.40	0.0	-	0.0	-	-	-	-	-	-	0.0			-	-	0.0	0.0	-	-	-	-	-

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table: 99 .Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in South Zone in DCH 32 N-Bt.

	Fruiting Body Damage (%) **							GBD (%) by ABW/ TC/SBW							Pink bollworm/20 green bolls															
															GBD (%)								Larvae							
	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR		
29	-	-	-			-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-		
30	-	-	-		0.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-		
31	-	-	-		0.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-		
32	-	-	-	68.8	0.0	-	-	-	-	-	12.3	-	-	-	-	-	0.0	0.0	-	-	-	-	-	0.0	0.0	-	-	-		
33	-	-	-	76.9	0.0	-	-	-	-	-	15.4	-	-	-	-	-	0.0	0.0	-	-	-	-	-	0.0	0.0	-	-	-		
34	-	-	-	81.3	0.0	-	-	-	-	-	16.3	-	-	-	0.0	-	0.0	0.0	-	-	-	0.0	-	0.0	0.0	-	-	-		
35	-	-	-	81.6	0.0	-	-	-	-	-	18.2	-	-	-	0.0	-	0.0	0.0	-	-	-	0.0	-	0.0	0.0	-	-	-		
36	-	-	-	81.0	0.0	-	-	-	-	-	20.4	-	-	-	0.0	-	0.0	0.0	-	-	-	0.0	-	0.0	0.0	-	-	-		
37	-	-	-	86.7	0.0	-	-	-	-	-	22.2	-	-	-	0.0	-	0.0	0.0	-	-	-	0.0	-	0.0	0.0	-	-	-		
38	-	-	-	72.7	0.0	-	-	-	-	-	24.2	-	-	-	0.0	-	0.0	0.0	-	-	-	0.0	-	0.0	0.0	-	-	-		
39	-	-	-	94.2	0.0	-	-	-	-	-	15.1	-	-	-	0.0	-	5.00	0.0	-	-	-	0.0	-	0.00	0.0	-	-	-		
40	-	-	-	78.7	0.0	-	-	-	-	-	12.2	-	-	-	0.0	-	10.50	20.0	-	-	-	0.0	-	6.0	3.0	-	-	-		
41	-	-	-	73.8	0.0	-	-	-	-	-	6.2	-	-	-	0.0	-	13.80	20.0	-	-	-	0.0	-	9.0	4.0	-	-	-		
42	-	-	-	80.0	0.0	-	-	-	-	-	5.2	-	-	-	0.0	-	15.90	30.0	-	-	-	0.0	-	12.0	7.0	-	-	-		
43	-	35.0	-	77.1	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	17.20	50.0	-	-	-	0.0	6.0	15.0	8.0	-	-	-		
44	-	35.0	-	62.9	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	18.50	60.0	-	-	-	0.0	7.0	18.0	8.0	-	-	-		
45	-	55.0	-	84.4	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	19.25	90.0	-	-	-	0.0	11.0	23.0	9.0	-	-	-		
46	-	70.0	-	75.4	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	19.90	100	-	-	-	0.0	16.0	29.0	11.0	-	-	-		
47	-	80.0	-	89.1	0.0	-	-	-	-	-	0.0	-	-	-	10.0	-	21.60	100	-	-	-	5.0	16.0	31.0	10.0	-	-	-		
48	-	70.0	-	93.8	0.0	-	-	-	-	-	0.0	-	-	-	50.0	-	24.20	100	-	-	-	5.0	15.0	34.0	12.0	-	-	-		
49	-	75.0	-	59.6	0.0	-	-	-	-	-	0.0	-	-	-	80.0	-	28.80	100	-	-	-	3.0	13.0	27.0	15.0	-	-	-		
50	-	90.0	-	60.6	0.0	-	-	-	-	-	0.0	-	-	-	50.0	-	30.60	100	-	-	-	6.0	16.0	19.0	14.0	-	-	-		
51	-	85.0	-	58.3	0.0	-	-	-	-	-	0.0	-	-	-	90.0	-	25.20	100	-	-	-	6.0	17.0	11.0	16.0	-	-	-		
52	-	75.0	-	100	0.0	-	-	-	-	-	0.0	-	-	-	60.0	-	16.40	100	-	-	-	18.0	19.2	-	15.0	-	-	-		
1	-	85.0	-	-	0.0	-	-	-	-	-	-	-	-	-	60.0	-	8.20	-	-	-	-	12.0	18.0	9.0	-	-	-	-		
2	-	80.0	-	-	-	-	-	-	-	-	-	-	-	-	60.0	-	5.00	-	-	-	-	9.0	18.0	4.0	-	-	-	-		

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table: 100. Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition to develop suitable forecasting model in South Zone in Suraj N-Bt.

	Sucking Pests																											
	Aphids/ 3 leaves							Jassid/ 3 leaves							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	SVPR	LG	ND	DW	RC	CN	CBE	SVPR
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	7.7	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	10.5	-	-	-
33	-	-	-	5.7	-	-	-	-	-	-	0.1	-	-	-	-	-	-	0.0	-	-	-	-	-	-	11.5	-	-	-
34	-	-	-	9.7	-	-	-	-	-	-	7.7	-	-	-	-	-	-	0.0	-	-	-	-	-	-	15.5	-	-	-
35	-	-	-	5.6	-	-	-	-	-	-	6.1	-	-	-	-	-	-	0.0	-	-	-	-	-	-	19.1	-	-	-
36	-	-	-	3.4	-	-	-	-	-	-	7.5	-	-	-	-	-	-	0.2	-	-	-	-	-	-	13.1	-	-	-
37	-	-	-	0.0	-	-	-	-	-	-	11.2	-	-	-	-	-	-	1.1	-	-	-	-	-	-	23.7	-	-	-
38	-	-	-	1.7	-	-	7.7	-	-	-	15.8	-	-	2.2	-	-	-	9.2	-	-	3.2	-	-	-	25.8	-	-	2.7
39	-	-	-	0.0	-	3.3	11.0	-	-	-	12.0	-	3.9	5.6	-	-	-	5.9	-	0.0	6.6	-	-	-	18.5	-	4.4	6.1
40	-	-	-	7.7	-	11.2	5.5	-	-	-	14.7	-	7.1	0.0	-	-	-	5.2	-	1.2	1.0	-	-	-	26.1	-	3.3	0.5
41	-	-	-	3.3	-	10.8	7.0	-	-	-	7.7	-	6.3	2.2	-	-	-	1.7	-	2.9	3.2	-	-	-	6.5	-	9.5	2.7
42	-	-	-	1.3	-	10.6	8.0	-	-	-	8.8	-	7.4	2.8	-	-	-	8.2	-	4.7	3.8	-	-	-	8.2	-	12.8	3.3
43	-	-	-	0.0	-	13.4	5.0	-	-	-	10.2	-	9.5	0.0	-	-	-	8.8	-	3.5	1.0	-	-	-	13.4	-	8.9	0.5
44	-	-	-	0.0	-	14.2	6.0	-	-	-	9.1	-	5.5	1.2	-	-	-	6.5	-	5.2	2.2	-	-	-	12.5	-	5.0	1.0
45	-	-	-	0.6	-	3.5	5.0	-	-	-	11.1	-	4.7	0.0	-	-	-	10.2	-	3.1	1.0	-	-	-	4.5	-	1.8	0.5
46	-	-	-	0.0	-	2.4	6.0	-	-	-	16.1	-	5.0	0.6	-	-	-	8.1	-	0.9	1.6	-	-	-	2.4	-	2.0	1.0
47	-	-	-	0.0	-	0.0	5.2	-	-	-	14.1	-	3.4	0.2	-	-	-	7.2	-	1.2	1.2	-	-	-	1.5	-	1.4	0.7
48	-	-	-	0.0	-	0.0	5.0	-	-	-	7.9	-	1.8	0.5	-	-	-	5.2	-	0.8	1.5	-	-	-	4.3	-	0.8	0.5
49	-	-	-	0.0	-	1.3	5.0	-	-	-	7.0	-	2.3	0.5	-	-	-	4.2	-	0.6	1.5	-	-	-	3.4	-	0.2	0.5
50	-	-	-	1.0	-	2.2	6.0	-	-	-	6.0	-	4.6	1.2	-	-	-	3.3	-	0.4	2.2	-	-	-	2.4	-	1.2	1.2
51	-	-	-	2.0	-	4.5	9.0	-	-	-	5.1	-	3.6	3.5	-	-	-	2.3	-	0.1	4.5	-	-	-	1.5	-	2.6	4.0
52	-	-	-	3.0	-	3.1	9.5	-	-	-	4.1	-	4.2	4.0	-	-	-	1.4	-	0.0	5.0	-	-	-	0.5	-	1.3	4.5
1	-	-	-	-	-	2.0	9.7	-	-	-	-	-	5.5	4.2	-	-	-	-	-	0.0	5.2	-	-	-	-	-	0.7	4.7
2	-	-	-	-	-	1.4	8.5	-	-	-	-	-	4.3	3.0	-	-	-	-	-	0.0	4.0	-	-	-	-	-	0.3	3.5

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table: 101 .Ent 2. Seasonal dynamics of key pests of cotton (Bollworms) under unprotected condition to develop suitable forecasting model in South Zone in Suraj N-Bt.

	Natural Enemies/plant*							No. of Larval Recovery/5plants																											
								<i>H.armigera</i>								<i>Earias spp.</i>								<i>S.litura</i>											
	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR							
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
32	-	-	-	2.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
33	-	-	-	3.4	-	-	-	-	-	-	1.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
34	-	-	-	11.3	-	-	-	-	-	-	2.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	1.0	-	-	-	-						
35	-	-	-	2.6	-	-	-	-	-	-	2.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
36	-	-	-	2.0	-	-	-	-	-	-	3.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	3.0	-	-	-	-						
37	-	-	-	4.4	-	-	-	-	-	-	5.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
38	-	-	-	2.8	-	-	0.20	-	-	-	3.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
39	-	-	-	1.2	-	0.1	0.40	-	-	-	5.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	3.0	-	-	-	-						
40	-	-	-	5.0	-	0.1	0.10	-	-	-	2.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
41	-	-	-	3.5	-	0.2	0.20	-	-	-	6.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	2.0	-	-	-	-						
42	-	-	-	2.4	-	0.2	0.20	-	-	-	7.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
43	-	-	-	4.0	-	0.4	0.40	-	-	-	8.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
44	-	-	-	5.2	-	0.5	1.40	-	-	-	1.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
45	-	-	-	4.0	-	0.5	0.40	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	2.0	-	-	-	-						
46	-	-	-	2.2	-	0.4	1.60	-	-	-	2.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	2.0	-	-	-	-						
47	-	-	-	0.6	-	0.3	0.80	-	-	-	2.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
48	-	-	-	1.2	-	0.4	0.80	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	2.0	-	-	-	-						
49	-	-	-	0.1	-	0.3	0.80	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
50	-	-	-	1.0	-	0.2	0.40	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
51	-	-	-	2.0	-	0.2	1.60	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
52	-	-	-	3.0	-	0.2	1.20	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-						
1	-	-	-	-	-	0.2	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
2	-	-	-	-	-	0.1	0.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table: 102. Ent 2. Seasonal dynamics of key pests of cotton (Sucking Pests) under unprotected condition to develop suitable forecasting model in South Zone in Suraj N-Bt

	Fruiting Body Damage (%) **							GBD (%) by ABW/ TC/SBW							Pink bollworm/20 green bolls															
															GBD (%)								Larvae							
	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR		
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
32	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	
33	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	
34	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	
35	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	
36	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	
37	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	
38	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	
39	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	
40	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	20.0	-	-	-	-	-	-	2.0	-	-	-	-	
41	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	25.0	-	-	-	-	-	-	2.0	-	-	-	-	
42	-	-	-	23.1	-	-	-	-	-	-	0.0	-	-	-	-	-	-	20.0	-	-	-	-	-	-	2.0	-	-	-	-	
43	-	-	-	66.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	35.0	-	-	-	-	-	-	3.0	-	-	-	-	
44	-	-	-	43.5	-	-	-	-	-	-	0.0	-	-	-	-	-	-	30.0	-	-	-	-	-	-	4.0	-	-	-	-	
45	-	-	-	59.3	-	-	-	-	-	-	0.0	-	-	-	-	-	-	40.0	-	-	-	-	-	-	5.0	-	-	-	-	
46	-	-	-	69.3	-	-	-	-	-	-	0.0	-	-	-	-	-	-	45.0	-	-	-	-	-	-	6.0	-	-	-	-	
47	-	-	-	68.8	-	-	-	-	-	-	0.0	-	-	-	-	-	-	50.0	-	-	-	-	-	-	6.0	-	-	-	-	
48	-	-	-	68.9	-	-	-	-	-	-	0.0	-	-	-	-	-	-	55.0	-	-	-	-	-	-	7.0	-	-	-	-	
49	-	-	-	74.7	-	-	-	-	-	-	0.0	-	-	-	-	-	-	70.0	-	-	-	-	-	-	8.0	-	-	-	-	
50	-	-	-	86.3	-	-	-	-	-	-	0.0	-	-	-	-	-	-	85.0	-	-	-	-	-	-	11.0	-	-	-	-	
51	-	-	-	90.2	-	-	-	-	-	-	0.0	-	-	-	-	-	-	85.0	-	-	-	-	-	-	13.0	-	-	-	-	
52	-	-	-	91.8	-	-	-	-	-	-	0.0	-	-	-	-	-	-	100.0	-	-	-	-	-	-	15.0	-	-	-	-	
1	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	
2	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	

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 (Trap catches) under Unprotected condition to develop suitable forecasting model in South Zone-2021-22

	Trap Catches/Weekly																											
	ABW							PBW							<i>E. Insulana</i> / <i>E. Vittella</i>							TC						
	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR	LG	ND	DW	RC	CN	CBE	SVPR
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
30	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	0.00	-	-	-	-	-	0	-	-	-	-
31	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	0.00	-	-	-	-	-	0	-	-	-	-
32	-	-	14	2	-	-	-	-	-	0	0	-	-	-	-	-	0	0.00	-	-	-	-	-	0	1	-	-	-
33	-	-	28	0	-	-	-	-	-	0	0	-	-	-	-	-	0	0.00	-	-	-	-	-	0	0	-	-	-
34	0	-	35	4	-	-	-	0	-	0	0	-	-	-	-	-	4	0.00	-	-	-	0	-	24	36	-	-	-
35	0	-	56	2	-	-	-	0	-	0	0	-	-	-	-	-	6	0.00	-	-	-	0	-	56	36	-	-	-
36	0	-	70	1	-	-	-	0	-	0	0	-	-	-	-	-	10	0.00	-	-	-	0	-	147	2	-	-	-
37	0	-	77	5	-	-	-	0	-	0	0	-	-	-	-	-	14	0.00	-	-	-	0	1	238	7	-	-	-
38	0	0	56	6	-	-	-	0	4	0	0	-	-	-	-	-	21	0.00	-	-	-	0	0	322	16	-	-	-
39	0	0	42	3	-	-	-	0	11	20	0	-	-	-	-	-	31	0.00	-	-	-	0	1	390	9	-	-	-
40	0	1	28	6	-	-	-	0	11	29	4	-	-	-	-	-	25	0.00	-	-	-	0	1	204	10	-	-	-
41	0	0	56	8	-	-	-	0	9	39	7	-	-	-	-	-	20	0.00	-	-	-	0	0	174	11	-	-	-
42	0	0	70	3	-	-	-	8	14	72	6	-	-	-	-	-	11	0.00	-	-	-	13	0	152	4	-	-	-
43	2	0	63	2	-	-	-	23	15	80	18	-	-	-	-	-	4	0.00	-	-	-	13	0	61	12	-	-	-
44	1	1	56	9	-	-	-	32	11	222	26	-	-	-	-	-	3	0.00	-	-	-	8	2	57	11	-	-	-
45	2	0	35	2	-	-	-	26	24	290	44	-	-	-	-	-	0	0.00	-	-	-	11	1	40	20	-	-	-
46	2	0	21	7	-	-	-	22	31	335	40	-	-	-	-	-	0	0.00	-	-	-	4	0	31	5	-	-	-
47	2	0	14	5	-	-	-	37	35	338	12	-	-	-	-	-	0	0.00	-	-	-	4	1	20	30	-	-	-
48	0	0	7	5	-	-	-	53	38	347	16	-	-	-	-	-	0	0.00	-	-	-	6	2	14	14	-	-	-
49	0	0	0	5	-	-	-	101	35	351	22	-	-	-	-	-	0	0.00	-	-	-	1	1	7	11	-	-	-
50	1	1	0	7	-	-	-	93	32	206	28	-	-	-	-	-	0	0.00	-	-	-	3	0	0	11	-	-	-
51	0	1	0	7	-	-	-	139	36	80	23	-	-	-	-	-	0	0.00	-	-	-	1	1	0	4	-	-	-
52	0	1	-	4	-	-	-	103	36	57	17	-	-	-	-	-	-	0.00	-	-	-	0	0	-	3	-	-	-
1	0	3	0	-	-	-	-	284	29	37	-	-	-	-	-	-	0	-	-	-	-	0	0	0	-	-	-	-
2	0	0	0	-	-	-	-	141	27	21	-	-	-	-	-	-	0	-	-	-	-	1	-	0	-	-	-	-

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table: 104. Ent 2. Seasonal dynamics of key pests of cotton (Abiotic factors) under Unprotected condition to develop suitable forecasting model in South Zone during 2021-22

SMW	Temperature °C														Relative Humidity (%)													
	LG		ND		DW		RC		CN		CBE		SVPR		LG		ND		DW		RC		CN		CBE		SVPR	
	21	28	21	28	21	28	21	28	21	28	21	28	21	28	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
29	-	-	-	-	21.17	29.90	-	-	21	28	-	-	-	-	-	-	-	-	87.86	70.00	-	-	96	65	-	-	-	-
30	-	-	-	-	20.73	27.69	-	-	21	30	-	-	-	-	-	-	-	-	90.14	82.71	-	-	98	58	-	-	-	-
31	-	-	-	-	20.70	25.79	-	-	21	30	-	-	-	-	-	-	-	-	91.86	88.71	-	-	95	53	-	-	-	-
32	-	-	-	-	20.34	25.57	24	31	21	31	-	-	-	-	-	-	-	-	91.71	89.00	91	63	99	54	-	-	-	-
33	-	-	-	-	20.71	26.97	23	27	20	30	-	-	-	-	-	-	-	-	92.14	86.86	95	82	99	57	-	-	-	-
34	24.0	31.3	-	-	20.90	28.93	23	31	20	32	-	-	-	-	87	75	-	-	88.57	82.71	93	66	100	49	-	-	-	-
35	24.3	30.6	-	-	20.21	27.10	23	32	21	30	-	-	-	-	82	82	-	-	90.29	88.57	87	60	98	54	-	-	-	-
36	23.9	29.7	-	-	20.10	28.74	25	33	21	29	-	-	-	-	94	72	-	-	88.86	85.43	86	55	97	58	-	-	-	-
37	25.4	31.9	-	-	20.56	28.19	23	30	20	31	-	-	-	-	97	70	-	-	88.57	78.86	95	73	98	53	-	-	-	-
38	24.7	31.3	-	-	20.49	27.91	23	29	21	33	-	-	25	36	99	65	-	-	90.14	76.57	95	75	99	45	-	-	70	-
39	24.0	29.8	-	-	21.06	26.91	22	30	20	31	23	31	26	35	94	83	-	-	92.86	87.86	95	72	99	49	83	59	59	-
40	25.3	30.5	-	-	20.37	29.19	23	31	22	31	24	31	25	33	99	76	-	-	88.14	70.14	94	63	100	57	87	62	81	-
41	24.6	32.0	-	-	20.21	27.84	23	31	21	31	23	31	25	33	98	72	-	-	88.43	76.86	94	70	100	56	83	65	69	-
42	24.7	31.3	-	-	20.96	30.61	23	30	21	30	24	31	25	34	94	74	-	-	87.00	78.57	91	69	100	61	86	66	74	-
43	23.2	31.3	24	33	20.90	29.30	22	31	21	31	23	30	12	31	85	64	83	63	91.57	82.43	94	56	99	52	86	64	83	-
44	23.3	28.2	24	31	20.04	30.33	21	32	21	29	23	28	8	24	85	84	89	73	86.43	60.29	88	47	100	61	87	71	88	-
45	20.5	28.3	23	32	19.04	30.21	17	31	20	27	22	28	24	29	99	83	82	66	76.86	62.57	82	45	100	64	87	73	92	-
46	22.6	28.9	24	29	18.94	29.31	21	30	21	30	23	30	24	30	95	80	88	76	80.00	62.14	86	57	100	57	87	67	89	-
47	22.6	28.2	24	30	17.89	28.93	19	32	20	30	22	29	19	30	95	81	89	71	85.14	74.29	85	41	100	57	86	67	87	-
48	20.4	27.5	22	30	19.53	28.17	19	27	20	28	23	28	17	29	94	75	87	73	83.43	72.14	89	64	100	61	86	69	89	-
49	19.1	29.6	21	32	20.26	26.77	18	30	20	31	23	30	17	29	94	54	87	68	94.14	86.14	80	43	100	51	86	66	86	-
50	19.8	28.9	21	31	-	-	15	30	17	29	22	28	23	30	98	63	85	66	-	-	81	35	100	51	85	58	78	-
51	14.5	26.4	16	31	-	-	15	30	14	30	20	29	22	30	99	65	80	48	-	-	83	38	100	41	84	53	71	-
52	17.3	29.5	17	31	-	-	16	29	13	31	19	29	22	31	99	67	84	51	-	-	88	38	100	34	84	48	69	-
1	-	-	18	31	-	-	-	-	-	-	21	28	23	30	-	-	84	55	-	-	-	-	-	-	84	51	73	-
2	-	-	21	31	-	-	-	-	-	-	21	30	23	32	-	-	85	57	-	-	-	-	-	-	85	50	75	-

AM-Morning, PM-Evening 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 (Abiotic factors) under Unprotected condition to develop suitable forecasting model in South Zone during 2021-22.

SMW	Rainfall in mm						
	LG	ND	DW	RC	CN	CBE	SVPR
29	-	-	45.80	-	38.4	-	-
30	-	-	112.20	-	3.0	-	-
31	-	-	6.40	-	2.5	-	-
32	-	-	10.60	23.2	24.0	-	-
33	-	-	9.20	79.6	12.6	-	-
34	99.2	-	0.00	43.2	25.0	-	-
35	97.4	-	6.40	0.0	14.5	-	-
36	65.8	-	13.00	0.0	2.5	-	-
37	3.0	-	19.00	81.8	11.5	-	-
38	25.5	-	3.80	118.0	16.0	-	52.50
39	40.2	-	2.80	117.8	62.0	17.5	0.00
40	122.4	-	28.80	36.6	21.5	37	174.00
41	0.0	-	50.40	83.6	57.0	11.5	3.00
42	1.8	-	0.00	27.0	60.0	66.5	6.00
43	0.0	1.50	11.00	32.4	5.0	86	133.00
44	24.5	15.20	5.20	0.0	39.5	104	50.00
45	1.4	0.00	9.60	0.0	91.5	85.2	135.50
46	20.4	29.30	106.40	0.0	62.1	60	64.00
47	51.4	16.50	0.00	0.0	16.0	32	87.00
48	4.8	43.50	1.40	12.6	10.0	25.8	258.50
49	3.8	0.00	39.60	0.0	1.5	30	376.50
50	0.0	0.00	0.00	0.0	0.0	19.5	7.00
51	0.0	0.00	0.00	0.0	0.0	0	0.00
52	0.0	0.00	0.00	0.0	0.0	0	1.00
1	-	0.00	0.00	-	-	16.6	0.50
2	-	0.00	0.00	-	-	0	46.50

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table: 106. Ent 3. Survey for key and emerging pests in cotton in Farmers Field for weekly advisory at North Zone during 2021 – 22

Zone	Centre	Duration Of Survey	Total no. of locations surveyed	No. of location crossed ETL												
				Whitefly	Leaf hopper	Thrips	Mealy bug	aphids	Mirid bug	H. armigera	E. vitella	p. gossypiella	s. litura	Stem weevil	Red cotton bug	Flower bud maggot
North Zone	Bathinda	June-October	215	0	12	0	0	0	0	0	0	59	0	-	-	0
	Faridkot	May- October	294	15	26	44	0	0	0	0	0	18	0	-	-	0
	Hisar	July-October	113	9	8	10	0	0	0	0	0	26	0	-	-	0
	Sirsa	June-October	123	9	0	6	0	0	0	0	0	31	0	-	-	0
	Sriganganagar	June-November	475	51	67	92	0	0	0	0	36	78	0	-	-	0
Central Zone	Banswara	Aug-Dec	173	0	32	0	0	0	0	0	0	0	0	0	0	0
	Junagadh	July-Dec	216	0	9	36	0	69		0	0	90	0			0
	Surat	June-Jan	602	0	42	15	0	56	0	0	0	58	0	0	0	0
	Bharuch	-														
	Akola	-	92	14	16	7	-	-	-	-	-	25	-	-	-	-
	Nanded	Aug-Dec	500	2	83	57	-	39	-	-	-	141	-	-	-	-
	Rahuri	July-Dec	371	25	28	54	-	191		1	2	21	4	-	-	-
	Khandwa	-														
	Bhawanipatna	Aug-Dec	632	0	80	0	0	0	0	0	0	0	0	0	0	0
South Zone	Lam Guntur	July - Dec	249	4	23	7		1	-	-	-	71	-	-	-	-
	Nandyal		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dharwad	July- Dec	315	1	81	93	-	46	57	-	-	80		6		
	Raichur	July-Dec	1267	0	296	362	0	0	0	0	0	202	0	0	0	0
	Chamarajanagar	July-Oct	1049	0	58	0	0	43	0	0	0	18	-	-	-	-
	Coimbatore	Jun-Jan	57	9	12	3	1	9	13	0	0	0	0	20	-	-
	Srivilliputhur	Aug-Jan	43	24	15	3	1	6	8	-	-	3	-	34	-	-



Table: 107. Ent 3(b). Survey for pink bollworm in cotton in Farmers Field for weekly advisory at North Zone during 2021 – 22

Zone	Centre	Duration Of Survey	Pink Bollworm Infestation (Range)					
			Rosette Flower (%)	Flower damage (%)	Green Boll Damage (%)	No. of PBW larva/ 20 bolls	Open Boll damage (%)	Open Locule damage (%)
North Zone	Bathinda	25 June- 4 Nov	0-12	-	0-85	0-11	-	-
	Faridkot	17 Sep-14 Oct	0	-	0-58	0-22	-	-
	Hisar		5-20	-	40-90	3-54	5-85	1.18-26.50
	Sirsa	25 June- 28 October	0-8	0-8	0-80	0-15	-	-
	Sriganganagar	23 July- 28 Oct	0	-	0-70	0-22	-	-

Table: 108. Ent.4: Management of sucking pest in cotton at Central Zone- (2021-22)

Treatment	Aphids/3 leaves																								
	BA					JU					SU					BH					AK				
	Pre		14 DAS		Reduction over Control (%)	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		O.V	T.V	O.V	T.V	
T1	-	-	-	-	-	18.0	4.24	4.7	2.17	79.87	31.7	5.7	26.2	5.1	33.17	-	-	-	-	-	0.9	1.20	0.4	0.94	66.67
T2	-	-	-	-	-	21.2	4.60	5.4	2.32	77.48	28.7	5.4	28.5	5.3	27.07	-	-	-	-	-	0.6	1.07	0.5	0.99	59.26
T3	-	-	-	-	-	17.7	4.21	9.3	3.05	65.10	30.3	5.5	7.6	2.8	83.54	-	-	-	-	-	0.8	1.15	0.4	0.95	66.67
T4	-	-	-	-	-	18.8	4.33	11.0	3.31	57.38	28.9	5.4	31.1	5.6	20.85	-	-	-	-	-	0.8	1.12	0.5	0.98	61.11
T5	-	-	-	-	-	17.0	4.12	16.3	4.04	42.56	29.3	5.5	10.4	3.2	74.88	-	-	-	-	-	1.0	1.20	0.5	1.00	57.41
T6	-	-	-	-	-	18.1	4.25	7.0	2.64	72.09	32.7	5.8	6.2	2.5	88.90	-	-	-	-	-	1.0	1.22	0.3	0.91	72.22
T7	-	-	-	-	-	18.8	4.34	10.4	3.23	60.10	31.1	5.6	22.5	4.7	37.20	-	-	-	-	-	0.9	1.17	0.5	0.99	59.26
T8	-	-	-	-	-	25.9	5.09	26.5	5.14		31.9	5.7	41.5	6.5		-	-	-	-	-	0.9	1.19	1.2	1.30	
CD (5%)							NS		0.48			NS		0.5								NS		0.13	
SE (m)							0.19		0.16			0.1		0.2								0.04		0.04	
SE (d)												-		-								-		-	
CV (%)							7.95		8.54			7.2		9.6								6.2		7.4	

BA- Banswara, JU- Junagadh, SU- Surat, BH- Bharuch, AK- Akola



Table: 109. Ent.4: Management of sucking pest in cotton at Central Zone- (2021-22)

Treatment	Aphids/3 leaves																			
	NA					RA					KH					BW				
	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	23.87	4.98	7.54	2.74	43.50	20.0	4.5	17.3	4.2	37.7	32.53	5.78	22.80	4.87	32.78	26.2	5.2	5.1	2.3	80.73
T2	24.10	5.01	7.26	2.69	45.60	20.6	4.6	8.8	3.1	68.31	31.63	5.71	25.47	5.14	22.79	25.9	5.1	4.0	2.1	84.86
T3	26.33	5.22	4.24	2.08	68.19	19.1	4.4	7.0	2.7	74.9	34.27	5.94	21.97	4.79	38.52	26.4	5.2	6.5	2.6	75.47
T4	24.50	5.05	6.23	2.48	53.32	19.8	4.5	13.9	3.8	49.98	30.60	5.61	11.53	3.54	63.85	26.2	5.2	2.7	1.7	89.59
T5	24.20	5.02	5.24	2.30	60.69	20.9	4.6	6.4	2.6	77.06	29.50	5.52	15.23	4.03	50.47	26.5	5.2	7.2	2.7	72.69
T6	26.50	5.24	3.91	2.03	70.69	21.0	4.6	5.5	2.5	80.16	31.13	5.67	19.23	4.50	40.75	26.0	5.1	1.2	1.3	95.35
T7	25.93	5.19	4.68	2.17	64.89	21.5	4.7	13.5	3.7	51.53	28.23	5.40	19.97	4.58	32.17	26.6	5.2	5.7	2.4	78.49
T8	25.80	5.18	13.34	3.68		20.5	4.6	27.8	5.3		31.30	5.68	36.00	6.08		26.2	5.2	26.3	5.2	
CD (5%)		NS		0.37			NS		0.6			NS		0.22			0.1		0.2	
SE (m)		0.14		0.12			0.11		0.2			0.10		0.07			0.1		0.1	
SE (d)		0.19		0.17			-		-			-		-			0.1		0.1	
CV (%)		4.76		8.25			4.47		0.99			-		-			1.6		4.0	

NA- Nanded, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna



Table: 110. Ent.4: Management of sucking pest in cotton at Central Zone- (2021-22)

Treatment	Jassids/3 leaves																			
	BA					JU					SU					BH				
	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	6.00	2.44	2.67	1.63	55.50	18.7	4.3	2.9	1.7	67.91	7.0	2.7	7.3	2.8	39.79	-	-	-	-	-
T2	6.67	2.58	1.00	0.99	85.00	18.3	4.3	3.1	1.8	64.66	6.6	2.7	7.7	2.9	33.51	-	-	-	-	-
T3	7.00	2.64	0.67	0.82	90.42	19.7	4.4	6.0	2.4	43.28	6.9	2.7	2.6	1.7	79.58	-	-	-	-	-
T4	7.33	2.70	0.67	0.82	90.85	17.7	4.2	5.2	2.3	48.66	7.5	2.8	8.2	2.9	15.71	-	-	-	-	-
T5	6.67	2.58	0.67	0.82	89.95	17.1	4.1	7.0	2.7	33.90	6.5	2.7	3.2	1.9	72.25	-	-	-	-	-
T6	6.33	2.51	0.33	0.57	94.78	18.8	4.3	4.8	2.2	52.34	6.1	2.6	1.8	1.5	86.39	-	-	-	-	-
T7	6.67	2.58	4.33	2.08	35.08	19.1	4.4	6.2	2.5	39.52	7.5	2.8	6.0	2.5	48.69	-	-	-	-	-
T8	6.33	2.51	13.0	3.61		18.5	4.3	13.8	3.7		7.3	2.8	11.8	3.5		-	-	-	-	-
CD (5%)		NS		0.23			NS		0.4		-	NS	-	0.2						
SE (m)		-		0.08			0.2		0.1		-	0.1	-	0.1						
SE (d)		-		-	-						-	-	-	-						
CV (%)		-		9.24			7.7		8.4		-	8.3	-	8.3						

Table: 111. Ent.4: Management of sucking pest in cotton at Central Zone- (2021-22)

Treatment	Jassids/3 leaves														
	NA					RA					KH				
	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	9.63	3.26	5.34	2.52	35.86	5.9	2.5	4.4	2.2	56.75	5.73	2.59	4.00	2.23	33.09
T2	9.67	3.26	5.06	2.46	39.18	5.7	2.5	4.0	2.1	60.96	5.60	2.55	4.33	2.31	25.78
T3	9.53	3.24	2.64	1.90	68.31	5.5	2.4	3.4	2.0	66.54	5.23	2.50	3.50	2.12	35.86
T4	9.50	3.24	3.83	2.18	54.01	5.5	2.5	4.3	2.2	57.53	5.73	2.59	2.03	1.74	65.98
T5	9.60	3.25	3.18	2.04	61.74	6.0	2.6	3.1	1.9	69.86	6.53	2.74	2.40	1.84	64.77
T6	9.73	3.27	2.45	1.85	70.55	6.4	2.6	2.6	1.8	74.17	5.27	2.50	1.80	1.67	67.22
T7	9.57	3.25	2.77	1.94	66.71	5.7	2.5	4.3	2.2	57.73	5.97	2.64	2.07	1.75	66.78
T8	9.50	3.24	8.32	3.05		6.9	2.7	10.2	3.3		5.63	2.57	5.87	2.62	
CD (5%)		NS		0.16			NS		0.2			NS		0.20	
SE (m)		0.12		0.05								0.11		0.07	
SE (d)		0.16		0.07			0.09		0.1			-		-	
CV (%)		6.19		3.97			6.29		4.5			-		-	

BA- Banswara, JU- Junagadh, SU- Surat, BH- Bharuch, AK- Akola;

NA- Nanded, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna



Table: 112. Ent.4: Management of sucking pest in cotton at Central Zone- (2021-22)

Treatment	Thrips /3 leaves																								
	BA					JU					SU					BH					AK				
	Pre		14 DAS		Reduction over Control (%)	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		O.V	T.V			
T1	-	-	-	-	-	21.1	4.6	2.3	1.5	75.37	29.7	5.5	6.4	2.5	89.22	-	-	-	-	-	8.6	2.93	3.6	1.91	62.90
T2	-	-	-	-	-	20.7	4.6	3.2	1.8	71.22	33.4	5.8	19.0	4.4	24.08	-	-	-	-	-	8.5	2.91	2.7	1.63	72.85
T3	-	-	-	-	-	21.7	4.7	4.3	2.1	64.94	32.5	5.7	7.4	2.7	85.55	-	-	-	-	-	8.1	2.84	4.3	2.03	55.88
T4	-	-	-	-	-	20.6	4.5	6.6	2.6	53.64	34.2	5.9	21.2	4.6	22.71	-	-	-	-	-	8.8	2.96	4.5	2.13	53.85
T5	-	-	-	-	-	18.2	4.3	8.9	3.0	42.19	32.7	5.8	10.9	3.3	78.44	-	-	-	-	-	8.9	2.97	3.9	1.98	60.18
T6	-	-	-	-	-	22.4	4.7	5.4	2.3	59.81	29.6	5.5	4.9	2.2	93.12	-	-	-	-	-	8.3	2.88	1.9	1.38	80.54
T7	-	-	-	-	-	20.8	4.6	7.2	2.7	50.10	32.7	5.8	14.1	3.8	46.56	-	-	-	-	-	9.2	3.03	4.2	2.04	57.47
T8	-	-	-	-	-	20.6	4.5	17.0	4.1		33.1	5.8	33.0	5.8		-	-	-	-	-	9.9	3.15	9.8	3.13	-
CD (5%)							NS		0.4		-	NS	-	0.4								NS		0.4	
SE (m)							0.2		0.1		-	0.1	-	0.2								0.1		0.1	
SE (d)											-	-	-	-								-		-	
CV (%)							8.2		8.1		-	7.4	-	7.6								7.1		11.3	

BA- Banswara, JU- Junagadh, SU- Surat, BH- Bharuch, AK- Akola



Table: 113. Ent.4: Management of sucking pest in cotton at Central Zone- (2021-22).

Treatme nt	Thrips /3 leaves																			
	NA					RA					KH					BW				
	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	53.53	7.37	8.28	2.99	59.03	22.5	4.8	6.0	2.6	42.2	-	-	-	-	-	5.9	2.5	2.3	1.7	68.66
T2	54.70	7.46	14.71	3.92	27.20	21.8	4.7	3.9	2.1	62.33	-	-	-	-	-	5.6	2.5	2.0	1.6	73.58
T3	54.80	7.45	9.11	3.12	54.93	21.1	4.6	3.7	2.0	64.84	-	-	-	-	-	5.5	2.4	2.1	1.6	71.64
T4	53.47	7.38	13.78	3.80	31.77	21.1	4.7	4.6	2.3	55.68	-	-	-	-	-	5.4	2.4	0.5	1.0	93.58
T5	54.47	7.43	10.52	3.34	47.90	19.1	4.4	2.6	1.8	74.66	-	-	-	-	-	5.8	2.5	2.5	1.7	65.97
T6	55.20	7.49	8.08	2.96	59.98	19.8	4.5	2.2	1.7	78.42	-	-	-	-	-	5.7	2.5	0.2	0.8	96.80
T7	53.50	7.38	11.36	3.44	43.75	21.7	4.7	5.4	2.4	48.17	-	-	-	-	-	5.8	2.5	1.3	1.3	82.85
T8	54.20	7.43	20.20	4.57		21.0	4.6	10.3	3.3	--	-	-	-	-	-	5.8	2.5	7.4	2.8	
CD (5%)		NS		0.23			NS		21								0.2		0.2	
SE (m)		0.22		0.08			0.08		0.07								0.1		0.1	
SE (d)		0.31		0.11													0.1		0.1	
CV (%)		5.11		3.68			3.0		5.21								3.5		7.0	

NA- Nanded, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna



Table: 114. Ent.4: Management of sucking pest in cotton at Central Zone- (2021-22)

Treatment	Whitefly/3 Leaves																			
	BA					JU					SU					BH				
	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	16.0	4.00	6.00	2.45	62.50	15.5	3.9	2.4	1.6	76.98	7.1	2.8	6.0	2.5	39.19	-	-	-	-	-
T2	15.7	3.95	1.67	1.29	89.34	16.9	4.1	3.0	1.7	73.56	5.5	2.4	4.1	2.1	71.62	-	-	-	-	-
T3	16.3	4.04	1.33	1.15	91.85	20.6	4.5	6.2	2.5	56.15	6.3	2.6	2.7	1.8	70.95	-	-	-	-	-
T4	15.7	3.96	1.67	1.29	89.34	17.1	4.1	4.7	2.2	63.86	6.3	2.6	1.7	1.5	84.46	-	-	-	-	-
T5	17.0	4.12	0.67	0.80	96.05	16.1	4.0	1.7	1.3	82.11	7.1	2.8	2.5	1.7	71.62	-	-	-	-	-
T6	17.7	4.20	0.67	0.80	96.20	17.3	4.2	4.5	2.1	66.01	7.9	2.9	1.3	1.3	89.86	-	-	-	-	-
T7	15.3	3.91	7.00	2.64	54.33	21.6	4.6	5.6	2.4	59.20	7.2	2.8	7.0	2.7	31.08	-	-	-	-	-
T8	16.3	4.04	24.7	4.97		24.9	5.0	16.6	4.1		6.1	2.6	10.7	3.3		-	-	-	-	-
CD (5%)		NS		0.22			NS		0.4			NS		0.2						
SE (m)		-		0.07			0.2		0.1			0.1		0.1						
SE (d)		-		-								-		-						
CV (%)		-		8.00			8.9		9.8			8.3		8.1						

BA- Banswara, JU- Junagadh, SU- Surat, BH- Bharuch, AK- Akola



Table: 115. Ent.4: Management of sucking pest in cotton at Central Zone- (2021-22)

Treatme nt	Whitefly/3 Leaves																			
	NA					RA					KH					BW				
	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	0.47	1.21	8.57	2.84	30.07	7.1	2.8	4.5	2.2	49.16	34.07	5.92	18.40	4.40	48.20	3.14	1.90	0.95	1.17	73.21
T2	0.50	1.23	3.42	1.99	72.05	8.4	3.0	3.6	2.0	59.37	31.87	5.73	20.63	4.65	37.90	3.35	1.96	0.72	1.08	79.60
T3	0.63	1.27	3.59	2.03	70.67	6.9	2.7	3.4	2.0	62.18	32.33	5.77	17.27	4.27	48.78	3.13	1.90	0.82	1.13	76.77
T4	0.57	1.25	3.86	2.09	68.52	7.9	2.9	3.9	2.1	56.79	33.80	5.90	11.10	3.48	68.50	3.22	1.93	0.41	0.93	88.47
T5	0.50	1.22	3.24	1.95	73.52	8.1	2.9	2.9	1.9	67.00	32.13	5.76	11.20	3.49	66.57	3.29	1.94	1.00	1.21	71.63
T6	0.60	1.26	3.05	1.91	75.10	8.0	2.9	2.3	1.7	74.19	31.73	5.72	10.53	3.40	68.16	3.24	1.93	0.51	0.99	85.64
T7	0.53	1.24	4.13	2.15	66.26	7.7	2.9	4.4	2.2	50.73	30.53	5.61	14.80	3.97	53.51	3.31	1.95	0.40	0.93	88.75
T8	0.60	1.26	12.25	3.36		8.1	2.9	8.9	3.1		33.20	5.84	36.30	6.11		3.27	1.94	3.54	2.00	
CD (5%)		NS		0.67			NS		0.3			NS		0.31			0.23		0.20	
SE (m)		0.03		0.22			0.1		0.1			0.15		0.10			0.11		0.10	
SE (d)		0.05		0.31								-		-			0.13		0.14	
CV (%)		4.53		16.44			4.8		7.2			-		-			6.93		10.6	

Table: 116. Ent.4: Management of sucking pest in cotton at Central Zone- (2021-22)

Treatme nt	Av. Natural enemies/plant																			
	BA				JU				SU				BH				AK			
	Pre		14 DAS		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	O.V	T.V	O.V	T.V
T1	-	-	-	-	8.5	2.9	8.3	2.9	2.9	1.9	1.9	1.5	-	-	-	-	0.26	0.87	0.16	0.81
T2	-	-	-	-	9.2	3.0	7.9	2.8	2.6	1.8	1.8	1.5	-	-	-	-	0.23	0.85	0.14	0.80
T3	-	-	-	-	8.5	2.9	6.1	2.5	2.7	1.8	2.0	1.6	-	-	-	-	0.31	0.90	0.24	0.86
T4	-	-	-	-	7.0	2.7	6.6	2.6	3.1	1.9	2.3	1.7	-	-	-	-	0.24	0.86	0.19	0.83
T5	-	-	-	-	8.5	2.9	7.4	2.7	3.3	1.9	2.5	1.7	-	-	-	-	0.26	0.87	0.19	0.83
T6	-	-	-	-	7.5	2.7	6.7	2.6	3.3	1.9	2.4	1.7	-	-	-	-	0.23	0.85	0.20	0.84
T7	-	-	-	-	8.5	2.9	6.2	2.5	2.9	1.8	1.5	1.4	-	-	-	-	0.26	0.87	0.22	0.85
T8	-	-	-	-	8.2	2.9	10.3	3.2	3.5	2.0	3.9	2.1	-	-	-	-	0.26	0.87	0.15	0.80
CD (5%)						NS		0.4		0.1		0.1						NS		NS
SE (m)						0.1		0.1		0.1		0.0						0.02		0.01
SE (d)										-		-						-		-
CV (%)						7.9		7.3		7.5		8.6						3.9		3.8

NA- Nanded, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna;

BA- Banswara, JU- Junagadh, SU- Surat, BH- Bharuch, AK- Akola



Table: 117. Ent.4: Management of sucking pest in cotton at Central Zone- (2021-22)

Treatment	Av. Natural enemies/plant															
	NA				RA				KH				BW			
	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	2.40	1.84	1.26	1.49	2.53		1.88		-	-	-	-	3.07	1.88	0.11	0.77
T2	2.20	1.79	1.07	1.43	2.53		1.82		-	-	-	-	3.13	1.89	0.12	0.78
T3	2.50	1.87	0.73	1.30	2.44		1.78		-	-	-	-	3.27	1.94	0.08	0.76
T4	2.10	1.76	1.08	1.43	2.53		1.87		-	-	-	-	3.40	1.97	0.24	0.85
T5	2.20	1.79	0.87	1.36	2.56		1.79		-	-	-	-	3.40	1.97	0.01	0.71
T6	2.50	1.87	1.05	1.42	2.60		1.80		-	-	-	-	3.27	1.94	0.31	0.88
T7	2.20	1.79	0.64	1.27	2.46		1.76		-	-	-	-	3.53	2.00	0.00	0.71
T8	2.40	1.84	1.79	1.66	2.49		2.64		-	-	-	-	3.40	1.97	2.03	1.49
CD (5%)		NS		0.09										0.31		0.21
SE (m)		0.06		0.03										0.15		0.10
SE (d)		0.08		0.04										0.18		0.12
CV (%)		5.24		3.53										9.14		12.8

Table: 118. Ent.4: Management of sucking pest in cotton at South Zone (2021-22)

Treatment	Aphids/3 leaves														
	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	3.4	2.1	10.3	3.4	30.89	-	-	-	-	-	18.5	4.2	6.8	2.7	80.42
T2	4.7	2.4	8.1	3.0	45.47	-	-	-	-	-	24.2	5.0	17.2	4.2	50.05
T3	4.8	2.4	10.1	3.3	31.71	-	-	-	-	-	20.2	4.6	9.8	3.2	71.61
T4	5.9	2.6	10.9	3.4	26.40	-	-	-	-	-	25.1	4.7	17.5	4.2	49.34
T5	5.0	2.4	8.8	3.1	40.99	-	-	-	-	-	21.8	4.7	9.0	3.1	73.91
T6	5.0	2.4	7.5	2.9	49.44	-	-	-	-	-	19.9	4.5	7.9	2.9	77.11
T7	3.3	2.1	10.0	3.3	32.54	-	-	-	-	-	21.0	4.6	11.3	3.4	67.31
T8	5.6	2.5	14.9	4.0		-	-	-	-	-	27.7	4.9	34.5	5.4	
CD (5%)	N/A		0.4									2.0		1.8	
SE (m)	0.2		0.1									0.7		0.6	
SE (d)	0.2		0.2												
CV (%)	11.5		6.7									8.4		9.3	

NA- Nanded, RA- Rahuri, KH- Khandwa, BW- Bhawanipatna;

LG-Lam Guntur; ND- Nandyal; DW-Dharwad



Table: 119 . Ent.4: Management of sucking pest in cotton at South Zone-(2021-22)

Treatment	Aphids/3 leaves														
	RC					CN					CBE				
	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	15.6	4.0	6.6	2.7	71.70	26.22	5.17	5.07	2.32	80.73	8.25	3.04	3.27	2.07	84.87
T2	16.2	4.1	1.5	1.4	93.50	25.87	5.13	3.98	2.09	84.86	8.66	3.11	4.10	2.26	81.03
T3	15.4	4.0	1.6	1.4	93.29	26.42	5.19	6.46	2.60	75.47	8.32	3.05	3.42	2.10	84.17
T4	15.9	4.0	10.2	3.3	56.48	26.18	5.16	2.74	1.72	89.59	7.98	3.00	4.29	2.30	80.15
T5	17.3	4.2	1.7	1.5	92.82	26.49	5.19	7.19	2.74	72.69	7.56	2.93	3.69	2.17	82.92
T6	14.3	3.8	1.1	1.3	95.21	25.96	5.14	1.22	1.27	95.35	8.12	3.02	2.87	1.97	86.72
T7	13.9	3.8	5.6	2.5	75.89	26.62	5.21	5.66	2.45	78.49	8.14	3.02	3.86	2.20	82.14
T8	13.5	3.7	23.4	4.9		26.22	5.17	26.32	5.17		9.20	3.19	21.61	4.75	0.00
CD (5%)		0.42					0.15		0.17			0.14		0.14	
SE (m)		0.14					0.07		0.08			0.05		0.04	
SE (d)							0.08		0.10			0.06		0.06	
CV (%)		12.33					1.61		3.96			2.57		3.10	

Table: 120. Ent.4: Management of sucking pest in cotton at South Zone -(2021-22)

Treatment	Jassids/3 leaves														
	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	3.4	2.1	2.3	1.8	65.49	6.2	2.6	4.6	2.3	35.38	5.3	2.4	2.7	1.8	72.48
T2	4.7	2.4	2.5	1.9	61.70	6.7	2.7	4.5	2.2	36.79	6.5	2.6	5.0	2.4	47.94
T3	4.8	2.4	2.3	1.8	65.49	6.1	2.5	2.8	1.8	60.38	5.8	2.5	3.3	2.0	65.88
T4	5.9	2.6	2.2	1.8	65.79	5.6	2.5	2.7	1.8	61.79	6.8	2.6	5.8	2.4	40.37
T5	5.0	2.4	2.0	1.7	69.15	6.5	2.6	4.7	2.3	33.02	5.9	2.5	3.4	2.0	65.07
T6	5.0	2.4	1.9	1.7	71.69	6.1	2.6	4.4	2.2	37.74	5.4	2.3	3.3	1.9	66.15
T7	3.3	2.1	2.8	1.9	57.87	6.7	2.7	4.3	2.2	39.15	6.7	2.5	5.1	2.2	47.71
T8	5.6	2.5	6.6	2.8		8.4	3.0	7.1	2.8	0.00	8.1	2.7	9.7	3.0	
CD (5%)	N/A		0.2			0.8		0.4							
SE (m)	0.2		0.1			0.3		0.1			0.4		0.4		
SE (d)	0.2		0.1			0.4		0.2			1.2		1.1		
CV (%)	11.5		5.5			13.3		8.0			9.0		9.8		

RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore; SVPR-Srivilliputtur;

LG-Lam Guntur; ND- Nandyal; DW-Dharwad



Table: 121. Ent.4: Management of sucking pest in cotton at South Zone (2021-22)

Treatment	Jassids/3 leaves														
	RC					CN					CBE				
	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	18.1	4.3	7.1	2.0	71.90	7.11	2.76	2.21	1.60	81.74	6.95	2.82	1.57	1.60	92.04
T2	17.5	4.2	8.6	3.0	66.18	7.49	2.83	2.34	1.65	80.68	6.20	2.68	2.59	1.90	86.87
T3	17.3	4.2	3.5	2.0	86.11	7.13	2.76	2.38	1.66	80.29	7.21	2.87	2.04	1.74	89.66
T4	17.8	4.3	12.1	3.6	52.13	7.20	2.77	2.04	1.55	83.11	6.87	2.81	2.79	1.95	85.86
T5	19.2	4.4	3.6	2.0	85.67	7.24	2.78	2.58	1.71	78.68	6.71	2.78	2.18	1.78	88.95
T6	16.2	4.1	3.1	1.9	87.88	7.36	2.80	0.95	1.15	92.15	7.10	2.85	1.30	1.52	93.41
T7	15.8	4.0	7.6	2.8	70.05	7.13	2.76	2.92	1.82	75.88	6.32	2.71	2.43	1.85	87.68
T8	15.5	4.0	25.3	5.1		7.16	2.77	12.10	3.55	-	7.36	2.89	19.73	4.55	
CD (5%)		0.2		0.5			0.06		0.19			0.12		0.12	
SE (m)		0.5		0.2			0.03		0.09			0.04		0.04	
SE (d)							0.04		0.11			0.06		0.06	
CV (%)		16.2					1.29		5.85			2.51		3.21	

Table: 122. Ent.4: Management of sucking pest in cotton at South Zone-(2021-22)

Treatment	Thrips /3 leaves														
	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	6.4	2.7	3.3	2.1	45.48	32.5	5.7	17.7	4.3	52.46	17.5	4.2	4.5	2.2	86.89
T2	7.7	3.0	3.9	2.2	36.38	33.7	5.8	21.8	4.7	41.25	22.8	4.8	13.6	3.8	60.35
T3	7.8	3.0	3.8	2.2	37.90	33.8	5.9	15.0	3.9	59.64	20.6	4.6	8.0	2.9	76.85
T4	8.9	3.1	3.3	2.1	45.18	30.3	5.5	13.5	3.7	63.68	24.0	5.0	15.0	3.9	56.44
T5	8.0	3.0	3.8	2.2	37.54	32.0	5.7	20.5	4.6	44.84	20.8	4.4	8.6	3.0	75.02
T6	8.0	3.0	3.4	2.1	43.54	31.7	5.6	15.0	3.9	59.64	20.8	4.6	7.9	2.9	76.91
T7	6.3	2.7	3.7	2.2	39.05	28.3	5.4	24.0	4.9	35.42	21.0	4.1	11.5	3.2	66.54
T8	8.6	3.1	6.1	2.7		32.2	5.7	37.2	6.1	0.00	26.9	4.9	34.4	5.4	
CD (5%)	N/A		0.3			1.3		0.9				0.7		0.6	
SE (m)	0.1		0.1			0.4		0.3				2.2		1.9	
SE (d)	0.2		0.1			0.5		0.4				9.2		10.6	
CV (%)	7.5		7.5			9.4		8.8							

RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore; LG-Lam Guntur; ND- Nandyal; DW-Dharwad



Table: 123. Ent.4: Management of sucking pest in cotton at South Zone-(2021-22)

Treatment	Thrips /3 leaves														
	RC					CN					CBE				
	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	26.3	5.2	4.4	2.2	68.81	5.9	2.5	2.3	1.7	68.66	3.55	2.13	2.29	1.81	58.14
T2	24.5	5.0	11.8	3.5	49.67	5.6	2.5	2.0	1.6	73.58	4.15	2.27	3.08	2.02	43.69
T3	25.6	5.1	5.2	2.4	67.12	5.5	2.4	2.1	1.6	71.64	3.66	2.16	2.43	1.85	55.58
T4	26.0	5.1	12.1	3.5	48.19	5.4	2.4	0.5	1.0	93.58	4.21	2.28	3.12	2.03	42.96
T5	27.1	5.3	5.5	2.5	65.46	5.8	2.5	2.5	1.7	65.97	3.47	2.11	2.75	1.94	49.73
T6	22.6	4.8	6.6	2.0	70.99	5.7	2.5	0.2	0.8	96.80	3.94	2.22	2.07	1.75	62.16
T7	23.5	4.9	8.5	3.0	58.85	5.8	2.5	1.3	1.3	82.85	3.54	2.13	2.93	1.98	46.44
T8	22.4	4.8	31.3	5.6	0.00	5.8	2.5	7.4	2.8		4.51	2.35	5.47	2.54	
CD (5%)		0.53		0.45			0.2		0.2			0.09		0.08	
SE (m)		0.2		0.2			0.1		0.1			0.03		0.03	
SE (d)							0.1		0.1			0.04		0.04	
CV (%)		12.34					3.5		7.0			2.31		2.28	

Table: 124. Ent.4: Management of sucking pest in cotton at South Zone-(2021-22)

Treatment	Whitefly/3 Leaves														
	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	3.4	2.1	2.8	2.0	61.80	0.3	0.9	0.3	0.9		1.4	1.4	0.9	1.2	57.12
T2	4.7	2.4	3.2	2.0	56.69	0.3	0.9	0.2	0.8		1.5	1.4	1.0	1.2	52.67
T3	4.8	2.4	2.9	2.0	61.35	0.2	0.8	0.2	0.8		1.4	1.4	1.0	1.2	48.87
T4	5.9	2.6	3.2	2.1	56.24	0.4	0.9	0.2	0.8		1.5	1.3	1.2	1.2	43.10
T5	5.0	2.4	2.2	1.8	70.38	0.2	0.9	0.2	0.8		1.6	1.4	1.0	1.2	48.87
T6	5.0	2.4	2.6	1.9	65.41	0.2	0.8	0.3	0.9		1.5	1.3	1.0	1.2	51.02
T7	3.3	2.1	3.6	2.1	51.13	0.2	0.8	0.5	1.0		1.6	1.4	1.2	1.2	39.25
T8	5.6	2.5	7.4	2.9		0.2	0.9	0.2	0.8		1.8	1.4	2.0	1.5	
CD (5%)	N/A		0.2			0.2		0.3				0.7		0.6	
SE (m)	0.2		0.1			0.1		0.1				0.2		0.2	
SE (d)	0.2		0.1			0.1		0.1							
CV (%)	11.5		5.8			10.5		12.2				9.1		8.8	

RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;

LG-Lam Guntur; ND- Nandyal; DW-Dharwad



Table: 125. Ent.4: Management of sucking pest in cotton at South Zone-(2021-22)

Treatment	Whitefly/3 Leaves														
	RC					CN					CBE				
	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	14.9	3.9	6.3	2.6	72.82	3.1	1.9	0.9	1.2	73.21	2.12	1.77	1.10	1.45	78.81
T2	14.3	3.8	1.2	1.3	94.96	3.4	2.0	0.7	1.1	79.60	2.36	1.83	1.74	1.66	66.47
T3	14.1	3.8	1.2	1.3	94.75	3.1	1.9	0.8	1.1	76.77	2.21	1.79	1.19	1.48	77.07
T4	12.6	3.6	5.3	2.4	77.07	3.2	1.9	0.4	0.9	88.47	2.02	1.74	1.87	1.69	63.97
T5	15.9	4.1	1.3	1.3	94.27	3.3	1.9	1.0	1.2	71.63	1.96	1.72	1.31	1.52	74.76
T6	12.9	3.7	0.8	1.1	96.70	3.2	1.9	0.5	1.0	85.64	2.11	1.76	1.00	1.41	80.73
T7	14.5	3.9	6.5	2.6	71.73	3.3	2.0	0.4	0.9	88.75	2.05	1.75	1.52	1.59	70.71
T8	12.2	3.6	23.0	4.9		3.3	1.9	3.5	2.0		2.56	1.89	5.19	2.49	
CD (5%)		0.54		0.8			0.2		0.2			0.06		0.07	
SE (m)		0.18		0.3			0.1		0.1			0.02		0.02	
SE (d)							0.1		0.1			0.03		0.03	
CV (%)		8.22					6.9		10.7			2.00		2.25	

Table: 126. Ent.4: Management of sucking pest in cotton at South Zone-(2021-22)

Treatment	Av. 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	0.4	1.2	0.3	1.2	0.1	0.8	0.2	0.9	1.2	1.2	0.8	1.1
T2	0.2	1.1	0.3	1.1	0.2	0.9	0.1	0.8	1.1	1.3	0.7	1.1
T3	0.3	1.1	0.4	1.2	0.1	0.8	0.1	0.8	1.2	1.3	0.6	1.1
T4	0.3	1.1	0.3	1.1	0.1	0.8	0.2	0.8	1.2	1.3	0.6	1.1
T5	0.3	1.1	0.4	1.2	0.1	0.8	0.0	0.7	1.1	1.3	0.8	1.1
T6	0.3	1.1	0.4	1.2	0.1	0.8	0.2	0.8	1.2	1.2	0.7	1.1
T7	0.3	1.1	0.3	1.1	0.1	0.8	0.2	0.8	1.1	1.3	0.7	1.1
T8	0.5	1.2	0.4	1.2	0.1	0.8	0.2	0.9	1.4	1.3	2.3	1.5
CD (5%)	N/A		N/A		0.1		0.2			0.2		0.2
SE (m)	0.1		0.0		0.0		0.1			0.6		0.5
SE (d)	0.1		0.0		0.1		0.1			9.4		9.1
CV (%)	14.8		4.6		7.6		13.2					

RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;

LG-Lam Guntur; ND- Nandyal; DW-Dharwad



Table: 127. Ent.4: Management of sucking pest in cotton at South Zone(2021-22)

Treatment	Av. Natural enemies/plant											
	RC				CN				CBE			
	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	2.1	1.6	0.3	0.8	3.07	1.88	0.11	0.77	3.19	2.05	6.47	2.73
T2	1.9	1.5	0.2	0.7	3.13	1.89	0.12	0.78	3.49	2.12	6.62	2.76
T3	1.9	1.6	0.4	0.8	3.27	1.94	0.08	0.76	3.82	2.19	6.73	2.78
T4	2.1	1.6	0.3	0.8	3.40	1.97	0.24	0.85	3.25	2.06	6.14	2.67
T5	1.5	1.4	0.5	0.9	3.40	1.97	0.01	0.71	3.50	2.12	6.15	2.67
T6	2.1	1.6	0.4	0.9	3.27	1.94	0.31	0.88	3.34	2.08	6.40	2.72
T7	1.5	1.4	0.5	0.9	3.53	2.00	0.00	0.71	3.85	2.20	7.00	2.83
T8	2.2	1.6	3.4	1.8	3.40	1.97	2.03	1.49	3.90	2.21	9.81	3.29
CD (5%)		0.3				0.31		0.21		0.08		0.13
SE (m)		0.1				0.15		0.10		0.03		0.04
SE (d)						0.18		0.12		0.04		0.06
CV (%)		8.6				9.14		12.81		2.24		2.59

RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore

Table: 128 .Ent 5. Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2021-22)- 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	-	-	-
T2	-	-	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	-

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: 129. Ent 5. Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2021-22)- 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	-	-	-	-	-	-	-	0.00	0.00	-	-	0.00	NA	-	NA
T2	-	-	0.00	0.00	-	-	0.00	-	-	-	-	-	-	-	0.00	0.00	-	NA	6.85	NA
T3	0.00	0.00	0.00	0.00	0.00	-	0.00	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	NA	4.70	NA
T4	0.00	0.00	0.00	0.00	0.00	-	0.00	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	NA	3.75	NA
T5	0.00	0.00	0.00	0.00	0.00	-	0.00	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	NA	3.35	NA
T6	0.00	0.00	0.00	0.00	0.00	-	0.00	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	NA	4.30	NA
CD (5%)																			1.15	
SE (m)																			NA	
SE (d)																			0.37	
CV (%)																			11.15	

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganganagar

O.V-Original Value ; T.V-Transformed value

Table: 130. Ent 5. Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2021-22)- 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	-	-	-
T2	-	-	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	-

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 (2021-22)- North Zone.

Treatment	No. of larva per plant in Flower (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	1.55	1.43	-	-	0.00	0.00	-	-	1.30	1.52	-	-	0.00	0.00	-	-	0.93	-	-	-
T2	-	-	5.53	2.43	-	-	0.00	0.00	-	-	3.89	2.21	-	-	0.00	0.00	-	-	5.13	-
T3	0.91	1.19	3.79	2.06	0.00	0.00	0.00	0.00	0.86	1.36	2.20	1.79	0.00	0.00	0.00	0.00	0.33	-	3.43	-
T4	1.21	1.31	3.20	1.92	0.00	0.00	0.00	0.00	1.74	1.65	3.08	2.02	0.00	0.00	0.00	0.00	0.68	-	2.72	-
T5	1.34	1.35	2.66	1.77	0.00	0.00	0.00	0.00	1.80	1.67	3.70	2.17	0.00	0.00	0.00	0.00	0.78	-	2.26	-
T6	1.01	1.23	3.46	1.98	0.00	0.00	0.00	0.00	1.68	1.64	3.39	2.09	0.00	0.00	0.00	0.00	0.41	-	3.11	-
CD (5%)		0.16		0.39						0.12		0.16					0.22		0.98	
SE (m)		0.05		0.13						0.04		0.05								
SE (d)		0.07		0.18						0.05		0.07					0.07		0.32	
CV (%)		7.75		12.44						4.75		5.08					15.86		13.24	

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganganagar

O.V-Original Value ; T.V-Transformed value

Table: 132. Ent 5. Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2021-22)- 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	-	-	-	0.14	2.14	-	-	0.00	-	-	-
T2	-	-	0.00	0.00	-	-	0.92	-	-	-	0.00	-	-	-	4.53	12.20	-	-	22.0	-
T3	0.00	0.00	0.00	0.00	0.00	-	0.73	-	0.00	-	0.00	-	0.00	0.31	2.85	9.70	0.00	-	17.7	-
T4	0.00	0.00	0.00	0.00	0.04	-	0.04	-	0.00	-	0.00	-	0.00	0.31	2.01	8.15	0.00	-	13.8	-
T5	0.00	0.00	0.00	0.00	0.00	-	0.00	-	0.00	-	0.00	-	0.00	0.31	2.60	9.26	0.00	-	12.2	-
T6	0.00	0.00	0.00	0.00	0.00	-	0.07	-	0.00	-	0.00	-	0.00	0.31	3.67	10.97	0.00	-	15.8	-
CD (5%)							NS						-	0.26	-	1.69			4.3	
SE (m)							0.09						-	0.08	-	0.54			NA	
SE (d)							0.13						-	0.12	-	0.77			1.4	
CV (%)							14.39						-	24.85	-	10.81			12.1	

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 (2021-22)- 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	5.3	2.4	-	-	0.00	-	-	-	2.13	1.76	-	-	0.00	0.00	-	-	7.4	-	-	-
T2	-	-	11.6	3.5	-	-	0.00	-	-	-	9.38	3.22	-	-	0.00	0.00	-	-	13.7	-
T3	1.6	1.4	8.6	3.0	0.00	-	0.00	-	1.75	1.66	6.13	2.67	0.00	0.00	0.00	0.00	2.7	-	10.3	-
T4	2.0	1.6	5.0	2.3	0.00	-	0.00	-	2.25	1.80	6.88	2.81	0.00	0.00	0.00	0.00	3.8	-	6.6	-
T5	4.2	2.2	3.3	1.9	0.00	-	0.00	-	2.63	1.90	8.13	3.02	0.00	0.00	0.00	0.00	6.1	-	4.9	-
T6	1.4	1.4	7.4	2.8	0.00	-	0.00	-	2.25	1.80	7.38	2.89	0.00	0.00	0.00	0.00	3.2	-	9.0	-
CD (5%)		0.4		0.4						N/A		0.24					1.2		2.9	
SE (m)		0.1		0.1						0.06		0.08					NA		NA	
SE (d)		0.2		0.2						0.08		0.11					0.4		0.9	
CV (%)		15.4		9.6						6.37		5.27					11.4		14.7	

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganganagar

O.V-Original Value ; T.V-Transformed value

Table: 134. Ent 5. Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2021-22)- 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	21.7	4.7	-	-	0.0	-	-	-	20.75	27.05	-	-	11.00	19.21	-	-	17.3	-	-	-
T2	-	-	38.4	6.2	-	-	20.5	-	-	-	38.75	38.47	-	-	19.00	25.75	-	-	34.8	-
T3	12.0	3.5	31.6	5.6	9.5	-	19.5	-	19.13	25.88	30.25	33.34	8.50	16.86	13.50	21.48	6.6	-	27.9	-
T4	15.8	4.0	25.1	5.0	0.0	-	0.0	-	23.38	28.89	35.50	36.54	6.00	14.08	10.00	18.38	10.5	-	19.1	-
T5	16.5	4.1	18.3	4.3	0.0	-	13.0	-	25.25	30.14	37.00	37.44	7.00	15.30	12.00	20.17	12.1	-	14.6	-
T6	11.7	3.5	26.6	5.2	0.0	-	15.5	-	23.88	29.23	34.75	36.09	5.50	13.42	13.00	20.96	8.4	-	22.5	-
CD (5%)		0.8		0.9	4.12		10.77			2.56		2.84	-	3.58	-	2.83	3.26	-	6.03	-
SE (m)		0.3		0.3	1.33		3.45			0.82		0.91	-	1.15	-	0.91	NA		NA	
SE (d)		0.4		0.4	1.89		4.89			1.16		1.29	-	1.63	-	1.28	1.06		1.95	
CV (%)		13.0		10.6	140.57		50.48			5.81		5.00	-	14.57	-	8.50	13.64		11.62	

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 (2021-22)- 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	25.3	30.1	-	-	1.96	-	-	-	20.11	26.57	-	-	9.47	17.88	-	-	13.0	-	-	-
T2	-	-	30.0	33.1	-	-	8.35	-	-	-	38.24	38.07	-	-	22.71	28.41	-	-	35.5	-
T3	10.0	18.3	24.0	29.3	3.15	-	10.99	-	15.99	23.40	27.46	31.46	6.30	14.26	16.29	23.77	6.0	-	32.0	-
T4	20.0	26.5	15.0	22.7	6.77	-	6.77	-	21.89	27.82	34.05	35.55	9.95	18.32	11.24	19.56	9.0	-	23.0	-
T5	20.0	26.5	13.0	21.1	2.52	-	7.57	-	23.64	29.01	36.74	37.26	7.40	15.75	11.99	20.23	9.5	-	17.0	-
T6	15.0	22.7	21.0	27.2	2.05	-	10.23	-	22.77	28.43	33.21	35.03	7.60	15.97	14.30	22.19	7.5	-	27.0	-
CD (5%)		4.3		3.8	NS		NS			N/A		N/A	-	2.85	-	1.89	2.67		6.61	
SE (m)		1.4		1.2	3.11		2.66			1.42		2.22	-	0.92	-	0.61	NA		NA	
SE (d)		2.0		1.8	4.40		3.77			2.01		3.14	-	1.30	-	0.86	0.87		2.14	
CV (%)		11.1		9.3	15.00		16.54			10.49		12.50	-	11.14	-	5.31	13.61		11.28	

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 (2021-22)- North Zone.

Treatment	Open 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	9.7	18.1	-	-	0.77	-	-	-	10.47	18.77	-	-	3.46	10.70	-	-	5.6	-	-	-
T2	-	-	14.6	22.4	-	-	4.92	-	-	-	21.28	27.26	-	-	10.45	18.64	-	-	16.6	-
T3	7.0	15.3	12.4	20.6	1.67	-	6.36	-	9.10	17.50	18.71	25.58	1.73	7.40	5.58	13.52	2.7	-	14.6	-
T4	7.7	16.1	8.1	16.5	3.34	-	3.34	-	14.78	22.50	24.48	29.49	3.35	10.51	3.55	10.72	3.3	-	9.9	-
T5	8.4	16.8	4.3	11.9	1.57	-	3.88	-	15.78	23.30	26.66	30.92	2.04	8.20	3.69	11.00	3.9	-	6.6	-
T6	7.2	15.5	9.6	18.0	1.13	-	4.54	-	14.95	22.65	23.62	29.00	2.73	9.48	4.85	12.58	2.9	-	11.7	-
CD (5%)		1.7		1.9	NS		NS			3.71		N/A	-	1.62	-	2.58	1.1		3.2	
SE (m)		0.6		0.6	2.19		1.96			1.19		1.67	-	0.52	-	0.83	NA		NA	
SE (d)		0.8		0.9	3.10		2.78			1.68		2.37	-	0.74	-	1.17	0.4		1.0	
CV (%)		6.8		6.9	13.84		17.67			11.37		11.76	-	11.26	-	12.47	13.7		12.3	

BT- Bathinda; **FA**- Faridkot; **HI** – Hisar; **SR**- Sirsa; **SG**- Sriganganagar

O.V-Original Value ; **T.V**-Transformed value



Table: 137. Ent 5. Evaluation of Refugia in Bag and structured refugia against bollworm complex in cotton (2021-22) - North Zone.

Treatment	Yield (q.)/ha.				
	BT	FA	HI	SR	SG
T1	21.98	28.24	26.37	27.25	23.8
T2	17.85	22.85	19.05	21.30	20.1
T3	24.43	25.78	23.79	23.65	24.5
T4	23.13	29.03	20.63	26.63	24.8
T5	27.10	27.84	19.77	25.38	24.5
T6	27.10	29.31	20.74	24.25	25.5

BT- Bathinda; **FA**- Faridkot; **HI** – Hisar; **SR**- Sirsa; **SG**- Sriganaganagar

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 2021-22.(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	0.20		0.00		0.00		0.00		0.0	0.7	0.0	0.7	0.0		--		0.03	0.73	-	-
T2	0.31		0.00		0.00		1.17		0.0	0.7	0.4	1.0	--		0.5		-	-	0.36	0.93
T3	0.00		0.08		0.00		0.25		0.0	0.7	0.2	0.8	0.0		0.4		0.04	0.73	0.31	0.9
T4	0.00		0.00		0.00		0.18		0.0	0.7	0.1	0.8	0.0		0.3		0.06	0.75	0.19	0.83
T5	0.00		0.18		0.02		0.17		0.1	0.7	0.2	0.8	0.0		0.3		0.04	0.73	0.18	0.82
T6	0.00		0.45		0.02		0.25		0.1	0.8	0.2	0.8	0.0		0.4		0.03	0.73	0.25	0.87
CD (5%)	0.00		0.00							0.0		0.1						0.03		0.13
SE (m)	0.00		0.00							0.0		0.0						0.01		0.04
SE (d)																				
CV (%)	0.00		0.00							3.3		8.5						3.166		11.92

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.

JU- Junagadh, **SU**- Surat, **AK**- Akola, **NA**- Nanded, **RA**- Rahuri



Table: 139 Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2021-22. (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	0.00	0.00	-	0.00	-	0.0	0.0	0.0	0.7	0.0	-	--	-	0.02	0.72	-	
T2	0.00	0.00	0.63	0.00	0.00	-	0.07	-	0.0	0.0	0.2	0.8	--	-	0.0	-	-	-	0.06	0.75
T3	0.00	0.00	0.00	0.00	0.00	-	0.01	-	0.0	0.0	0.1	0.7	0.0	-	0.0	-	0.01	0.71	0.03	0.73
T4	0.00	0.00	0.00	0.00	0.00	-	0.00	-	0.0	0.0	0.0	0.7	0.0	-	0.0	-	0.02	0.72	0.01	0.71
T5	0.00	0.00	0.00	0.00	0.00	-	0.00	-	0.0	0.0	0.0	0.7	0.0	-	0.0	-	0.02	0.72	0.05	0.74
T6	0.00	0.00	0.00	0.00	0.00	-	0.00	-	0.0	0.0	0.0	0.7	0.0	-	0.0	-	0.02	0.72	0.05	0.74
CD (5%)												0.1						0.134		0.04
SE (m)												0.0						0.044		0.01
SE (d)																				
CV (%)												6.2						11.92		5.28

Table: 140. Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2021-22. (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	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	0.71	0.00	0.71
T2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.71	0.00	0.71
T3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.71	0.00	0.71
T4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.71	0.00	0.71
T5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.71	0.00	0.71
T6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.71	0.00	0.71
CD (5%)																				
SE (m)																				
SE (d)																				
CV (%)																				

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: 141. Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2021-22. (Central Zone) (Larval Recovery)

Treatment	No. of larvae per plant in Flower (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	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	3.20	-	0.00	-	2.33	1.68	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
T2	0.00	-	11.73	-	0.00	0.00	9.83	3.21	-	-	-	-	-	-	-	-	-	-	-	-
T3	2.95	-	8.84	-	4.00	2.11	7.08	2.75	-	-	-	-	-	-	-	-	-	-	-	-
T4	2.59	-	7.88	-	2.50	1.71	3.67	2.03	-	-	-	-	-	-	-	-	-	-	-	-
T5	2.97	-	8.69	-	2.83	1.82	5.25	2.39	-	-	-	-	-	-	-	-	-	-	-	-
T6	3.37	-	9.52	-	3.58	2.01	5.75	2.50	-	-	-	-	-	-	-	-	-	-	-	-
CD (5%)	0.20		0.30			0.30		0.22												
SE (m)	0.07		0.10			0.10		0.07												
SE (d)						-		-												
CV (%)	9.39		7.83			10.51		5.41												

Table: 142. Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex in Cotton (Central Zone) (Fruiting Body Damage)

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	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.62	-	--	--	0.00	0.00	-	-
T2	0.00	0.00	32.24	28.45	0.00	0.00	39.06	38.66	0.0	0.0	12.1	20.3	--	-	12.82	20.96	0.00	0.00	13.5	21.56
T3	8.88	2.38	29.82	24.74	0.35	2.38	30.01	33.20	0.0	0.9	7.9	16.1	0.31	-	9.40	17.82	0.00	0.00	10.57	18.97
T4	7.51	1.71	29.98	24.97	0.31	1.59	17.81	24.93	0.1	1.4	4.0	11.5	0.00	-	6.27	14.49	0.00	0.00	7.16	15.52
T5	9.53	2.74	29.15	23.73	0.68	3.30	17.61	24.79	0.1	1.8	5.8	13.9	0.00	-	5.89	13.99	0.00	0.00	7.22	15.59
T6	9.76	2.87	30.23	25.34	0.85	3.67	19.94	26.50	0.2	2.4	6.8	15.0	0.00	-	8.49	16.94	0.00	0.00	8.72	17.18
CD (5%)		0.92		3.04		NS		1.38		0.3		1.9				1.80				2.14
SE (m)		0.31		1.01		1.34		0.45		0.1		0.6				0.58				0.69
SE (d)																0.82				
CV (%)		10.27		8.00		25.66		3.03		19.9		10.0				6.85				7.87

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.

* Fruiting Body damage includes damage in squares, flowers and bolls.

** Green boll damage (%)



Table: 143. Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2021-22.(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	9.71	2.84	0.00	0.00	4.03	11.56	0.00	0.00	1.83	1.51	0.00	0.71	9.00	17.41	--	--	8.0	16.43	-	
T2	0.00	0.00	19.82	11.50	0.00	0.00	4.69	12.47	0.00	0.71	5.55	2.43	--	--	19	25.79	-		21.0	27.27
T3	9.96	2.99	16.58	8.15	4.70	12.50	4.56	12.28	2.80	1.79	3.24	1.92	7.00	15.31	15.67	23.27	9.0	17.46	24.0	29.33
T4	9.23	2.57	15.79	7.41	3.70	11.07	3.59	10.28	1.44	1.39	2.32	1.66	8.00	16.41	11.33	19.52	9.0	17.46	21.0	27.27
T5	9.97	3.00	16.63	8.19	4.28	11.84	3.21	10.29	2.51	1.72	3.13	1.90	7.70	16.10	11.33	19.52	8.0	16.43	21.0	27.27
T6	10.50	3.32	17.35	8.89	4.59	12.32	5.09	12.97	3.25	1.92	4.48	2.21	7.00	15.31	14.33	22.23	8.0	16.43	18.0	25.1
CD (5%)		0.93		1.76	-	NS	-	1.78		0.40		0.44		1.09		3.57		N/A		N/A
SE (m)		0.31		0.58	-	0.59	-	0.58		0.13		0.15		0.35		1.15		0.81		0.95
SE (d)														0.50		1.62				
CV (%)		7.52		8.13	-	9.97	-	9.81		17.58		16.22		4.36		10.38		9.665		6.983

JU- Junagadh, SU- Surat, AK- Akola, NA- Nanded, RA- Rahuri

Table: 144. Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex (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	9.02	2.46	0.00	0.00	3.83	11.26	0.00	0.00	8.2	16.4	0.0	0.0	20.0	26.55	--	--	20	26.57		
T2	0.00	0.00	25.51	18.55	0.00	0.00	18.17	25.15	0.0	0.0	30.2	33.2	--	--	32.40	34.68	-		31.2	33.9
T3	8.59	2.23	23.17	15.48	7.50	15.77	12.83	20.96	15.7	23.3	21.5	27.6	15.6	23.19	28.00	31.93	21	27.27	30.5	33.5
T4	7.90	1.89	22.38	14.50	4.33	11.81	7.00	15.29	7.2	15.5	10.8	19.2	18.0	24.47	21.00	27.25	20	26.57	28.5	32.2
T5	8.75	2.31	22.94	15.20	4.83	12.63	9.33	17.73	9.8	18.2	14.7	22.4	17.2	24.48	20.40	26.83	20	26.57	28.8	32.4
T6	9.41	2.67	23.54	15.95	6.33	14.47	9.83	18.22	12.0	20.2	18.2	25.1	16.4	23.86	22.00	27.94	21	27.27	30.8	33.6
CD (5%)		1.22		2.23	-	2.74	-	2.00		2.9		3.8		2.07		2.09		N/A		N/A
SE (m)		0.41		0.74	-	0.89	-	0.65		1.0		1.3		0.67		0.67		0.9		1.1
SE (d)														0.94		0.95				
CV (%)		11.16		7.54	-	13.48	-	6.68		12.2		11.8		5.43		4.50		6.73		6.70

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: 145 .Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex (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	11.85	4.22	0.00	0.00	2.34	8.71	0.00	0.00	7.8	16.1	0.0	0.0	28.4	32.18	--	--	31.3	34.0		
T2	0.00	0.00	27.10	20.75	0.00	0.00	20.74	27.05	0.0	0.0	43.8	41.4	--	--	41.3	39.97	-		34.9	36.2
T3	11.19	3.76	26.54	19.97	3.38	10.54	8.57	16.99	14.3	22.0	27.4	31.5	22.6	28.36	37.4	37.67	17.9	25.0	35.2	36.4
T4	10.81	3.51	25.95	19.15	1.58	7.18	5.59	13.62	7.3	15.5	12.0	20.0	26.5	30.96	30.05	33.22	21.7	27.8	35.2	36.4
T5	11.35	3.87	26.31	19.64	1.88	7.83	5.75	13.72	9.1	17.4	18.8	25.5	25.4	30.24	28.6	32.31	29.3	32.8	25.1	30.1
T6	11.90	4.25	26.95	20.53	2.56	9.17	6.81	15.09	12.9	20.8	22.4	28.0	26.1	30.68	28.2	32.06	26.7	31.1	30.9	33.8
CD (5%)		1.27		2.70		1.68		2.83		4.6		6.4		1.83		1.92		0.11		N/A
SE (m)		0.42		0.90		0.55		0.92		1.5		2.1		0.59		0.62		0.03		2.84
SE (d)														0.83		0.87				
CV (%)		8.85		8.10		12.57		10.61		19.8		17.4		3.85		3.52		1.78		19.07

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: 146. Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex (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	9.85	2.93	0.00	0.00	0.88	5.33	0.00	0.00	2.5	9.0	0.0	0.0	15.35	23.02	--	--	22.2	28.1	-	-
T2	0.00	0.00	23.91	16.42	0.00	0.00	9.02	17.44	0.0	0.0	21.7	27.7	--	--	22.65	28.40	-	-	24.7	29.8
T3	9.11	2.50	22.83	15.06	1.52	7.06	3.73	11.08	4.7	12.5	11.6	19.7	13.20	21.26	18.70	25.58	10.8	19.2	18.9	25.7
T4	8.45	2.16	22.08	14.12	0.69	4.76	2.15	8.38	1.9	7.8	4.1	11.6	14.55	22.35	16.40	23.84	13.7	21.7	16.9	24.3
T5	9.18	2.54	22.51	14.66	0.80	5.11	2.33	8.69	3.2	10.3	7.3	15.3	13.70	21.68	15.15	22.89	14.5	22.4	18.4	25.4
T6	9.90	2.96	23.12	15.41	0.99	5.72	2.88	9.68	4.2	11.8	9.5	17.7	14.10	22.02	15.80	23.40	15.3	23.0	20.7	27.1
CD (5%)		0.99		2.33		0.97		2.34		2.0		4.4		NS		1.78		N/A		N/A
SE (m)		0.33		0.77		0.31		0.76		0.7		1.4		0.65		0.57		2.34		2.41
SE (d)														0.92		0.81				
CV (%)		8.50		8.10		11.24		13.77		15.7		18.9		5.87		4.61		13.76		18.42

JU- Junagadh, SU- Surat, AK- Akola, NA- Nanded, RA- Rahuri



Table: 147. Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2021-22.(Central Zone) (Yield)

Treatment	Yield (q.)/ha.				
	JU	SU	AK	NA	RA
T1	36.15	20.56	14.44	14.30	16.34
T2	17.85	12.85	7.23	7.80	9.12
T3	41.93	24.53	14.15	12.65	13.28
T4	42.16	19.63	18.04	13.50	15.42
T5	44.55	24.77	17.24	13.70	15.49
T6	43.98	24.07	16.95	13.05	15.56

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)-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: 148. Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2021-22.(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	-	-	-	-	0.0	0.0	0.0	0.7	0.0	0.7	-	-	0.00	-	-	-	-	-	-	-
T2	-	-	-	-	0.0	0.0	1.3	1.3	-	-	5.0	2.3	-	-	1.08	-	-	-	-	-
T3	-	-	-	-	0.0	0.0	0.0	0.7	0.0	0.7	4.3	2.2	0.00	-	0.86	-	-	-	-	-
T4	-	-	-	-	0.0	0.0	0.0	0.7	0.0	0.7	3.6	2.0	0.00	-	0.76	-	-	-	-	-
T5	-	-	-	-	0.0	0.0	0.0	0.7	0.0	0.7	3.6	2.0	0.00	-	0.66	-	-	-	-	-
T6	-	-	-	-	0.0	0.0	0.0	0.7	0.0	0.7	3.7	2.0	0.00	-	1.02	-	-	-	-	-
CD (5%)							0.2					0.3			0.33					
SE (m)							0.1					0.1			0.11					
SE (d)							0.1													
CV (%)							10.3					8.4			16.45					

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.

LG-Lam Guntur; **ND-** Nandyal; **DW-**Dharwad; **RC-**Raichur; **CN-** Chamarajanagar



Table: 149. Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2021-22.(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	-	0.0	0.7	-	-	0.00	-	0.00	-	-	-	-	-
T2	-	-	-	-	0.00	-	0.00	-	-	-	3.0	2.0	-	-	-	-	-	-	-	-
T3	-	-	-	-	0.00	-	0.00	-	0.0	0.7	2.2	1.8	0.00	-	0.00	-	-	-	-	-
T4	-	-	-	-	0.00	-	0.00	-	0.0	0.7	1.1	1.4	0.00	-	0.00	-	-	-	-	-
T5	-	-	-	-	0.00	-	0.00	-	0.0	0.7	1.0	1.4	0.00	-	0.00	-	-	-	-	-
T6	-	-	-	-	0.00	-	0.00	-	0.0	0.7	1.3	1.5	0.00	-	0.00	-	-	-	-	-
CD (5%)												0								
SE (m)												0.1								
SE (d)																				
CV (%)												11.6								

Table: 150. Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton 2021-22.(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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CD (5%)																				
SE (m)																				
SE (d)																				
CV (%)																				

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 2021-22.(South Zone) (Larval Recovery)

Treatment	No. of larva per plant in Flower (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	-	-	-	-	29.0	5.4	0.0	0.7	15.6	4.1	-	-	-	-	-	-	-	-	-	-
T2	-	-	-	-	0.0	0.7	32.0	5.7	-	-	24.2	5.0	-	-	-	-	-	-	-	-
T3	-	-	-	-	14.7	3.9	0.0	0.7	29.2	5.5	20.1	4.6	-	-	-	-	-	-	-	-
T4	-	-	-	-	25.0	5.0	0.0	0.7	17.3	4.3	18.2	4.4	-	-	-	-	-	-	-	-
T5	-	-	-	-	27.7	5.3	0.0	0.7	17.1	4.3	17.7	4.2	-	-	-	-	-	-	-	-
T6	-	-	-	-	21.7	4.7	0.0	0.7	17.7	4.2	18.1	4.3	-	-	-	-	-	-	-	-
CD (5%)					0.8		0.2			0.6		0.8								
SE (m)					0.2		0.1			0.2		0.3								
SE (d)					0.3		0.1													
CV (%)					10.1		8.5			9.4		10.9								

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar

O.V-Original Value ; T.V-Transformed value

Table: 152. Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex. (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	-	-	-	-	-	-	-	-	2.8	9.5	-	-	0.00	0.00	-	-	-	-	-	-
T2	-	-	-	-	-	-	-	-	-	-	24.8	29.9	-	-	36.08	36.92	-	-	-	-
T3	-	-	-	-	-	-	-	-	4.6	12.3	20.3	26.7	0.00	0.00	36.80	37.34	-	-	-	-
T4	-	-	-	-	-	-	-	-	3.7	11.0	17.1	24.4	0.00	0.00	26.08	30.71	-	-	-	-
T5	-	-	-	-	-	-	-	-	3.4	10.5	15.2	22.9	0.00	0.00	26.80	31.17	-	-	-	-
T6	-	-	-	-	-	-	-	-	3.6	10.7	16.3	23.2	0.00	0.00	27.51	31.63	-	-	-	-
CD (5%)										2.1		4.6			0.21	6.86				
SE (m)										0.7		1.5			0.07	2.29				
SE (d)																				
CV (%)										12.7		11.8			13.24	18.56				

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.

* Fruiting Body damage includes damage in squares, flowers and boll.

** Green boll damage (%).



Table: 153. Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton.(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	13.0	21.1	-	-	0.00	0.00	0.00	0.00	1.9	7.9	-	-	6.00	2.55	-	-	-	-	-	-
T2	-	-	16.5	23.9	0.00	0.00	0.00	0.00	-	-	5.3	13.6	-	-	10.00	3.24	-	-	-	-
T3	13.3	20.6	18.1	23.6	0.00	0.00	0.00	0.00	3.7	11.2	4.2	12.0	5.00	2.35	8.00	2.92	-	-	-	-
T4	15.0	22.7	16.2	24.9	0.00	0.00	0.00	0.00	2.8	9.7	3.6	11.1	4.00	2.12	7.00	2.74	-	-	-	-
T5	15.8	23.3	11.6	19.4	0.00	0.00	0.00	0.00	2.7	9.5	3.5	10.7	4.00	2.12	6.00	2.55	-	-	-	-
T6	17.0	24.2	14.8	21.9	0.00	0.00	0.00	0.00	2.8	9.1	3.5	10.4	6.00	2.55	8.00	2.92	-	-	-	-
CD (5%)	N/A		N/A							1.8		1.4		0.45		0.36				
SE (m)	2.4		2.2							0.6		0.5		0.15		0.12				
SE (d)	3.4		3.1																	
CV (%)	21.2		19.6							12.2		8.1		13.65		16.28				

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar

O.V-Original Value ; T.V-Transformed value

Table: 154 .Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton.(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	32.9	34.8	-	-	35.0	36.2	0.0	0.0	23.5	29.0	-	-	36.45	37.14	-	-	-	-	-	-
T2	-	-	30.9	33.7	0.0	0.0	40.0	39.2	-	-	31.7	34.3	-	-	83.14	65.76	-	-	-	-
T3	37.1	38.8	46.6	43.2	35.0	36.2	0.0	0.0	26.5	31.0	26.8	31.2	35.48	36.56	82.64	65.38	-	-	-	-
T4	39.5	37.4	32.9	34.7	40.0	39.2	0.0	0.0	20.8	27.1	23.7	29.1	34.16	35.77	73.24	58.85	-	-	-	-
T5	47.1	43.2	38.6	38.0	43.3	41.2	0.0	0.0	20.8	27.0	23.0	28.7	34.85	36.18	68.22	55.69	-	-	-	-
T6	41.4	39.8	38.6	37.8	46.7	43.1	0.0	0.0	21.1	27.2	23.9	29.1	36.82	37.36	71.45	57.70	-	-	-	-
CD (5%)	N/A		N/A		6.7		2.2			2.9		3.5		4.31		5.68				
SE (m)	3.598		4.037		2.1		0.7			0.9		1.1		1.44		1.89				
SE (d)	5.088		5.709		3.0		1.0													
CV (%)	18.544		21.545		11.2		18.3			8.1		7.4		15.45		14.25				

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. (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	44.7	41.9	-	-	20.0	26.5	0.0	0.0	19.5	26.1	-	-	84.82	67.07	-	-	-	-	-	-
T2	-	-	67.0	55.3	0.0	0.0	50.0	45.0	-	-	44.0	41.6	-	-	92.98	74.64	-	-	-	-
T3	60.8	51.3	65.8	54.6	16.7	24.1	0.0	0.0	27.3	31.4	39.4	38.9	82.66	65.39	87.63	69.40	-	-	-	-
T4	53.2	46.8	66.6	55.0	21.7	27.7	0.0	0.0	23.7	28.9	33.8	35.4	78.34	62.26	86.14	68.14	-	-	-	-
T5	54.3	47.5	56.3	48.7	25.0	29.9	0.0	0.0	22.7	28.4	30.7	33.5	80.16	63.55	86.58	68.51	-	-	-	-
T6	60.7	51.2	63.3	52.9	18.3	25.3	0.0	0.0	25.3	30.1	33.0	34.9	78.45	62.34	87.38	69.19	-	-	-	-
CD (5%)	N/A		N/A		4.8		2.1			5.5		6.2		4.36		6.84				
SE (m)	2.8		4.1		1.5		0.7			1.8		2.0		1.45		2.28				
SE (d)	4.0		5.8		2.2		1.0													
CV (%)	11.9		15.5		11.8		15.6			11.84		10.87		15.66		16.32				

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. (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	31.5	34.0	-	-	6.0	14.2	0.0	0.0	21.1	27.4	-	-	76.45	60.97	-	-	-	-	-	-
T2	-	-	37.4	37.7	0.0	0.0	11.0	19.4	-	-	45.2	42.2	-	-	91.38	72.93	-	-	-	-
T3	27.6	31.5	34.5	35.9	4.7	12.5	0.0	0.0	28.5	32.3	36.1	36.9	72.68	58.49	85.00	67.21	-	-	-	-
T4	24.8	29.8	30.6	33.5	7.0	15.3	0.0	0.0	24.5	29.7	33.6	35.2	67.34	55.15	83.25	65.84	-	-	-	-
T5	24.7	29.7	27.5	31.6	7.0	15.3	0.0	0.0	22.5	28.3	30.5	33.5	71.45	57.70	83.77	66.24	-	-	-	-
T6	30.3	33.3	29.5	32.8	7.7	16.0	0.0	0.0	22.8	28.5	31.4	34.0	74.56	59.71	84.70	66.98	-	-	-	-
CD (5%)	N/A		N/A		1.9		0.7			3.8		7.1		4.25		8.64				
SE (m)	2.1		1.9		0.6		0.2			1.2		2.3		1.42		2.88				
SE (d)	3.0		2.6		0.9		0.3													
CV (%)	13.4		10.8		8.6		11.6			9.4		12.6		14.88		16.22				

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar



Table: 157. Ent 5. Evaluation of Refugia in bag and structured refugia against bollworm complex in cotton. (Yield)

Treatment	Yield (q.)/ha.				
	LG	ND	DW	RC	CN
T1	15.8	13.43	11.95	8.33	-
T2	10.7	10.70	5.95	4.23	-
T3	12.4	10.63	9.53	7.30	-
T4	13.8	8.90	10.52	8.12	-
T5	13.6	8.50	11.46	7.46	-
T6	12.0	9.97	10.70	6.99	-

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: 158. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2021-22)-North Zone.

Treatment	No. of larvae per plant (ABW/SBW/TC)																			
	BT					FA					HI					SR				
	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	0.0	0.0	0.0	0.0	-	0.3	-	0.0	-	-	2.97	1.99	3.03	2.01	39.04	0.10	1.05	0.03	1.02	-
T2	0.0	0.0	0.0	0.0	-	0.2	-	0.0	-	-	3.07	2.02	2.67	1.91	47.60	0.13	1.06	0.03	1.02	-
T3	0.0	0.0	0.0	0.0	-	0.3	-	0.2	-	-	3.47	2.11	2.90	1.97	45.65	0.07	1.03	0.07	1.03	-
T4	0.0	0.0	0.0	0.0	-	0.1	-	0.0	-	-	3.20	2.05	2.43	1.85	46.85	0.13	1.06	0.03	1.02	-
T5	0.0	0.0	0.0	0.0	-	0.0	-	0.3	-	-	3.37	2.09	1.37	1.54	72.67	0.10	1.05	0.00	1.00	-
T6	0.0	0.0	0.0	0.0	-	0.2	-	0.0	-	-	3.30	2.07	2.23	1.80	60.06	0.10	1.05	0.07	1.03	-
T7	0.0	0.0	0.0	0.0	-	0.2	-	0.0	-	-	3.17	2.04	2.10	1.76	62.46	0.13	1.06	0.03	1.02	-
T8	0.0	0.0	0.0	0.0	-	0.2	-	0.1	-	-	3.10	2.02	1.77	1.66	74.47	0.10	1.05	0.03	1.02	-
T9	0.0	0.0	0.0	0.0	-	0.2	-	0.0	-	-	3.20	2.05	1.97	1.72	70.27	0.17	1.08	0.03	1.02	-
T10	0.0	0.0	0.0	0.0	-	0.2	-	0.0	-	-	3.40	2.09	2.03	1.74	68.17	0.13	1.06	0.07	1.03	-
T11	0.0	0.0	0.0	0.0	-	0.4	-	0.0	-	-	3.13	2.03	2.17	1.78	59.76	0.17	1.08	0.07	1.03	-
T12	0.0	0.0	0.0	0.0	-	0.6	-	0.6	-	-	3.40	2.10	3.93	2.22		0.13	1.06	0.17	1.08	-
CD (5%)						NS		NS				N/A		0.16			N/A		N/A	
SE (m)						0.2		0.1				0.07		0.05			0.03		0.01	
SE (d)						0.2		0.2				0.10		0.08			0.04		0.02	
CV (%)						109.8		210.8				5.76		5.13			5.05		2.45	

Treatments Details: T₁ – Bifenthrin 10EC, T₂ – Cypermethrin 25EC, T₃ – Fenpropathrin, T₄ – Profenophos 50 EC, T₅ – Chlorantraniliprole 18.5 SC, T₆ – Flubendiamide 39.35SC, T₇ – Indoxacarb 14.5 SC, T₈– Spinetoram 11.7 SC, T₉- Spinosad 45 SC, T₁₀- Emamectin benzoate 5 SG, T₁₁- Pyridalyl 10 EC, T₁₂- Control

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganganagar

O.V-Original Value ; T.V-Transformed value



Table: 159. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2021-22)-North Zone.

Treatment	No. of larvae per plant in flower (PBW)																								
	BT					FA					HI					SR					SG				
	Pre		14 DAS		Reduction over Control (%)	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		O.V	T.V			
T1	6.33	2.71	5.00	2.44	25.59	-	-	-	-	-	5.13	2.47	4.80	2.40	45.94	-	-	-	-	-	5.27	2.40	4.13	2.15	52.99
T2	6.33	2.71	4.20	2.27	37.14	-	-	-	-	-	4.97	2.43	4.73	2.39	47.70	-	-	-	-	-	4.73	2.29	4.07	2.13	56.55
T3	6.40	2.72	4.93	2.43	20.62	-	-	-	-	-	5.67	2.58	4.60	2.36	50.17	-	-	-	-	-	4.47	2.23	4.27	2.18	52.97
T4	6.53	2.74	4.53	2.34	31.42	-	-	-	-	-	5.10	2.47	4.43	2.33	50.34	-	-	-	-	-	5.07	2.35	3.53	2.01	61.73
T5	6.67	2.77	4.73	2.39	29.27	-	-	-	-	-	5.50	2.54	3.20	2.05	60.56	-	-	-	-	-	4.93	2.33	2.67	1.77	66.08
T6	7.13	2.85	5.47	2.53	8.01	-	-	-	-	-	4.93	2.43	3.60	2.14	56.15	-	-	-	-	-	3.93	2.11	3.53	2.01	60.13
T7	6.27	2.70	4.20	2.27	38.17	-	-	-	-	-	5.27	2.50	3.27	2.06	62.14	-	-	-	-	-	5.20	2.39	3.87	2.08	61.39
T8	6.00	2.64	4.00	2.23	48.36	-	-	-	-	-	5.30	2.51	3.13	2.03	63.90	-	-	-	-	-	4.80	2.30	2.93	1.85	63.75
T9	6.60	2.76	4.27	2.29	36.73	-	-	-	-	-	5.37	2.52	4.10	2.26	51.40	-	-	-	-	-	4.13	2.15	3.33	1.96	60.14
T10	5.60	2.57	3.73	2.17	49.77	-	-	-	-	-	4.43	2.32	2.80	1.94	68.48	-	-	-	-	-	5.13	2.37	3.07	1.89	65.74
T11	6.47	2.73	5.93	2.63	13.64	-	-	-	-	-	5.10	2.47	3.40	2.10	58.62	-	-	-	-	-	4.93	2.32	3.20	1.92	64.47
T12	6.40	2.72	5.13	2.47		-	-	-	-	-	5.50	2.55	6.97	2.82		-	-	-	-	-	4.60	2.26	6.07	2.56	
CD (5%)		NS		0.13								N/A		0.26								0.37		0.29	
SE (m)		0.05		0.04								0.08		0.09											
SE (d)		0.07		0.06								0.12		0.12								0.13		0.10	
CV (%)		3.06		3.24								5.83		6.71								6.79		5.85	

Treatments Details: **T₁** – Bifenthrin 10EC, **T₂** – Cypermethrin 25EC, **T₃** – Fenpropathrin, **T₄** – Profenophos 50 EC, **T₅** – Chlorantraniliprole 18.5 SC, **T₆** – Flubendiamide 39.35SC, **T₇** – Indoxacarb 14.5 SC, **T₈**– Spinetoram 11.7 SC, **T₉**- Spinosad 45 SC, **T₁₀**- Emamectin benzoate 5 SG, **T₁₁**- Pyridalyl 10 EC, **T₁₂**- Control

BT- Bathinda; **FA**- Faridkot; **HI** – Hisar; **SR**- Sirsa; **SG**- Sriganganagar

O.V-Original Value ; **T.V**-Transformed value



Table:160. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2021-22)-North Zone.

Treatment	Green Boll damage due to SBW/ABW or Fruiting Body Damage (%)																								
	BT**					FA**					HI**					SR*					SG**				
	Pre		14 DAS		Reduction over Control (%)	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		O.V	T.V	O.V	T.V	
T1	0.0	0.0	0.0	0.0	-	0.8	-	0.7	-	-2.54	16.7	23.9	15.0	22.6	34.63	4.8	12.3	1.5	7.0	72.42	25.3	30.2	15.3	23.0	45.7
T2	0.0	0.0	0.0	0.0	-	1.1	-	0.6	-	-4.41	17.5	24.6	11.7	19.9	47.44	3.3	10.2	1.1	6.0	70.34	27.3	31.4	14.0	22.0	49.9
T3	0.0	0.0	0.0	0.0	-	0.4	-	0.6	-	-16.10	14.2	22.1	13.3	21.3	39.75	3.7	10.9	1.9	7.9	55.11	32.7	34.8	13.3	21.4	52.1
T4	0.0	0.0	0.0	0.0	-	0.0	-	0.0	-	28.78	17.5	24.6	11.7	19.9	47.44	3.5	10.7	1.1	6.1	71.35	28.0	31.9	12.7	20.8	55.0
T5	0.0	0.0	0.0	0.0	-	1.4	-	0.0	-	-38.65	15.8	23.2	5.8	13.5	65.39	4.6	12.2	1.1	6.0	78.33	32.0	34.4	7.3	15.7	65.8
T6	0.0	0.0	0.0	0.0	-	1.3	-	1.3	-	-53.18	17.5	24.6	8.3	16.6	58.98	6.1	13.9	2.8	9.6	58.29	29.3	32.6	10.7	19.0	60.0
T7	0.0	0.0	0.0	0.0	-	0.0	-	0.3	-	75.19	15.0	22.8	10.0	18.4	52.57	6.4	13.8	2.6	8.9	63.75	28.7	32.3	11.3	19.6	57.9
T8	0.0	0.0	0.0	0.0	-	2.0	-	1.7	-	-65.20	15.0	22.3	6.7	14.8	64.11	8.2	15.4	2.8	9.5	68.94	32.7	34.8	8.7	17.1	64.3
T9	0.0	0.0	0.0	0.0	-	1.4	-	0.4	-	-54.89	14.2	22.1	8.3	16.6	61.54	4.4	12.0	1.6	7.1	68.32	24.7	29.8	9.3	17.8	60.0
T10	0.0	0.0	0.0	0.0	-	0.4	-	1.2	-	-8.21	15.8	23.2	10.0	18.4	53.85	6.3	13.9	2.8	9.5	60.85	33.3	35.2	8.0	16.4	61.4
T11	0.0	0.0	0.0	0.0	-	1.3	-	0.5	-	41.00	17.5	24.6	10.0	18.4	51.29	3.4	10.4	1.5	7.0	58.85	28.7	32.4	7.3	15.5	63.5
T12	0.0	0.0	0.0	0.0	-	0.6	-	0.5	-		15.8	23.2	24.2	29.4		7.2	15.4	8.0	16.3		24.7	29.8	35.3	36.5	
CD (5%)						NS		NS				N/A		4.6			N/A		3.1			6.3		3.4	
SE (m)						0.7		0.6				2.3		1.5			2.6		1.1			NA		NA	
SE (d)						1.0		0.8				3.2		2.2			3.7		1.5			2.2		1.2	
CV (%)						132.		151.4				16.7		14.0			35.3		21.4			8.10		7.0	

*SR-Fruiting Body Damage (%) includes damage in squares, flowers and boll.

** Green Boll Damage (%)

Treatments Details: T₁ – Bifenthrin 10EC, T₂ – Cypermethrin 25EC, T₃ – Fenpropathrin, T₄ – Profenophos 50 EC, T₅ – Chlorantraniliprole 18.5 SC, T₆ – Flubendiamide 39.35SC, T₇ – Indoxacarb 14.5 SC, T₈ – Spinetoram 11.7 SC, T₉ – Spinosad 45 SC, T₁₀ – Emamectin benzoate 5 SG, T₁₁ – Pyridalyl 10 EC, T₁₂ – Control

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganganagar

O.V-Original Value ; T.V-Transformed value



Table:161. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2021-22)-North Zone.

Treatment	Green Boll damage(%) due to PBW																								
	BT					FA					HI					SR					SG				
	Pre		14 DAS		Reduction over Control (%)	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		O.V	T.V	O.V	T.V	
T1	50.0	45.0	46.7	43.1	30.99	10.0	-	6.4	-	25.85	25.0	29.9	19.2	25.8	28.82	16.7	23.7	8.3	16.6	54.20	23.3	28.9	13.3	21.4	51.2
T2	43.3	41.1	41.7	40.1	36.33	10.0	-	4.8	-	47.51	21.7	27.6	20.8	27.1	29.72	16.7	24.0	8.3	16.6	54.20	22.7	28.4	11.3	19.6	56.2
T3	66.7	54.8	53.3	46.9	13.31	9.4	-	2.2	-	51.26	25.0	30.0	15.8	23.3	38.73	10.0	18.0	8.3	16.6	23.66	20.7	27.0	12.7	20.8	53.5
T4	71.7	57.9	61.7	51.8	2.66	11.1	-	5.2	-	50.42	26.7	31.0	17.5	24.6	37.83	13.3	21.1	3.3	8.6	76.52	24.7	29.7	10.7	19.0	59.5
T5	50.0	45.0	43.3	41.2	33.67	9.4	-	7.5	-	17.47	22.5	28.3	10.8	19.2	45.94	16.7	23.7	11.7	19.9	35.84	21.3	27.5	3.3	10.4	69.4
T6	63.3	52.8	58.3	49.8	9.75	8.9	-	6.6	-	27.09	23.3	28.9	15.0	22.8	38.73	18.3	24.8	11.7	19.9	41.65	19.3	26.0	6.0	14.2	65.3
T7	46.7	43.1	36.7	37.0	45.16	12.2	-	8.9	-	12.51	20.8	27.1	12.5	20.5	45.94	15.0	22.6	6.7	14.8	59.25	20.7	27.0	9.3	17.8	64.4
T8	50.0	45.0	40.0	39.1	38.99	8.8	-	3.3	-	70.84	25.8	30.5	10.8	19.2	53.15	20.0	25.4	6.7	12.3	69.43	23.3	28.8	8.7	17.1	67.7
T9	68.3	55.9	56.7	48.8	9.78	7.8	-	6.6	-	29.58	21.7	27.7	16.7	24.0	36.03	16.7	23.7	6.7	14.8	63.33	18.7	25.6	9.3	17.8	63.5
T10	46.7	43.1	36.7	37.2	45.23	11.1	-	3.7	-	48.76	22.5	28.3	9.2	17.6	55.85	18.3	24.8	10.0	18.4	50.00	22.0	27.9	10.7	19.0	66.9
T11	63.3	52.8	58.3	49.8	9.75	7.6	-	4.2	-	40.83	25.8	30.5	12.5	20.6	44.14	13.3	21.1	6.7	14.8	54.14	25.3	30.1	9.3	17.8	67.8
T12	70.0	56.8	63.3	52.7		8.9	-	8.9	-		24.2	29.4	36.7	37.2		18.3	25.3	20.0	26.4		21.3	27.5	28.7	32.4	
CD (5%)		8.6		8.9		NS		NS				N/A		5.0			N/A		7.5			4.9		3.1	
SE (m)		2.9		3.0		1.8		1.5				1.4		1.7			3.44		2.6			NA		NA	
SE (d)		4.2		4.3		1.4		2.1				1.9		2.4			4.86		3.6			1.6		1.0	
CV (%)		10.3		11.8		15.7		16.0				8.0		12.5			25.7		27.0			7.42		6.8	

Treatments Details: T₁ – Bifenthrin 10EC, T₂ – Cypermethrin 25EC, T₃ – Fenpropathrin, T₄ – Profenophos 50 EC, T₅ – Chlorantraniliprole 18.5 SC, T₆ – Flubendiamide 39.35SC, T₇ – Indoxacarb 14.5 SC, T₈ – Spinetoram 11.7 SC, T₉ – Spinosad 45 SC, T₁₀ – Emamectin benzoate 5 SG, T₁₁ – Pyridalyl 10 EC, T₁₂ – Control

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganganagar

O.V-Original Value ; T.V-Transformed value



Table: 162. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2021-22)-North Zone.

Treatment	Natural Enemies/plant*																								
	BT					FA					HI					SR					SG				
	Pre		14 DAS		Reduction over Control (%)	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		O.V	T.V	O.V	T.V	
T1	1.5	1.6	0.9	1.4	-	0.9	-	1.6	-	34.78	1.70	1.63	1.97	1.70	33.98	0.96	1.40	0.74	1.32	34.18	4.2	2.2	3.5	2.0	48.8
T2	2.1	1.7	1.3	1.5	-	0.8	-	2.0	-	27.79	2.00	1.72	1.90	1.69	35.84	0.80	1.34	0.73	1.31	22.08	3.7	2.0	3.4	2.0	54.5
T3	1.7	1.7	0.9	1.4	-	1.3	-	2.3	-	11.48	1.62	1.59	1.97	1.72	33.98	0.78	1.33	0.72	1.31	21.18	3.1	1.9	3.4	2.0	51.6
T4	1.9	1.7	1.1	1.4	-	0.9	-	2.1	-	11.48	2.10	1.75	1.90	1.70	27.94	0.81	1.35	0.74	1.32	21.99	3.3	1.9	3.3	2.0	50.2
T5	2.3	1.8	1.3	1.5	-	0.8	-	2.3	-	4.50	1.73	1.64	2.23	1.80	11.67	0.90	1.38	0.68	1.30	35.48	3.8	2.1	3.6	2.0	45.3
T6	2.2	1.8	1.4	1.5	-	1.3	-	1.6	-	13.81	1.97	1.72	2.10	1.75	20.97	0.94	1.39	0.82	1.35	25.51	4.6	2.2	3.6	2.0	44.9
T7	1.8	1.7	0.7	1.3	-	1.4	-	1.2	-	44.10	2.00	1.73	2.10	1.75	19.11	0.82	1.35	0.76	1.33	20.86	3.6	2.0	3.1	1.9	55.4
T8	2.0	1.7	1.4	1.5	-	0.7	-	2.0	-	4.50	2.30	1.81	2.13	1.75	13.06	0.74	1.32	0.55	1.25	36.53	2.9	1.8	3.6	2.0	44.6
T9	2.1	1.8	1.0	1.4	-	1.9	-	2.3	-	6.83	1.73	1.64	2.23	1.79	11.67	0.64	1.28	0.49	1.22	34.62	3.4	2.0	3.4	2.0	45.5
T10	1.9	1.7	1.1	1.4	-	0.4	-	1.7	-	32.45	2.27	1.79	2.23	1.79	13.53	0.69	1.30	0.55	1.24	31.93	4.4	2.2	3.6	2.0	42.1
T11	2.1	1.8	1.3	1.5	-	1.2	-	2.1	-	16.14	2.23	1.78	2.10	1.75	19.11	0.78	1.33	0.57	1.25	37.60	2.8	1.8	3.7	2.0	46.5
T12	2.4	1.8	1.7	1.6		0.9	-	2.3	-		2.10	1.76	2.30	1.81		0.76	1.33	0.89	1.37		3.6	2.0	3.8	2.1	
CD (5%)		NS		NS		NS		NS				N/A		N/A			0.06		N/A			0.3		0.3	
SE (m)		0.1		0.1		0.3		0.3				0.14		0.11			0.02		0.04			NA		NA	
SE (d)		0.2		0.1		0.4		0.5				0.20		0.16			0.03		0.06			0.1		0.1	
CV (%)		11.8		12.4		44.5		29.3				14.4		11.2			2.41		5.16			5.8		5.1	

Treatments Details: T₁ – Bifenthrin 10EC, T₂ – Cypermethrin 25EC, T₃ – Fenpropathrin, T₄ – Profenophos 50 EC, T₅ – Chlorantraniliprole 18.5 SC, T₆ – Flubendiamide 39.35SC, T₇ – Indoxacarb 14.5 SC, T₈ – Spinetoram 11.7 SC, T₉ – Spinosad 45 SC, T₁₀ – Emamectin benzoate 5 SG, T₁₁ – Pyridalyl 10 EC, T₁₂ – Control

BT- Bathinda; FA- Faridkot; HI – Hisar; SR- Sirsa; SG- Sriganaganagar

O.V-Original Value ; T.V-Transformed value



Table: 163. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2021-22)-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	30.0	33.0	11.1	19.5	7.9	-	4.0	-	14.2	22.1	9.4	17.8	8.2	16.6	3.6	10.9	13.3	21.4	6.1	14.3
T2	23.3	28.5	9.8	18.3	3.6	-	1.9	-	12.2	20.4	7.8	16.1	9.3	17.3	3.9	11.2	12.7	20.8	6.8	15.0
T3	31.7	34.0	13.0	21.1	6.0	-	3.4	-	13.3	21.3	8.0	16.4	11.3	19.6	5.0	12.9	16.1	23.6	7.5	15.9
T4	26.7	30.8	10.6	18.9	4.7	-	2.8	-	10.4	18.8	5.1	12.9	7.7	16.1	3.7	11.1	11.3	19.6	5.5	13.6
T5	28.3	32.0	11.2	19.5	4.4	-	2.4	-	7.8	16.1	4.6	12.3	11.9	20.1	4.6	12.3	6.7	14.9	3.3	10.5
T6	40.0	39.2	13.4	21.4	5.6	-	3.3	-	9.1	17.5	4.9	12.7	13.3	21.0	5.5	13.3	7.3	15.7	3.5	10.8
T7	20.0	26.1	9.6	18.0	3.6	-	2.3	-	9.8	18.2	5.2	13.1	10.7	18.9	4.6	12.1	10.7	19.0	4.9	12.8
T8	16.7	23.9	7.6	15.9	2.6	-	1.7	-	7.2	15.4	3.7	11.1	7.6	15.9	3.3	10.4	5.3	13.3	2.8	9.5
T9	21.7	27.2	9.7	18.1	2.8	-	1.6	-	12.2	20.3	7.3	15.6	8.3	16.7	3.6	11.0	7.3	15.7	3.6	10.8
T10	13.3	21.3	6.2	14.2	1.4	-	0.9	-	8.3	15.4	4.7	12.3	9.1	17.5	4.0	11.6	6.7	14.8	3.4	10.6
T11	36.7	37.1	13.0	21.1	6.3	-	3.3	-	9.5	17.9	4.9	12.7	8.5	16.9	3.2	10.3	6.0	14.2	3.2	10.3
T12	63.3	52.9	14.9	22.7	12.0	-	5.9	-	23.2	28.7	12.5	20.7	21.5	27.2	8.8	17.1	25.3	30.2	15.5	23.1
CD (5%)		10.2		1.3	1.8	-	1.7	-		5.7		2.8		5.7		3.2		3.3		2.2
SE (m)		3.5		0.5	0.6		0.5			1.9		1.0		2.0		1.1		NA		NA
SE (d)		4.9		0.6	0.8		0.8			2.7		1.4		2.8		1.6		1.1		0.8
CV (%)		18.8		4.1	15.7		26.9			17.3		11.4		18.1		15.8		7.4		7.1

Treatments Details: T₁ – Bifenthrin 10EC, T₂ – Cypermethrin 25EC, T₃ – Fenpropathrin, T₄ – Profenophos 50 EC, T₅ – Chlorantraniliprole 18.5 SC, T₆ – Flubendiamide 39.35SC, T₇ – Indoxacarb 14.5 SC, T₈– Spinetoram 11.7 SC, T₉- Spinosad 45 SC , T₁₀- Emamectin benzoate 5 SG, T₁₁- Pyridalyl 10 EC, T₁₂- Control

BT- Bathinda; **FA-** Faridkot; **HI** – Hisar; **SR-** Sirsa; **SG-** Sriganganagar

O.V-Original Value ; **T.V-**Transformed value



Table: 164. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton (2021-22)-North Zone.

Treatment	Yield/q/ha					Phytotoxicity symptom				
	BT	FA	HI	SR	SG	BT	FA	HI	SR	SG
T1	20.12	19.75	23.63	20.27	28.06	-	-	-	Nil	-
T2	21.86	20.36	24.84	19.98	28.78	-	-	-	Nil	-
T3	18.5	20.24	23.93	17.39	27.75	-	-	-	Nil	-
T4	21.25	21.46	26.07	20.83	29.06	-	-	-	Nil	-
T5	20.5	19.75	28.04	17.31	31.94	-	-	-	Nil	-
T6	15.23	19.87	26.98	15.33	31.25	-	-	-	Nil	-
T7	22.54	19.51	26.52	17.23	29.58	-	-	-	Nil	-
T8	22.98	18.53	28.20	20.18	32.50	-	-	-	Nil	-
T9	22.13	19.75	25.91	19.72	30.97	-	-	-	Nil	-
T10	23.86	18.29	27.44	17.24	31.11	-	-	-	Nil	-
T11	16.65	19.51	26.52	17.45	32.08	-	-	-	Nil	-
T12	12.39	15.36	18.29	14.65	28.06	-	-	-	Nil	-
CD (5%)	NA	NS	4.45	2.57	4.66					
SE (m)	NA	1.99	1.51	0.87	NA					
SE (d)	NA	2.81	2.13	1.24	1.59					
CV (%)	NA	17.76	10.22	8.35	6.54					

Treatments Details: T₁ – Bifenthrin 10EC, T₂ – Cypermethrin 25EC, T₃ – Fenpropathrin, T₄ – Profenophos 50 EC, T₅ – Chlorantraniliprole 18.5 SC, T₆ – Flubendiamide 39.35SC, T₇ – Indoxacarb 14.5 SC, T₈- Spinetoram 11.7 SC, T₉- Spinosad 45 SC, T₁₀- Emamectin benzoate 5 SG, T₁₁- Pyridalyl 10 EC, T₁₂- Control

BT- Bathinda; **FA-** Faridkot; **HI** – Hisar; **SR-** Sirsa; **SG-** Sriganganagar



Table:165.Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22.

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	4.85	2.20	1.39	1.18	53.35	2.47	1.72	2.67	1.78	30.61	0.7	1.1	0.6	1.0	74.35
T2	4.33	2.08	1.21	1.10	56.48	2.53	1.74	2.33	1.67	44.90	0.8	1.2	0.6	1.0	71.94
T3	4.72	2.17	1.52	1.23	49.48	2.87	1.83	2.00	1.57	48.98	1.4	1.4	0.8	1.1	64.72
T4	3.99	2.00	0.85	0.92	61.93	3.07	1.87	1.79	1.50	59.18	1.0	1.2	0.7	1.1	67.47
T5	3.92	1.98	1.39	1.18	51.02	2.47	1.72	2.18	1.63	36.73	1.1	1.2	0.6	1.0	73.32
T6	3.97	1.99	0.32	0.57	75.86	3.53	2.01	1.21	1.29	79.59	0.9	1.2	0.3	0.9	83.99
T7	4.44	2.11	1.72	1.31	45.31	3.20	1.92	1.59	1.43	57.14	0.8	1.2	0.6	1.1	71.77
T8	5.00	2.24	0.65	0.80	65.76	3.33	1.95	1.01	1.21	89.80	1.2	1.3	0.4	1.0	80.03
T9	4.52	2.13	0.99	1.00	59.26	2.87	1.84	1.70	1.47	63.27	1.4	1.4	0.7	1.1	65.75
T10	4.12	2.03	0.44	0.66	70.65	2.93	1.85	1.38	1.36	71.43	0.9	1.2	0.6	1.0	72.63
T11	4.40	2.10	0.38	0.62	73.19	2.87	1.83	1.30	1.33	83.67	1.3	1.3	0.5	1.0	77.28
T12	4.65	2.16	1.79	1.34	43.89	3.07	1.89	2.47	1.71	38.78	0.9	1.2	0.6	1.1	70.22
T13	4.26	2.06	4.67	2.16		3.53	2.01	3.72	2.05		0.8	1.1	2.2	1.6	-
CD (5%)		NS		0.19			NS		0.08			-		0.2	
SE (m)		0.09		0.06			0.09		0.03			0.1		0.1	
SE (d)							-		-						
CV (%)		7.03		10.3			7.99		7.31			15.8		8.4	

JU- Junagadh, SU- Surat, AK- Akola

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenpropathrin, 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

O.V-Original Value ; T.V-Transformed value

Table: 166. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22.

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	0.2	1.1	0.31	1.14	41.51	0.4	0.95	0.29	0.91	38.30	0.5	1.0	0.3	0.9	61.29
T2	0.2	1.1	0.30	1.14	43.40	0.47	0.98	0.34	0.98	27.65	0.5	1.0	0.3	0.9	58.06
T3	0.3	1.14	0.32	1.15	38.99	0.27	0.88	0.29	0.91	38.29	0.5	1.0	0.2	0.8	70.97
T4	0.3	1.14	0.14	1.07	72.96	0.4	0.95	0.27	0.88	42.55	0.4	0.9	0.1	0.8	80.65
T5	0.2	1.1	0.30	1.14	43.40	0.33	0.91	0.35	0.91	25.53	-	-	-	-	
T6	0.2	1.1	0.06	1.03	89.31	0.4	0.95	0.25	0.88	46.80	0.5	1.0	0.0	0.7	100.00
T7	0.2	1.1	0.08	1.04	85.53	0.4	0.95	0.27	0.91	42.55	0.5	1.0	0.1	0.8	90.32
T8	0.1	1.05	0.10	1.05	81.13	0.4	0.95	0.31	0.95	34.04	0.5	1.0	0.1	0.8	87.10
T9	0.2	1.1	0.07	1.03	87.42	0.47	0.98	0.21	0.91	55.31	0.5	1.0	0.0	0.7	93.55
T10	0.1	1.05	0.08	1.04	84.91	0.33	0.91	0.22	0.88	53.31	0.5	1.0	0.1	0.8	80.65
T11	0.1	1.05	0.07	1.03	87.42	0.4	0.95	0.21	0.91	53.19	0.5	1.0	0.0	0.7	96.77
T12	0.2	1.1	0.12	1.06	76.73	0.33	0.91	0.27	0.95	55.31	0.4	0.9	0.0	0.7	93.55
T13	0.2	1.1	0.53	1.23		0.47	0.98	0.47	1.04	42.55	0.5	1.0	0.7	1.1	
CD (5%)		NS		0.10			NS		0.04			0.1		0.1	
SE (m)		0.02		0.03			0.03		0.01			0.0		0.0	
SE (d)		0.03		0.05								0.1		0.1	
CV (%)		3.47		5.14			6.35		3.69			5.2		7.1	

NA- Nanded, RA- Rahuri, BW- Bhawanipatna



Table: 167. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22.

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			
T1	-	-	-	-	-	3.47	1.99	2.73	1.79	46.15	0.9	1.9	0.8	1.1	55.35
T2	-	-	-	-	-	3.27	1.94	2.69	1.78	43.08	0.8	1.8	0.7	1.1	61.01
T3	-	-	-	-	-	3.20	1.92	2.38	1.69	55.38	1.1	2.0	0.9	1.2	47.17
T4	-	-	-	-	-	3.80	2.07	2.49	1.70	58.46	0.9	2.0	0.8	1.1	54.72
T5	-	-	-	-	-	3.60	2.02	3.07	1.88	44.62	1.0	2.1	0.9	1.2	49.06
T6	-	-	-	-	-	3.33	1.96	1.76	1.49	67.69	1.0	2.0	0.6	1.0	67.92
T7	-	-	-	-	-	3.60	2.02	2.18	1.62	60.00	1.0	1.9	0.8	1.2	52.83
T8	-	-	-	-	-	3.47	1.99	1.67	1.46	73.85	1.1	2.2	0.4	0.9	79.25
T9	-	-	-	-	-	3.33	1.95	2.27	1.65	63.08	1.0	2.0	0.8	1.1	54.72
T10	-	-	-	-	-	3.40	1.97	1.98	1.56	67.69	0.8	1.9	0.7	1.1	61.01
T11	-	-	-	-	-	3.27	1.94	1.58	1.42	73.85	1.2	2.1	0.5	1.0	72.33
T12	-	-	-	-	-	4.00	2.12	3.13	1.90	43.08	0.9	1.9	0.7	1.1	58.49
T13	-	-	-	-	-	3.93	2.10	4.42	2.22		1.0	2.1	1.8	1.5	-
CD (5%)							NS		0.16			-		0.2	
SE (m)							0.08		0.06			0.1		0.1	
SE (d)							-		-						
CV (%)							7.17		9.69			11.9		8.0	

JU- Junagadh, SU- Surat, AK- Akola



Table: 168. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22.

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	0.03	1.02	0.00	-	0.00	0.07	0.75	0.00	-	-	1.3	1.3	0.4	0.9	81.12
T2	0.03	1.02	0.00	-	0.00	0.03	0.73	0.00	-	-	1.1	1.3	0.5	1.0	77.04
T3	0.07	1.03	0.00	-	0.00	0.04	0.73	0.00	-	-	1.3	1.3	0.4	0.9	82.65
T4	0.00	1.00	0.00	-	0.00	0.05	0.74	0.00	-	-	1.3	1.4	0.4	0.9	83.67
T5	0.00	1.00	0.00	-	0.00	0.05	0.74	0.00	-	-	-	-	-	-	-
T6	0.03	1.02	0.00	-	0.00	0.04	0.73	0.00	-	-	1.2	1.3	0.1	0.7	97.45
T7	0.03	1.02	0.00	-	0.00	0.07	0.75	0.00	-	-	1.2	1.3	0.2	0.8	89.80
T8	0.03	1.02	0.00	-	0.00	0.06	0.75	0.00	-	-	1.2	1.3	0.3	0.9	84.69
T9	0.07	1.03	0.00	-	0.00	0.07	0.75	0.00	-	-	1.1	1.3	0.2	0.8	90.82
T10	0.03	1.02	0.00	-	0.00	0.04	0.73	0.00	-	-	1.1	1.3	0.3	0.9	85.71
T11	0.03	1.02	0.00	-	0.00	0.05	0.74	0.00	-	-	1.2	1.3	0.2	0.8	92.86
T12	0.07	1.03	0.00	-	0.00	0.07	0.75	0.00	-	-	1.3	1.4	0.1	0.8	94.90
T13	0.07	1.03	0.00	-	0.00	0.03	0.73	0.00	-	-	1.3	1.3	2.2	1.6	-
CD (5%)		NS					0.07					0.2		0.1	
SE (m)		0.02					NS					0.1		0.1	
SE (d)		0.03										0.1		0.1	
CV (%)		3.75					1.34					8.1		7.7	

NA- Nanded, RA- Rahuri, BW- Bhawanipatna



Table: 169. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22.

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			
T1	-	-	-	-	-	3.20	1.92	2.87	1.83	42.05	-	-	-	-	-
T2	-	-	-	-	-	3.47	1.99	2.69	1.78	45.45	-	-	-	-	-
T3	-	-	-	-	-	3.07	1.89	2.36	1.69	59.09	-	-	-	-	-
T4	-	-	-	-	-	3.47	1.99	2.18	1.63	69.32	-	-	-	-	-
T5	-	-	-	-	-	3.13	1.91	2.54	1.74	60.23	-	-	-	-	-
T6	-	-	-	-	-	3.33	1.96	1.52	1.41	79.55	-	-	-	-	-
T7	-	-	-	-	-	3.20	1.92	1.84	1.52	72.73	-	-	-	-	-
T8	-	-	-	-	-	3.13	1.91	1.36	1.35	84.09	-	-	-	-	-
T9	-	-	-	-	-	3.47	1.99	2.10	1.61	71.59	-	-	-	-	-
T10	-	-	-	-	-	3.00	1.87	1.69	1.47	75.00	-	-	-	-	-
T11	-	-	-	-	-	2.93	1.85	1.42	1.37	85.23	-	-	-	-	-
T12	-	-	-	-	-	3.60	2.02	2.77	1.80	53.41	-	-	-	-	-
T13	-	-	-	-	-	3.33	1.96	5.37	2.42						
CD (5%)							NS		0.13						
SE (m)							0.06		0.05						
SE (d)							-		-						
CV (%)							5.16		6.71						

JU- Junagadh, SU- Surat, AK- Akola



Table: 170. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22.

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	0.03	1.02	0.00	-	-	0.08	0.76	0.00	-	-	-	-	-	-	-
T2	0.03	1.02	0.00	-	-	0.06	0.75	0.00	-	-	-	-	-	-	-
T3	0.10	1.05	0.00	-	-	0.05	0.74	0.00	-	-	-	-	-	-	-
T4	0.00	1.00	0.00	-	-	0.05	0.74	0.00	-	-	-	-	-	-	-
T5	0.07	1.03	0.00	-	-	0.04	0.73	0.00	-	-	-	-	-	-	-
T6	0.07	1.03	0.00	-	-	0.04	0.73	0.00	-	-	-	-	-	-	-
T7	0.07	1.03	0.00	-	-	0.07	0.75	0.00	-	-	-	-	-	-	-
T8	0.07	1.03	0.00	-	-	0.06	0.75	0.00	-	-	-	-	-	-	-
T9	0.07	1.03	0.00	-	-	0.05	0.74	0.00	-	-	-	-	-	-	-
T10	0.03	1.02	0.00	-	-	0.04	0.73	0.00	-	-	-	-	-	-	-
T11	0.00	1.00	0.00	-	-	0.04	0.73	0.00	-	-	-	-	-	-	-
T12	0.07	1.03	0.00	-	-	0.06	0.74	0.00	-	-	-	-	-	-	-
T13	0.03	1.02	0.00	-	-	0.09	0.76	0.00	-	-	-	-	-	-	-
CD (5%)		NS					0.01								
SE (m)		0.022					0.001								
SE (d)		0.03													
CV (%)		3.73					1.21								

NA- Nanded, RA- Rahuri, BW- Bhawanipatna



Table: 171. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22 .

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	16.0	7.6	11.4	3.9	53.26	6.7	15.0	13.8	21.7	18.7	6.7	14.9	12.5	20.6	27.97
T2	19.5	11.2	11.2	3.8	54.74	6.3	14.4	12.3	20.5	29.0	7.3	15.7	11.9	20.1	31.11
T3	15.9	7.5	12.3	4.5	48.04	7.5	15.8	9.7	18.1	49.8	6.0	14.0	9.6	17.9	44.52
T4	17.6	9.1	10.8	3.5	57.17	7.0	15.3	9.1	17.5	54.2	5.5	13.5	8.0	16.3	53.72
T5	16.7	8.2	11.9	4.3	50.47	7.1	15.4	10.7	19.0	38.8	9.2	17.6	10.7	19.0	38.10
T6	17.0	8.5	9.1	2.5	66.22	7.4	15.8	3.7	10.9	83.9	7.7	16.0	5.6	13.5	67.74
T7	16.6	8.2	12.4	4.6	47.42	7.6	15.9	7.7	16.0	58.2	6.7	14.9	8.7	17.0	50.03
T8	16.0	7.6	9.7	2.9	63.21	7.5	15.9	3.0	9.7	90.9	6.5	14.7	6.6	14.7	62.06
T9	16.5	8.0	10.1	3.1	61.41	6.8	15.1	8.0	16.3	52.0	6.7	15.0	8.2	16.6	52.66
T10	17.9	9.4	10.7	3.5	57.76	7.7	16.1	5.9	14.0	68.8	8.3	16.6	7.1	15.3	59.20
T11	18.4	9.9	8.6	2.2	68.71	7.3	15.6	5.3	13.2	72.2	6.5	14.4	4.3	11.7	75.43
T12	16.1	7.6	12.5	4.7	46.82	7.7	16.1	11.8	20.0	35.0	8.8	17.1	8.6	17.0	50.22
T13	19.0	10.6	19.3	10.9	-	7.7	16.1	16.7	24.0	-	6.5	14.6	17.3	24.5	-
CD (5%)		2.23		1.48			NS		2.6			-		4.3	
SE (m)		0.73		0.51			0.6		0.9			1.4		1.5	
SE (d)							-		-						
CV (%)		7.37		7.62			7.1		9.4			15.8		14.9	

JU- Junagadh, SU- Surat, AK- Akola

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenpropathrin, 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

O.V-Original Value ; T.V-Transformed value



Table: 172. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22 .

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	30	33.15	14.0	21.4	34.36	35.6	36.6	28.7	32.4	23.06	-	-	-	-	-
T2	32	34.39	14.0	21.6	34.36	35.6	36.6	25.5	30.3	31.69	-	-	-	-	-
T3	28	31.87	12.0	19.8	43.74	37.0	37.5	21.9	27.9	41.21	-	-	-	-	-
T4	30	33.14	12.0	19.8	43.74	36.7	37.3	21.2	27.4	43.17	-	-	-	-	-
T5	30	33.17	16.0	23.3	24.99	40.5	39.5	26.5	31.0	28.9	-	-	-	-	-
T6	32	34.41	8.7	16.0	59.37	33.0	35.1	16.0	23.5	57.2	-	-	-	-	-
T7	32	34.42	14.7	22.1	31.24	41.4	40.1	20.9	27.2	44.00	-	-	-	-	-
T8	28	31.87	12.0	19.4	43.74	39.7	39.1	22.7	28.5	39.01	-	-	-	-	-
T9	30	33.14	11.3	18.2	46.87	35.6	36.6	16.0	23.6	57.01	-	-	-	-	-
T10	32	34.43	11.3	18.2	46.87	35.2	36.4	20.1	26.7	46.01	-	-	-	-	-
T11	30	33.19	8.7	16.0	59.37	35.0	36.3	18.0	25.1	51.72	-	-	-	-	-
T12	28	31.87	14.7	22.1	31.24	40.1	39.3	23.6	29.1	36.6	-	-	-	-	-
T13	30	33.04	21.3	27.4		37.7	37.9	37.3	37.6		-	-	-	-	-
CD (5%)		NS		3.2			2.9		6.2						
SE (m)		1.71		1.1			NS		2.1						
SE (d)		2.42		1.5											
CV (%)		8.92		9.2			13.2		15.0						

NA- Nanded, RA- Rahuri, BW- Bhawanipatna



Table:173. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22.

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	-	-	-	-	-	11.2	19.6	22.3	28.1	19.51	9.8	18.2	7.4	15.7	55.18
T2	-	-	-	-	-	13.3	21.3	21.7	27.6	18.75	11.7	19.9	8.1	16.4	50.97
T3	-	-	-	-	-	14.2	22.1	20.0	26.5	38.38	19.1	25.6	10.2	18.5	38.21
T4	-	-	-	-	-	12.3	20.5	18.0	25.0	43.35	14.5	22.3	9.4	17.7	43.14
T5	-	-	-	-	-	13.6	21.6	21.2	27.3	27.65	15.4	22.1	7.7	16.0	53.35
T6	-	-	-	-	-	13.6	21.6	12.4	20.5	69.41	13.1	20.9	4.6	12.2	71.89
T7	-	-	-	-	-	11.4	19.7	15.5	23.0	52.00	11.7	19.9	8.1	16.5	50.65
T8	-	-	-	-	-	13.9	21.8	11.6	19.8	74.48	17.3	24.0	5.8	13.6	64.90
T9	-	-	-	-	-	12.7	20.9	16.1	23.6	50.61	19.6	25.8	9.9	18.2	40.03
T10	-	-	-	-	-	13.9	21.8	14.5	22.3	58.92	12.6	20.5	7.9	16.2	52.05
T11	-	-	-	-	-	13.6	21.6	13.7	21.7	59.76	17.7	24.4	6.6	14.7	60.13
T12	-	-	-	-	-	12.9	21.0	21.2	27.3	27.27	12.6	20.8	8.6	17.0	47.93
T13	-	-	-	-	-	13.6	21.6	26.5	30.9		11.7	19.5	16.5	23.9	-
CD (5%)						-	NS	-	1.6			-	-	4.0	
SE (m)						-	0.6	-	0.6			3.2	-	1.4	
SE (d)						-	-	-	-						
CV (%)						-	6.7	-	7.2		-	25.2	-	14.1	

JU- Junagadh, SU- Surat, AK- Akola

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenpropathrin, 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

O.V-Original Value ; T.V-Transformed value

*Fruiting Body Damage (%) includes damage in squares, flowers and boll.



Table:174. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22.

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	0.00	-	7.68	15.85	19.55	0.00	-	10.0	18.4	21.2	7.0	2.7	3.0	1.8	65.15
T2	0.00	-	7.77	15.96	18.67	0.00	-	10.9	19.2	14.4	6.7	2.7	3.2	1.9	62.85
T3	0.00	-	7.57	15.72	20.77	0.00	-	9.2	17.7	27.3	6.9	2.7	2.8	1.7	67.45
T4	0.00	-	6.20	14.05	35.08	0.00	-	9.3	17.8	26.6	6.8	2.7	2.7	1.7	68.46
T5	0.00	-	7.33	15.47	23.21	0.00	-	7.4	15.8	41.5	-	-	-	-	-
T6	0.00	-	4.82	12.26	49.56	0.00	-	5.1	13.0	60.1	7.1	2.7	1.1	1.2	86.94
T7	0.00	-	4.90	12.39	48.69	0.00	-	6.3	14.5	50.5	6.6	2.7	1.8	1.5	79.56
T8	0.00	-	5.30	12.92	44.50	0.00	-	7.1	15.4	44.3	6.8	2.7	2.2	1.6	74.16
T9	0.00	-	5.23	12.63	45.20	0.00	-	6.0	14.1	53.0	6.7	2.7	1.9	1.5	77.75
T10	0.00	-	5.42	12.90	43.28	0.00	-	7.9	16.4	37.4	6.7	2.7	2.5	1.7	70.78
T11	0.00	-	4.93	12.40	48.34	0.00	-	6.3	14.6	50.0	6.8	2.7	1.5	1.4	82.45
T12	0.00	-	6.17	13.96	35.43	0.00	-	8.4	16.9	33.6	7.0	2.7	1.3	1.3	85.34
T13	0.00	-	9.55	17.92		0.00	-	12.7	20.9		6.9	2.7	8.6	3.0	
CD (5%)				1.57								0.2		0.2	
SE (m)				0.53								0.1		0.1	
SE (d)				0.76								0.1		0.1	
CV (%)				6.52								3.6		7.5	

NA- Nanded, RA- Rahuri, BW- Bhawanipatna

*Fruiting Body Damage (%) includes damage in squares, flowers and boll.



Table:175. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22

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	25.0	30.0	14.6	22.4	39.81	13.3	21.3	17.4	24.5	62.50	13.3	21.3	14.2	21.9	56.11
T2	27.1	31.4	15.0	22.8	38.35	13.3	21.3	14.6	22.3	75.00	14.7	22.5	13.6	21.5	58.17
T3	23.0	28.7	15.5	23.2	36.99	15.0	22.8	14.1	21.8	70.83	12.0	20.0	10.1	18.4	68.91
T4	26.2	30.8	14.0	22.0	41.62	13.3	21.3	11.1	19.1	83.33	10.3	18.7	8.8	17.3	72.91
T5	26.7	31.1	16.3	23.8	34.43	13.3	21.3	14.8	22.4	70.83	18.3	25.3	16.5	23.9	49.03
T6	29.8	33.1	12.1	20.4	47.56	13.3	21.3	7.2	15.0	87.50	15.3	23.0	9.9	18.3	69.37
T7	24.8	29.9	18.1	25.2	28.52	11.7	19.9	10.0	18.2	83.33	13.0	21.1	10.1	18.5	68.91
T8	24.5	29.7	12.9	21.0	45.18	11.7	19.9	6.1	13.2	91.67	11.7	19.9	7.1	15.1	78.17
T9	23.8	29.2	13.3	21.4	43.74	10.0	18.4	13.0	20.9	75.00	13.3	21.4	14.4	22.4	55.43
T10	27.9	31.9	13.1	21.2	44.34	11.7	19.9	7.6	15.1	91.67	16.7	23.9	12.1	20.4	62.63
T11	25.7	30.4	11.4	19.7	49.86	13.3	21.3	6.5	12.9	91.67	13.0	20.6	9.1	17.7	71.89
T12	29.4	32.8	17.6	24.8	30.09	13.3	21.3	16.1	23.6	66.67	17.7	24.7	14.7	22.5	54.74
T13	31.2	33.9	30.1	33.3		11.7	19.9	28.5	32.1		12.3	20.4	32.4	34.6	-
CD (5%)		NS		3.0			NS		2.8			-		4.6	
SE (m)		1.8		1.0			1.1		1.0			2.0		1.6	
SE (d)							-		-						
CV(%)		10.2		7.66			9.0		17.4			15.5		13.0	

JU- Junagadh, SU- Surat, AK- Akola

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenpropathrin, 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

O.V-Original Value; T.V-Transformed value

Table:176. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22

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	20.0	26.1	17.8	24.8	51.27	26.35	30.89	24.03	29.35	36.44	-	-	-	-	-
T2	23.3	28.6	20.6	26.8	43.64	24.56	29.71	22.63	28.4	40.14	-	-	-	-	-
T3	20.0	24.9	17.2	24.4	52.80	23.89	29.26	21.76	27.81	42.44	-	-	-	-	-
T4	26.7	31.1	14.4	22.2	60.40	22.33	28.2	20.77	27.11	45.06	-	-	-	-	-
T5	23.3	28.6	24.4	29.3	32.99	26.39	30.91	23.88	29.25	36.84	-	-	-	-	-
T6	23.3	28.7	11.1	19.4	69.54	24.78	29.85	17.85	25.00	52.79	-	-	-	-	-
T7	20.0	26.1	13.3	21.3	63.45	26.49	30.98	19.96	26.54	47.2	-	-	-	-	-
T8	23.3	28.7	14.4	22.2	60.40	27.45	31.6	23.12	28.74	38.85	-	-	-	-	-
T9	26.7	30.3	9.8	18.0	73.09	24.57	29.71	18.5	25.47	51.06	-	-	-	-	-
T10	20.0	26.1	11.1	19.1	69.54	24.78	29.85	20.24	26.73	46.46	-	-	-	-	-
T11	23.3	28.6	8.5	16.6	76.66	21.3	27.49	19.01	25.85	49.72	-	-	-	-	-
T12	23.3	28.7	21.7	27.5	40.60	26.37	30.9	24.56	29.71	35.04	-	-	-	-	-
T13	23.3	28.6	36.5	36.7		26.63	31.07	37.81	37.95		-	-	-	-	-
CD (5%)		NS		6.1			NS		7.67						
SE (m)		1.7		2.0			1.1		2.61						
SE (d)		2.4		2.8											
CV		10.4		11.6			6.35		15.08						

NA- Nanded, RA- Rahuri, BW- Bhawanipatna



Table:177. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22.

Treatment	Natural Enemies/plant*											
	JU				SU				AK			
	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	7.6	2.8	4.1	2.0	2.9	1.8	1.2	1.3	0.3	0.9	0.3	0.9
T2	8.7	3.0	3.9	2.0	2.8	1.8	1.3	1.3	0.5	1.0	0.4	1.0
T3	9.8	3.1	3.6	1.9	2.9	1.8	1.5	1.4	0.7	1.1	0.3	0.9
T4	8.3	2.9	4.5	2.1	3.0	1.9	1.6	1.4	0.3	0.9	0.3	0.9
T5	9.3	3.1	3.7	1.9	2.9	1.9	1.4	1.4	0.6	1.0	0.3	0.9
T6	7.8	2.8	5.6	2.4	2.9	1.8	2.0	1.6	0.3	0.9	0.3	0.9
T7	8.0	2.8	2.6	1.6	3.0	1.9	1.7	1.5	0.3	0.9	0.3	0.9
T8	7.8	2.8	5.1	2.3	2.9	1.9	2.0	1.6	0.3	0.9	0.4	1.0
T9	9.5	3.1	4.8	2.2	2.7	1.8	1.7	1.5	0.6	1.0	0.3	0.9
T10	7.9	2.8	4.7	2.2	3.2	1.9	1.9	1.5	0.5	1.0	0.3	0.9
T11	8.6	2.9	5.7	2.4	3.0	1.9	1.9	1.5	0.7	1.1	0.3	0.9
T12	9.0	3.0	2.7	1.6	2.9	1.9	1.4	1.3	0.3	0.9	0.3	0.9
T13	8.0	2.8	3.9	2.0	3.2	1.9	3.6	2.0	0.9	1.2	0.9	1.2
CD (5%)		NS		0.3	-	NS	-	0.1		-		-
SE (m)		0.1		0.1	-	0.1	-	0.03		0.1		0.1
SE (d)					-	-	-	-				
CV (%)		7.5		7.4	-	5.9	-	8.7		14.7		11.5

JU- Junagadh, SU- Surat, AK- Akola

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenpropathrin, 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

O.V-Original Value ; T.V-Transformed value



Table:178. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22.

Treatment	Natural Enemies/plant*											
	NA				RA				BW			
	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	1.3	1.5	0.2	1.1	4.8	2.3	2.8	1.7	4.4	2.2	0.1	0.8
T2	1.1	1.5	0.2	1.1	3.9	2.1	2.7	1.7	4.5	2.2	0.0	0.7
T3	1.2	1.5	0.3	1.1	3.8	2.1	2.7	1.7	4.0	2.1	0.2	0.8
T4	1.1	1.5	0.4	1.2	3.7	2.1	2.8	1.7	4.1	2.1	0.3	0.9
T5	1.2	1.5	0.3	1.1	4.6	2.3	2.7	1.6				
T6	1.2	1.5	0.6	1.3	3.7	2.0	2.8	1.7	4.1	2.1	0.9	1.2
T7	1.1	1.5	0.6	1.3	3.7	2.0	2.7	1.6	4.6	2.3	0.5	1.0
T8	1.1	1.4	0.4	1.2	3.5	2.0	2.6	1.8	4.2	2.2	0.4	0.9
T9	1.2	1.5	0.6	1.3	3.5	2.0	2.9	1.8	4.3	2.2	0.6	1.0
T10	1.1	1.5	0.6	1.3	3.7	2.1	2.7	1.8	4.7	2.3	0.4	0.9
T11	1.2	1.5	0.5	1.2	3.5	2.0	2.6	1.7	4.3	2.2	0.7	1.1
T12	1.3	1.5	0.5	1.2	3.7	2.0	2.5	1.8	4.5	2.2	0.8	1.1
T13	1.1	1.5	1.0	1.4	3.9	2.1	3.5	1.9	4.4	2.2	3.4	1.7
CD (5%)		NS		0.1		NS		0.1		0.2		0.2
SE (m)		0.0		0.0		0.1		0.0		0.1		0.1
SE (d)		0.1		0.1						0.1		0.1
CV (%)		3.3		6.2		5.8		4.3		4.7		10.0

NA- Nanded, RA- Rahuri, BW- Bhawanipatna



Table:179. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22 (Open Boll and Locule Damage)

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	23.3	28.8	17.0	24.4	24.62	29.73	11.71	19.99	24.5	29.6	12.9	21.0
T2	23.7	29.2	18.6	25.5	21.42	27.54	10.47	18.86	20.8	27.1	11.0	19.3
T3	24.3	29.5	18.8	25.7	17.49	24.70	8.43	16.87	27.5	31.6	14.5	22.3
T4	22.8	28.5	16.3	23.8	15.49	23.13	7.21	15.56	17.3	24.6	9.1	17.6
T5	25.0	30.0	19.7	26.3	19.55	26.21	9.30	17.74	23.0	28.7	12.1	20.4
T6	19.6	26.3	14.2	22.2	5.97	14.03	3.03	9.97	10.9	19.0	4.8	12.4
T7	26.5	31.0	20.6	27.0	11.92	20.16	5.90	13.99	18.3	25.2	9.6	18.0
T8	20.5	26.9	14.9	22.7	5.93	14.05	2.77	9.57	8.8	17.1	3.8	11.2
T9	21.0	27.3	15.5	23.2	13.07	21.16	6.53	14.76	20.0	26.6	10.5	18.9
T10	22.0	28.0	16.1	23.7	7.42	15.69	3.60	10.78	10.0	18.4	5.3	13.2
T11	18.8	25.7	13.2	21.3	6.53	14.64	2.86	9.60	7.4	15.6	3.0	9.8
T12	25.9	30.6	20.1	26.6	17.63	24.81	8.59	17.04	21.0	27.3	11.1	19.4
T13	33.9	35.6	28.7	32.4	33.19	35.15	15.77	23.39	40.2	39.3	26.8	31.1
CD (5%)		4.1		3.3		1.99		1.73		4.9		3.3
SE (m)		1.4		1.1		0.68		0.59		1.7		1.1
SE (d)						-		-				
CV (%)		8.3		7.9		7.27		6.73		11.6		11.0

JU- Junagadh, SU- Surat, AK- Akola

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenopropathrin, 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

O.V-Original Value ; T.V-Transformed value

Table:180.Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22 (Open Boll and Locule Damage)

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	27.4	31.5	13.7	21.6	42.14	40.48	26.43	30.94	22.9	4.8	9.9	3.2
T2	30.2	33.3	15.8	23.3	40.13	39.31	27.72	31.77	23.2	4.9	10.3	3.3
T3	26.3	30.7	12.8	20.9	39.78	39.1	23.57	29.04	21.7	4.7	9.3	3.1
T4	23.2	28.7	11.6	19.8	39.7	39.06	22.47	28.29	20.9	4.6	8.6	3.0
T5	37.9	37.9	18.9	25.7	44.41	41.79	28.2	32.08				
T6	15.5	23.0	8.4	16.8	26.88	31.23	18.12	25.19	16.5	4.1	5.4	2.4
T7	21.1	27.2	10.5	18.8	39.35	38.85	24.85	29.9	19.6	4.5	8.0	2.9
T8	19.8	26.3	9.5	17.8	40.05	39.26	23.57	29.04	20.1	4.5	8.3	3.0
T9	15.6	23.2	8.5	16.9	26.88	31.23	19.27	26.04	18.6	4.4	7.4	2.8
T10	18.9	25.7	8.6	17.0	37.97	38.04	21.57	27.68	20.6	4.6	8.6	3.0
T11	15.8	23.3	8.4	16.8	37.97	38.04	20.06	26.61	18.0	4.3	7.0	2.7
T12	30.5	33.5	16.1	23.6	40.05	39.26	28.41	32.21	17.2	4.2	6.2	2.6
T13	44.2	41.7	26.3	30.8	60.59	51.11	41.56	40.14	27.0	5.2	14.1	3.8
CD (5%)		5.1		4.3		7.30		7.67		0.3		0.1
SE (m)		1.8		1.5		2.48		2.61		0.1		0.1
SE (d)		2.5		2.1						0.2		0.1
CV (%)		10.2		12.2		11.06		15.08		3.4		2.6

NA- Nanded, RA- Rahuri, BW- Bhawanipatna



Table:181.Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22 (Yield and Phytotoxicity symptom)

Treatment	Yield/q./ha					
	JU	SU	AK	NA	RA	BW
T1	25.13	15.02	6.39	8.55	12.72	17.04
T2	24.8	15.22	7.52	8.33	11.85	16.76
T3	24.03	16.97	6.15	8.55	12.34	17.36
T4	25.46	18.11	7.91	9.81	14.55	17.87
T5	23.37	15.54	6.62	7.68	11.26	-
T6	29.21	23.15	11.35	11.52	17.84	21.30
T7	22.38	21.09	8.65	10.03	14.6	19.21
T8	28.99	24.08	11.93	9.49	13.48	18.84
T9	26.9	20.06	7.67	11.95	16.66	19.68
T10	27.89	22.12	10.25	10.24	14.86	18.33
T11	30.2	23.04	12.72	11.31	15.74	20.05
T12	22.71	15.54	7.01	9.17	13.42	20.79
T13	18.63	11.21	3.36	6.74	9.38	11.76
CD (5%)	328.95	404.58	2.68	1.42	0.58	1.06
SE (m)	112.7	138.61	0.92	0.48	0.20	0.51
SE (d)		-		4.36		0.62
CV (%)	7.7	12.94	19.23	8.77	9.28	3.42

JU- Junagadh, SU- Surat, AK- Akola, NA- Nanded, RA- Rahuri, BW- Bhawanipatna

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenopropathrin, 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: 182. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22. (Larval Recovery)

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	0.0	-	0.0	-	-	0.00	-	0.00	-	-	2.8	1.8	1.2	1.3	-
T2	0.0	-	0.0	-	-	0.00	-	0.00	-	-	2.7	1.8	0.9	1.2	-
T3	0.0	-	0.0	-	-	0.00	-	0.00	-	-	2.7	1.8	0.9	1.2	-
T4	0.0	-	0.0	-	-	0.00	-	0.00	-	-	2.8	1.8	0.7	1.1	-
T5	0.0	-	0.0	-	-	0.00	-	0.00	-	-					-
T6	0.0	-	0.0	-	-	0.00	-	0.00	-	-	3.0	1.9	0.6	1.0	-
T7	0.0	-	0.0	-	-	0.00	-	0.00	-	-	2.7	1.8	0.6	1.0	-
T8	0.0	-	0.0	-	-	0.00	-	0.00	-	-	2.8	1.8	0.7	1.1	-
T9	0.0	-	0.0	-	-	0.00	-	0.00	-	-	3.0	1.9	0.3	0.9	-
T10	0.0	-	0.0	-	-	0.00	-	0.00	-	-	2.8	1.8	0.4	0.9	-
T11	0.0	-	0.0	-	-	0.00	-	0.00	-	-	2.7	1.8	0.8	1.1	-
T12	0.0	-	0.0	-	-	0.00	-	0.00	-	-	2.8	1.8	0.9	1.2	-
T13	0.0	-	0.0	-	-	0.00	-	0.00	-	-	2.9	1.8	3.5	2.0	-
CD (5%)												NS		0.5	
SE (m)												0.2		0.2	
SE (d)															
CV (%)												8.6		8.4	

LG-Lam Guntur; ND- Nandyal; DW-Dharwad

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenopropathrin, T4 – Profenophos 50 EC, T5 – Ethion 50 EC, T6 – Chlorantraniliprole 18.5 SC, T7 – Flubendiamide 39.35SC, 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

O.V-Original Value ; T.V-Transformed value



Table: 183. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22. (Larval Recovery)

Treatmen t	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	1.3	1.4	6.1	2.6	80.07	0.5	1.0	0.3	0.9	61.29	0.0	-	0.0	-	-	-	-	-	-	-
T2	1.5	1.4	6.7	2.7	78.21	0.5	1.0	0.3	0.9	58.06	0.0	-	0.0	-	-	-	-	-	-	-
T3	1.7	1.5	8.1	2.9	73.69	0.5	1.0	0.2	0.8	70.97	0.0	-	0.0	-	-	-	-	-	-	-
T4	1.7	1.5	6.0	2.5	80.49	0.4	0.9	0.1	0.8	80.65	0.0	-	0.0	-	-	-	-	-	-	-
T5	1.9	1.5	9.4	3.1	69.37	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T6	1.3	1.4	3.9	2.1	87.41	0.5	1.0	0.0	0.7	100.00	0.0	-	0.0	-	-	-	-	-	-	-
T7	1.5	1.4	5.2	2.4	83.09	0.5	1.0	0.1	0.8	90.32	0.0	-	0.0	-	-	-	-	-	-	-
T8	1.7	1.5	6.5	2.7	78.78	0.5	1.0	0.1	0.8	87.10	0.0	-	0.0	-	-	-	-	-	-	-
T9	1.8	1.5	4.5	2.2	85.40	0.5	1.0	0.0	0.7	93.55	0.0	-	0.0	-	-	-	-	-	-	-
T10	1.3	1.4	4.2	2.2	86.24	0.5	1.0	0.1	0.8	80.65	0.0	-	0.0	-	-	-	-	-	-	-
T11	1.6	1.4	6.4	2.6	79.15	0.5	1.0	0.0	0.7	96.77	0.0	-	0.0	-	-	-	-	-	-	-
T12	1.3	1.4	9.7	3.2	68.61	0.4	0.9	0.0	0.7	93.55	0.0	-	0.0	-	-	-	-	-	-	-
T13	1.9	1.5	30.8	5.6		0.5	1.0	0.7	1.1	-	0.0	-	0.0	-	-	-	-	-	-	-
CD (5%)		0.3					0.1		0.1											
SE (m)		0.1					0.0		0.0											
SE (d)							0.1		0.1											
CV (%)		12.3					5.2		7.1											

RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table:184.Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22. (Larval Recovery)

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	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T2	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T3	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T4	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T5	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T6	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T7	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T8	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T9	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T10	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T11	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T12	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T13	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
CD (5%)															
SE (m)															
SE (d)															
CV (%)															

LG-Lam Guntur; ND- Nandyal; DW-Dharwad



Table: 185. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22. (Larval Recovery)

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	-	-	1.3	1.3	0.4	0.9	81.12	0.0	-	0.0	-	-	-	-	-	-	-
T2	0.00	-	0.00	-	-	1.1	1.3	0.5	1.0	77.04	0.0	-	0.0	-	-	-	-	-	-	-
T3	0.00	-	0.00	-	-	1.3	1.3	0.4	0.9	82.65	0.0	-	0.0	-	-	-	-	-	-	-
T4	0.00	-	0.00	-	-	1.3	1.4	0.4	0.9	83.67	0.0	-	0.0	-	-	-	-	-	-	-
T5	0.00	-	0.00	-	-	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T6	0.00	-	0.00	-	-	1.2	1.3	0.1	0.7	97.45	0.0	-	0.0	-	-	-	-	-	-	-
T7	0.00	-	0.00	-	-	1.2	1.3	0.2	0.8	89.80	0.0	-	0.0	-	-	-	-	-	-	-
T8	0.00	-	0.00	-	-	1.2	1.3	0.3	0.9	84.69	0.0	-	0.0	-	-	-	-	-	-	-
T9	0.00	-	0.00	-	-	1.1	1.3	0.2	0.8	90.82	0.0	-	0.0	-	-	-	-	-	-	-
T10	0.00	-	0.00	-	-	1.1	1.3	0.3	0.9	85.71	0.0	-	0.0	-	-	-	-	-	-	-
T11	0.00	-	0.00	-	-	1.2	1.3	0.2	0.8	92.86	0.0	-	0.0	-	-	-	-	-	-	-
T12	0.00	-	0.00	-	-	1.3	1.4	0.1	0.8	94.90	0.0	-	0.0	-	-	-	-	-	-	-
T13	0.00	-	0.00	-	-	1.3	1.3	2.2	1.6	-	0.0	-	0.0	-	-	-	-	-	-	-
CD (5%)							0.2		0.1											
SE (m)							0.1		0.1											
SE (d)							0.1		0.1											
CV (%)							8.1		7.7											

RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table: 186. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22. (Larval Recovery)

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	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T2	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T3	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T4	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T5	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T6	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T7	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T8	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T9	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T10	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T11	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T12	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T13	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
CD (5%)															
SE (m)															
SE (d)															
CV (%)															

LG-Lam Guntur; ND- Nandyal; DW-Dharwad



Table: 187. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22. (Larval Recovery)

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	8.3	3.0	3.4	2.3	55.57	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T2	8.3	3.0	3.4	2.3	55.61	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T3	8.7	3.0	3.1	2.2	59.39	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T4	7.7	2.9	3.7	2.3	51.86	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T5	8.7	3.0	4.2	2.2	44.83	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T6	7.3	2.8	2.0	1.9	74.35	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T7	7.3	2.8	2.0	1.9	74.35	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T8	7.7	2.9	2.0	1.9	74.35	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T9	7.7	2.9	1.7	1.8	78.07	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T10	7.3	2.8	2.0	1.9	74.35	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T11	8.3	3.0	2.2	2.0	70.53	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T12	7.3	2.8	2.2	1.9	70.49	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T13	8.7	3.0	6.4	2.8	-	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
CD (5%)		0.3																		
SE (m)		0.1																		
SE (d)																				
CV (%)		8.2																		

RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table:188. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22 (Larval Recovery)

Treatment	Rosette flower (%) 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	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
T2	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
T3	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
T4	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
T5	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
T6	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
T7	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
T8	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
T9	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
T10	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
T11	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
T12	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
T13	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
CD (5%)															
SE (m)															
SE (d)															
CV (%)															

LG-Lam Guntur; ND- Nandyal; DW-Dharwad

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenpropathrin, 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

O.V-Original Value ; T.V-Transformed value

Table: 189.Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22 (Larval Recovery)

Treatmen t	Rosette flower (%) 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	22.9	28.6	13.9	21.9	56.03	-	-	-	-	-	9.3	17.8	10.0	18.4	59.33	-	-	-	-	-
T2	23.2	28.8	14.4	22.3	54.64	-	-	-	-	-	9.2	17.7	8.3	16.8	66.03	-	-	-	-	-
T3	25.1	30.0	14.1	22.1	55.55	-	-	-	-	-	8.5	16.9	9.8	18.2	60.07	-	-	-	-	-
T4	19.6	26.3	14.3	22.2	54.85	-	-	-	-	-	8.9	17.3	9.2	17.6	62.56	-	-	-	-	-
T5	20.2	26.3	15.6	20.2	50.95	-	-	-	-	-	9.0	17.5	11.3	19.6	53.98	-	-	-	-	-
T6	17.9	25.0	7.7	16.1	75.85	-	-	-	-	-	8.3	16.8	9.5	18.0	61.05	-	-	-	-	-
T7	19.4	26.1	8.4	16.9	73.41	-	-	-	-	-	9.7	18.1	10.2	18.6	58.23	-	-	-	-	-
T8	21.3	27.5	8.7	17.1	72.71	-	-	-	-	-	10.0	18.5	11.7	19.9	52.43	-	-	-	-	-
T9	21.0	27.3	8.1	16.6	74.32	-	-	-	-	-	9.0	17.4	9.0	17.4	63.33	-	-	-	-	-
T10	19.4	26.1	8.0	16.4	74.94	-	-	-	-	-	10.1	18.5	12.5	20.7	49.16	-	-	-	-	-
T11	22.9	28.6	9.1	17.6	71.28	-	-	-	-	-	8.8	17.2	10.7	19.1	56.39	-	-	-	-	-
T12	18.0	25.1	8.5	16.9	73.27	-	-	-	-	-	9.3	17.7	11.8	20.1	51.90	-	-	-	-	-
T13	24.6	29.7	31.7	34.3		-	-	-	-	-	9.9	18.3	24.5	29.6		-	-	-	-	-
CD (5%)		4.4										0.9		0.9						
SE (m)		1.5										0.3		0.3						
SE (d)												0.4		0.4						
CV (%)		14.6										2.9		2.8						

RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table:190. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22(GBD or Fruiting Body Damage)

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	0.0	-	0.0	-	-	0.00	-	0.00	-	-	16.2	17.8	10.3	14.0	61.58
T2	0.0	-	0.0	-	-	0.00	-	0.00	-	-	16.8	18.1	10.2	13.9	62.10
T3	0.0	-	0.0	-	-	0.00	-	0.00	-	-	15.9	17.6	11.9	15.1	55.64
T4	0.0	-	0.0	-	-	0.00	-	0.00	-	-	16.1	17.7	8.8	12.9	67.33
T5	0.0	-	0.0	-	-	0.00	-	0.00	-	-	-	-	-	-	-
T6	0.0	-	0.0	-	-	0.00	-	0.00	-	-	16.0	17.6	8.5	12.5	68.37
T7	0.0	-	0.0	-	-	0.00	-	0.00	-	-	16.3	17.8	7.9	11.8	70.54
T8	0.0	-	0.0	-	-	0.00	-	0.00	-	-	15.9	17.6	12.5	15.5	53.21
T9	0.0	-	0.0	-	-	0.00	-	0.00	-	-	17.0	18.3	7.2	11.7	73.04
T10	0.0	-	0.0	-	-	0.00	-	0.00	-	-	16.8	18.1	7.7	12.1	71.36
T11	0.0	-	0.0	-	-	0.00	-	0.00	-	-	16.3	17.9	9.7	13.6	63.67
T12	0.0	-	0.0	-	-	0.00	-	0.00	-	-	16.3	17.6	11.7	15.0	56.27
T13	0.0	-	0.0	-	-	0.00	-	0.00	-	-	17.2	17.8	26.8	23.1	
CD (5%)												NS		3.7	
SE (m)												1.6		1.2	
SE (d)															
CV (%)												11.7		11.0	

LG-Lam Guntur; ND- Nandyal; DW-Dharwad

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenpropathrin, 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

O.V-Original Value ; T.V-Transformed value *SR-Fruiting Body Damage (%) includes damage in squares, flowers and boll.

*Fruiting Body Damage (%) includes damage in squares, flowers and boll.



Table: 191. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22(GBD or Fruiting Body Damage)

Treatment	Green Boll damage due to SBW/ABW or Fruiting Body Damage (%)																			
	RC**					CN**					CB**					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	47.0	43.3	14.2	22.2	78.90	7.0	2.7	3.0	1.8	65.15	0.0	-	0.0	-	-	-	-	-	-	-
T2	47.3	43.4	14.6	22.5	78.35	6.7	2.7	3.2	1.9	62.85	0.0	-	0.0	-	-	-	-	-	-	-
T3	49.1	44.5	14.1	22.0	79.12	6.9	2.7	2.8	1.7	67.45	0.0	-	0.0	-	-	-	-	-	-	-
T4	43.7	41.4	15.0	22.8	77.73	6.8	2.7	2.7	1.7	68.46	0.0	-	0.0	-	-	-	-	-	-	-
T5	44.6	57.9	17.5	22.8	74.01	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-
T6	42.0	40.4	10.2	17.9	84.95	7.1	2.7	1.1	1.2	86.94	0.0	-	0.0	-	-	-	-	-	-	-
T7	43.5	41.2	10.5	18.4	84.49	6.6	2.7	1.8	1.5	79.56	0.0	-	0.0	-	-	-	-	-	-	-
T8	45.4	42.3	10.5	18.4	84.45	6.8	2.7	2.2	1.6	74.16	0.0	-	0.0	-	-	-	-	-	-	-
T9	45.1	42.2	10.0	18.0	85.21	6.7	2.7	1.9	1.5	77.75	0.0	-	0.0	-	-	-	-	-	-	-
T10	43.5	41.2	10.0	18.0	85.22	6.7	2.7	2.5	1.7	70.78	0.0	-	0.0	-	-	-	-	-	-	-
T11	47.0	43.3	10.5	18.5	84.36	6.8	2.7	1.5	1.4	82.45	0.0	-	0.0	-	-	-	-	-	-	-
T12	42.1	40.4	11.0	18.5	83.68	7.0	2.7	1.3	1.3	85.34	0.0	-	0.0	-	-	-	-	-	-	-
T13	48.7	44.2	67.5	55.2		6.9	2.7	8.6	3.0	-	0.0	-	0.0	-	-	-	-	-	-	-
CD (5%)		4.6					0.2		0.2											
SE (m)		1.5					0.1		0.1											
SE (d)							0.1		0.1											
CV (%)		16.6					3.6		7.5											

RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur

*Fruiting Body Damage (%) includes damage in squares, flowers and boll.

** Green Boll Damage (%).



Table: 192. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22 (Green Boll damage due to PBW)

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	10.0	13.3	33.3	35.1	54.5	68.2	55.7	52.5	46.5	33.68	16.7	18.1	12.5	15.5	58.69
T2	10.0	13.3	33.3	35.2	54.5	63.3	52.8	47.5	43.6	40.00	16.0	17.7	12.2	15.2	59.85
T3	30.0	32.9	16.7	24.0	77.3	59.0	50.2	51.7	46.0	34.74	20.2	20.0	18.8	19.2	37.97
T4	40.0	39.2	43.3	41.1	40.9	63.3	52.8	43.3	41.1	45.26	14.8	17.0	10.2	14.0	66.19
T5	40.0	39.2	56.7	48.8	22.7	-	-	-	-	-	-	-	-	-	-
T6	20.0	26.6	46.7	43.1	36.4	61.7	52.0	50.8	45.5	35.79	17.8	18.7	15.5	17.4	48.71
T7	30.0	32.9	53.3	46.9	27.3	58.3	49.8	51.7	46.0	34.74	15.5	17.4	13.5	16.2	55.25
T8	30.0	32.9	33.3	35.1	54.5	60.8	51.3	40.0	39.2	49.47	16.3	17.8	14.8	16.9	51.22
T9	20.0	26.6	50.0	45.0	31.8	59.2	50.3	45.8	42.6	42.10	11.5	14.9	9.3	13.3	69.33
T10	30.0	32.9	50.0	45.0	31.8	58.7	50.0	45.0	42.1	43.16	11.7	15.0	9.5	13.5	68.54
T11	20.0	26.6	33.3	34.8	54.5	65.3	54.0	48.2	44.0	39.16	17.4	18.5	15.8	17.5	47.88
T12	30.0	32.9	33.3	34.8	54.5	62.8	52.5	41.8	40.3	47.16	18.3	18.7	17.7	18.7	41.41
T13	40.0	39.2	73.3	59.1	-	82.5	65.4	79.2	62.9	-	26.4	22.9	30.3	24.6	
CD (5%)	N/A		13.9			NS		10.1				4.8		5.0	
SE (m)	6.8		4.5			2.5		3.2				1.6		1.6	
SE (d)	9.6		6.3			3.6		4.6							
CV (%)	32.1		15.6			6.8		10.2				11.2		12.4	

LG-Lam Guntur; ND- Nandyal; DW-Dharwad

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenopropathrin, 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

O.V-Original Value ; T.V-Transformed value

Table:193. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22 (Green Boll damage due to PBW)

Treatment	Green Boll damage (%) due to PBW																			
	RC					CN					CB					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			
T1	49.5	44.7	16.2	27.4	72.46	-	-	-	-	-	21.1	27.3	14.4	9.3	76.58	-	-	-	-	-
T2	49.7	44.8	15.5	26.9	73.66	-	-	-	-	-	26.0	30.6	12.4	8.1	79.76	-	-	-	-	-
T3	50.0	45.0	15.4	26.8	73.78	-	-	-	-	-	26.0	30.6	14.1	9.2	77.08	-	-	-	-	-
T4	51.9	46.1	16.7	27.9	71.50	-	-	-	-	-	24.0	29.3	13.4	8.8	78.24	-	-	-	-	-
T5	48.5	63.0	28.7	37.3	51.14	-	-	-	-	-	22.7	28.4	15.4	9.7	74.93	-	-	-	-	-
T6	46.4	42.9	15.2	26.4	74.12	-	-	-	-	-	22.9	28.6	13.7	8.9	77.65	-	-	-	-	-
T7	44.7	42.0	14.7	25.9	75.03	-	-	-	-	-	23.5	29.0	14.8	9.5	75.88	-	-	-	-	-
T8	46.2	42.8	16.2	27.2	72.36	-	-	-	-	-	24.4	29.6	15.6	9.8	74.58	-	-	-	-	-
T9	48.1	43.9	15.8	27.0	73.03	-	-	-	-	-	20.5	26.9	12.9	8.4	78.97	-	-	-	-	-
T10	47.8	43.8	15.6	26.8	73.42	-	-	-	-	-	20.3	26.8	16.4	10.1	73.37	-	-	-	-	-
T11	46.2	42.8	15.4	26.6	73.83	-	-	-	-	-	22.8	28.5	15.1	9.6	75.46	-	-	-	-	-
T12	49.7	44.8	17.1	28.0	70.91	-	-	-	-	-	23.4	28.9	15.8	9.9	74.20	-	-	-	-	-
T13	44.8	42.0	54.2	50.0	-	-	-	-	-	-	26.9	31.2	61.4	24.2	-					
CD (5%)		4.4										1.5		0.4						
SE (m)		1.5										0.5		0.2						
SE (d)												0.7		0.2						
CV (%)		11.2										3.0		2.5						

RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table: 194. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22(Natural Enemies)

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	0.7	1.3	0.6	1.3	0.1	0.8	0.2	0.8	2.0	1.6	1.7	1.5
T2	0.3	1.1	0.3	1.1	0.2	0.8	0.0	0.7	1.7	1.5	1.7	1.5
T3	0.4	1.2	0.5	1.2	0.0	0.7	0.0	0.7	1.9	1.5	1.6	1.4
T4	0.3	1.1	0.5	1.2	0.0	0.7	0.1	0.8	2.0	1.5	1.8	1.5
T5	0.2	1.1	0.3	1.1	-	-	-	-	-	-	-	-
T6	0.3	1.1	0.5	1.2	0.3	0.9	0.1	0.8	1.9	1.5	1.9	1.5
T7	0.3	1.1	0.4	1.2	0.0	0.7	0.3	0.9	2.0	1.6	1.6	1.4
T8	0.3	1.1	0.6	1.3	0.0	0.7	0.1	0.8	1.8	1.5	1.6	1.3
T9	0.4	1.2	0.5	1.2	0.1	0.8	0.1	0.8	1.8	1.5	1.7	1.4
T10	0.2	1.1	0.4	1.2	0.0	0.7	0.0	0.7	1.8	1.5	1.8	1.5
T11	0.3	1.1	0.3	1.1	0.1	0.8	0.1	0.8	1.9	1.5	1.7	1.5
T12	0.2	1.1	0.5	1.2	0.7	1.0	0.1	0.8	1.9	1.5	1.5	1.4
T13	0.6	1.3	0.4	1.2	0.1	0.8	0.2	0.8	1.8	1.5	2.1	1.5
CD (5%)	N/A		N/A		NS		NS			NS		0.6
SE (m)	0.1		0.1		0.1		0.1			0.2		0.2
SE (d)	0.1		0.1		0.1		0.1			-		-
CV (%)	9.1		6.5		12.9		14.1			8.7		8.4

LG-Lam Guntur; ND- Nandyal; DW-Dharwad

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenopropathrin, 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

O.V-Original Value ; T.V-Transformed value

Table: 195. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22(Natural Enemies)

Treatment	Natural Enemies /plant*															
	RC				CN				CB				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	1.9	1.5	0.4	0.9	4.4	2.2	0.1	0.8	2.1	1.7	5.8	2.7	-	-	-	-
T2	2.1	1.6	0.6	1.1	4.5	2.2	0.0	0.7	2.3	1.7	6.0	2.6	-	-	-	-
T3	1.8	1.5	0.3	0.9	4.0	2.1	0.2	0.8	2.3	1.7	6.6	2.6	-	-	-	-
T4	1.7	1.5	0.2	0.8	4.1	2.1	0.3	0.9	2.0	1.6	6.1	2.6	-	-	-	-
T5	2.1	1.6	0.6	1.0	-	-	-	-	2.1	1.6	7.0	2.6	-	-	-	-
T6	2.0	1.6	0.5	1.0	4.1	2.1	0.9	1.2	2.1	1.5	5.8	2.5	-	-	-	-
T7	1.7	1.5	0.2	0.8	4.6	2.3	0.5	1.0	2.4	1.7	6.6	2.8	-	-	-	-
T8	2.1	1.6	0.6	1.0	4.2	2.2	0.4	0.9	2.3	0.7	6.5	0.7	-	-	-	-
T9	2.1	1.6	0.6	1.0	4.3	2.2	0.6	1.0	2.4	1.5	6.2	1.8	-	-	-	-
T10	1.9	1.5	0.9	1.2	4.7	2.3	0.4	0.9	2.1	1.5	6.4	1.8	-	-	-	-
T11	2.2	1.6	1.2	1.3	4.3	2.2	0.7	1.1	2.0	1.5	6.0	1.8	-	-	-	-
T12	2.2	1.6	0.2	0.8	4.5	2.2	0.8	1.1	1.8	1.5	5.6	1.8	-	-	-	-
T13	1.8	1.5	3.3	1.9	4.4	2.2	3.4	1.7	2.5	1.4	7.4	1.7	-	-	-	-
CD (5%)		0.2				0.2		0.2		0.0		0.1				
SE (m)		0.1				0.1		0.1		0.0		0.0				
SE (d)						0.1		0.1		0.0		0.0				
CV (%)		8.4				4.7		10.0		1.6		1.8				

RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table: 196. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22 (Open Boll and Locule Damage)

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	77.9	62.1	49.4	44.7	56.7	48.9	5.7	2.5	24.4	22.2	22.5	21.2
T2	66.4	54.7	39.2	38.7	58.3	49.9	6.7	2.7	24.1	22.1	23.2	21.6
T3	62.8	52.5	37.1	37.4	61.7	51.8	4.7	2.3	32.7	26.1	31.5	25.6
T4	78.0	63.1	45.7	42.4	58.3	50.0	6.0	2.5	23.3	21.6	21.9	20.9
T5	69.9	57.2	38.3	37.9	-	-	-	-	-	-	-	-
T6	74.8	60.8	43.7	40.9	60.0	50.9	6.0	2.5	34.2	26.8	32.4	26.0
T7	82.6	65.6	42.2	40.4	40.0	39.1	5.7	2.5	27.4	23.7	26.3	23.1
T8	72.6	60.0	44.5	41.6	55.0	47.9	5.3	2.4	23.9	21.9	21.8	20.8
T9	74.1	59.9	40.1	39.1	56.7	48.9	3.0	1.9	19.1	19.5	18.2	18.9
T10	82.1	65.8	51.2	45.7	66.7	55.1	5.0	2.3	20.1	20.0	19.2	19.5
T11	83.2	65.8	49.3	44.6	58.3	49.9	5.7	2.5	33.9	26.7	31.5	25.6
T12	80.8	64.8	46.9	43.2	60.0	50.8	4.7	2.3	35.3	27.3	33.2	26.2
T13	81.6	64.6	51.6	45.9	70.0	56.9	9.0	3.1	38.7	28.8	35.2	27.0
CD (5%)	N/A		N/A		10.1		0.5			5.4		5.8
SE (m)	3.9		4.3		3.4		0.2			1.7		1.9
SE (d)	5.5		6.0		4.9		0.3					
CV (%)	8.9		14.4		11.9		12.9			11.1		10.6

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenopropathrin, 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

O.V-Original Value ; T.V-Transformed value



Table: 197. Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22 (Open Boll and Locule Damage)

Treatment	Open Boll and Locule Damage (%)															
	RC				CN				CB				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	10.5	18.9	8.1	16.5	22.9	4.8	9.9	3.2	14.4	22.2	6.9	15.2	15.3	23.0	7.0	15.4
T2	12.3	20.6	10.0	18.4	23.2	4.9	10.3	3.3	12.5	20.7	5.3	13.3	13.8	21.8	6.6	14.9
T3	8.7	17.1	6.3	14.5	21.7	4.7	9.3	3.1	16.8	24.2	7.6	16.0	18.1	25.2	7.5	15.9
T4	16.3	23.8	13.9	21.9	20.9	4.6	8.6	3.0	13.3	21.4	6.2	14.4	13.8	21.8	6.9	15.2
T5	42.5	55.2	38.4	50.0	-	-	-	-	15.7	23.3	6.4	14.6	16.5	24.0	7.5	15.9
T6	15.8	23.4	13.4	21.5	16.5	4.1	5.4	2.4	12.4	20.6	4.9	12.7	13.1	21.2	6.5	14.8
T7	16.4	23.9	14.3	22.2	19.6	4.5	8.0	2.9	16.8	24.2	6.9	15.2	18.2	25.2	7.6	16.0
T8	17.1	24.4	15.0	22.7	20.1	4.5	8.3	3.0	15.9	23.4	6.7	15.0	15.7	23.3	7.0	15.4
T9	11.1	19.5	9.0	17.5	18.6	4.4	7.4	2.8	14.6	22.5	6.9	15.2	14.8	22.6	6.9	15.3
T10	12.2	20.4	10.0	18.5	20.6	4.6	8.6	3.0	15.7	23.3	6.2	14.5	16.4	23.9	7.4	15.7
T11	18.5	25.5	16.4	23.9	18.0	4.3	7.0	2.7	13.1	21.2	6.0	14.1	13.9	21.9	6.9	15.2
T12	18.1	25.2	15.9	23.5	17.2	4.2	6.2	2.6	17.8	25.0	6.4	14.6	18.5	25.5	8.3	16.7
T13	78.2	62.2	76.1	60.7	27.0	5.2	14.1	3.8	22.4	28.3	12.7	20.9	23.1	28.7	13.4	21.4
CD (5%)		5.6		4.5		0.3		0.1		1.1		0.7		0.6		0.4
SE (m)		1.9		1.5		0.1		0.1		0.4		0.2				
SE (d)						0.2		0.1		0.6		0.3		0.3		0.2
CV (%)		14.3		16.3		3.4		2.6		2.9		2.8		1.5		1.3

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur



Table: 198.Ent 6. Evaluation of prominent insecticides against bollworm complex of cotton 2021-22 (Yield and Phytotoxicity symptom)

Treatment	Yield/q./ha						
	LG	ND	DW	RC	CN	CB	SVPR
T1	8.73	-	9.44	22.88	17.04	0.98	11.07
T2	9.79	-	9.30	21.33	16.76	1.20	12.40
T3	9.00	-	8.16	24.68	17.36	0.90	10.47
T4	8.20	-	10.04	23.78	17.87	1.12	12.53
T5	8.38	-	-	15.24	-	0.92	10.60
T6	7.50	-	8.31	21.18	21.30	1.20	12.80
T7	8.11	-	9.80	19.34	19.21	0.90	10.33
T8	9.97	-	8.68	21.86	18.84	0.96	11.00
T9	8.29	-	11.20	22.23	19.68	1.00	11.33
T10	8.56	-	10.65	21.87	18.33	0.94	10.93
T11	8.12	-	6.74	18.25	20.05	1.09	11.83
T12	7.14	-	6.21	20.18	20.79	0.89	10.20
T13	5.82	-	5.82	4.32	11.76	0.84	9.53
CD (5%)	N/A		1.22	0.39	1.06		
SE (m)	0.83		0.40	0.13	0.51		
SE (d)	1.17				0.62		
CV (%)	14.13		9.92		3.42		

LG-Lam Guntur; ND- Nandyal; DW-Dharwad; RC-Raichur; CN- Chamarajanagar; CBE- Coimbatore;SVPR-Srivilliputtur

T1 – Bifenthrin 10EC, T2 – Cypermethrin 25EC, T3 – Fenopropathrin, 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. 7. Determination of nymphal based ETL estimation and yield losses for cotton whitefly (*Bemisia tabaci*) (2021-22)-North Zone.

Treatment	Name of the Centre: Bathinda												
	Nymph/30 tagged plant												
	Honey Dew	***Nymphal count on main stem leaf				Av.Nymph/3leaf/tagged plants	WF/3 leaves	Ant/Plant	Av. Yield Q/Ha	Insecticide sprays			Reduction (%) Over Standard control (T ₉)
		3rd	4th	5th	6th					No. of Spray	Cost of Spray/ha	Insecticide Name	
T1	-	1.19	1.96	4.71	3.27	2.45	5.94	0.16	18.96	3	3750	Pyriproxyfen 10 EC	-22.97
T2	-	1.49	2.39	5.14	3.81	2.88	6.44	0.23	18.33	3	3750	Pyriproxyfen 10 EC	-18.92
T3	-	1.73	2.91	6.05	4.89	4.97	7.72	0.38	15.00	2	2500	Pyriproxyfen 10 EC	2.72
T4	-	-	-	-	-	-	-	-	-	-	-	-	-
T5	-	-	-	-	-	-	-	-	-	-	-	-	-
T6	-	-	-	-	-	-	-	-	-	-	-	-	-
T7	-	-	-	-	-	-	-	-	-	-	-	-	-
T8	-	-	-	-	-	-	-	-	-	-	-	-	-
T9	-	2.31	3.82	6.03	4.70	3.31	6.41	0.27	15.42	1	1400	Flonicamid 50 WG	0
T10	-	3.88	6.16	10.19	8.58	7.88	11.82	0.81	13.54	0			12.19

T1-One nymph/ leaf; T2-Two nymph/ leaf; T3-Four nymph / leaf; T4-Six nymph/ leaf; T5-Honey dew symptoms 20%; T6-Honey dew symptoms 30%; T7-Honey dew symptoms 40%; T8-Honey dew symptoms 50%; T9-Treated control (adult); T10-Untreated control.



Table: 200. Ent. 7. Determination of nymphal based ETL estimation and yield losses for cotton whitefly (*Bemisia tabaci*) (2021-22)-North Zone.

Treatment	Name of the Centre: Faridkot												
	Nymph/30 tagged plant												
	Honey Dew	***Nymphal count on main stem leaf				Av.Nymph/3leaf/tagged plants	WF/3 leaves	Ant/Plant	Av. Yield Q/Ha	Insecticide sprays			Reduction (%) Over Standard control (T ₉)
		3rd	4th	5th	6th					No. of Spray	Cost of Spray/ha	Insecticide Name	
T1	Nil	0.18	0.36	0.47	0.50	0.32	2.86	1.22	15.02	Nil	-	-	-
T2	Nil	0.26	0.36	0.47	0.56	0.38	2.75	0.75	15.14	Nil	-	-	-
T3	Nil	0.26	0.42	0.72	0.51	0.33	2.78	1.34	18.19	Nil	-	-	-
T4	Nil	0.08	0.06	0.25	0.17	0.16	2.70	1.68	15.51	Nil	-	-	-
T5	Nil	-	-	-	-	-	-	-	-	-	-	-	-
T6	Nil	-	-	-	-	-	-	-	-	-	-	-	-
T7	Nil	-	-	-	-	-	-	-	-	-	-	-	-
T8	Nil	-	-	-	-	-	-	-	-	-	-	-	-
T9	Nil	0.18	0.09	0.35	0.49	0.27	2.22	1.13	18.07	-	-	-	-
T10	Nil	0.13	0.15	0.32	0.43	0.28	2.09	0.95	16.40	-	-	-	-

T1-One nymph/ leaf; T2-Two nymph/ leaf; T3-Four nymph / leaf; T4-Six nymph/ leaf; T5-Honey dew symptoms 20%; T6-Honey dew symptoms 30%; T7-Honey dew symptoms 40%; T8-Honey dew symptoms 50%; T9-Treated control (adult); T10-Untreated control.



Table: 201. Ent. 7. Determination of nymphal based ETL estimation and yield losses for cotton whitefly (*Bemisia tabaci*) (2021-22)-North Zone.

Treatment	Name of the Centre: Hisar												
	Nymph/10tagged plant												
	Honey Dew	***Nymphal count on main stem leaf				Av.Nymph/3leaf/tagged plants	WF/3 leaves	Ant/Plant	Av. Yield Q/Ha	Insecticide sprays			Reduction (%) Over Standard control (T ₉)
		3rd	4th	5th	6th					No. of Spray	Cost of Spray/ha	Insecticide Name	
T1	No	–	1.01 (0.33-3.83)	1.49 (0.47-5.33)	1.56 (0.48-5.53)	1.19 (0.40-4.27)	5.99 (2.00-10.63)	0.00 (0.00-0.03)	29.11	3	3450	Pyriproxyfen 10 EC	-6.13
T2	No	–	1.38 (0.50-3.93)	2.04 (0.73-5.47)	2.13 (0.76-5.67)	1.64 (0.63-4.37)	6.42 (2.23-11.00)	0.00 (0.00-0.03)	28.96	3	3450	Pyriproxyfen 10 EC	-5.57
T3	No	–	2.82 (1.23-6.50)	4.28 (1.73-10.57)	4.49 (1.80-10.97)	3.45 (1.50-8.13)	7.20 (2.07-13.17)	0.00 (0.00-0.07)	28.35	2	2300	Pyriproxyfen 10 EC	-3.35
T4	No	–	3.69 (1.50-12.47)	5.61 (2.07-19.80)	5.92 (2.16-21.27)	4.46 (1.80-14.67)	8.41 (2.13-22.13)	0.01 (0.00-0.17)	28.04	2	2300	Pyriproxyfen 10 EC	-2.24
T5	No	–	5.44 (2.00-14.73)	8.26 (2.40-23.83)	8.67 (2.53-25.55)	6.41 (2.20-16.00)	9.63 (2.00-23.20)	0.05 (0.00-0.60)	25.91	–	–	–	5.54
T6	No	–	5.14 (2.03-14.17)	7.84 (2.87-22.10)	8.13 (2.99-23.60)	6.17 (2.60-15.73)	9.72 (2.17-25.33)	0.06 (0.00-0.73)	26.37	–	–	–	3.87
T7	No	–	5.10 (2.07-13.73)	7.76 (2.60-21.37)	8.06 (2.72-22.85)	6.02 (2.37-15.23)	9.76 (2.23-24.20)	0.05 (0.00-0.67)	26.22	–	–	–	4.43
T8	No	–	5.15 (1.97-14.40)	7.95 (2.43-22.37)	8.25 (2.53-24.00)	6.22 (2.20-16.00)	10.56 (2.33-25.87)	0.06 (0.00-0.70)	26.22	–	–	–	4.43
T9	No	–	4.83 (2.27-12.43)	7.40 (2.73-19.73)	7.80 (2.88-21.17)	5.86 (2.50-14.60)	8.44 (2.07-22.73)	0.02 (0.00-0.20)	27.43	1	1300	Diafenthiuron	–
T10	No	–	5.36 (2.00-14.93)	8.13 (2.60-23.37)	8.47 (2.72-24.30)	6.34 (2.37-16.20)	10.54 (2.23-25.83)	0.06 (0.00-0.73)	25.91	–	–	–	5.54

T1-30 Red eyed nymph, T2-60 Live red eyed nymph, T3 - 120 Red eyed nymph, T4- 180 Red eyed nymph, T5- Honey dew symptoms 20%, T6- Honey dew symptoms 30%, T7- Honey dew symptoms 40%, T8- Honey dew symptoms 50%, T9- Treated control (adult), T10- Untreated control.



Table: 202. Ent. 7. Determination of nymphal based ETL estimation and yield losses for cotton whitefly (*Bemisia tabaci*) (2021-22)-North Zone.

Treatment	Name of the Centre: CICR, RS Sirsa												
	Nymph/30 tagged plant												
	Honey Dew	***Nymphal count on main stem leaf				Av.Nymph/3leaf/tagged plants	WF/3 leaves	Ant/Plant	Av. Yield Q/Ha	Insecticide sprays			Reduction (%) Over Standard control (T ₉)
		3rd	4th	5th	6th					No. of Spray	Cost of Spray/ha	Insecticide Name	
T1	0.10 (0.00-0.30)	0.12 (0.00-0.33)	0.30 (0.07-0.57)	0.52 (0.23-0.87)	0.35 (0.10-0.53)	0.85 (0.60-1.01)	9.87 (5.70-15.20)	0.17 (0.00-0.50)	33.09	2	3100	Lano	-2.53
T2	0.07 (0.00-0.27)	0.10 (0.00-0.50)	0.41 (0.00-1.03)	0.61 (0.20-0.80)	0.49 (0.37-0.73)	1.04 (0.89-1.26)	10.07 (7.80-14.90)	0.25 (0.00-0.70)	31.05	Nil	Nil	Nil	3.8
T3	0.09(0.00-0.30)	0.14 (0.00-0.83)	0.39 (0.03-0.87)	0.69 (0.37-1.03)	0.45 (0.00-0.93)	1.03 (0.70-1.39)	10.13 (6.37-14.17)	0.35 (0.00-0.83)	31.45	Nil	Nil	Nil	2.53
T4	0.10 (0.00-0.37)	0.19 (0.00-0.83)	0.41 (0.07-1.03)	0.73 (0.40-1.57)	0.54 (0.10-1.63)	1.16 (0.79-1.81)	10.12 (6.97-13.67)	0.36 (0.07-1.27)	31.32	Nil	Nil	Nil	2.95
T5	0.11 (0.00-0.27)	0.26 (0.00-0.70)	0.53 (0.13-1.27)	0.74 (0.37-1.17)	0.56 (0.20-0.87)	1.14 (0.77-1.42)	10.28 (6.73-13.33)	0.32 (0.10-0.73)	32.41	Nil	Nil	Nil	-0.42
T6	0.13 (0.00-0.37)	0.29 (0.00-1.17)	0.54 (0.03-1.07)	0.77 (0.37-1.13)	0.51 (0.33-1.03)	1.15 (0.91-1.33)	10.30 (7.90-14.50)	0.32 (0.07-0.60)	30.77	Nil	Nil	Nil	4.64
T7	0.14 (0.00-0.33)	0.25 (0.03-0.87)	0.59 (0.30-1.00)	0.73 (0.40-1.27)	0.67 (0.20-2.77)	1.13 (1.01-1.22)	10.42 (8.13-15.10)	0.24 (0.00-0.53)	31.05	Nil	Nil	Nil	3.8
T8	0.17 (0.00-0.63)	0.28 (0.07-1.10)	0.53 (0.20-1.37)	0.88 (0.67-1.27)	0.53 (0.20-0.80)	1.23 (0.99-1.68)	10.06 (7.40-14.43)	0.27 (0.07-0.50)	31.18	Nil	Nil	Nil	3.38
T9	0.14 (0.00-0.33)	0.26 (0.03-0.77)	0.49 (0.20-0.93)	0.76 (0.37-1.20)	0.78 (0.20-2.47)	1.16 (0.88-1.43)	10.77 (7.13-15.87)	0.32 (0.17-0.50)	32.27	Nil	Nil	Nil	0
T10	0.15 (0.00-0.47)	0.35 (0.00-1.47)	0.66 (0.27-2.23)	0.90 (0.50-2.40)	0.68 (0.50-1.23)	1.32 (0.77-2.20)	10.89 (7.90-16.20)	0.36 (0.13-0.57)	31.86	Nil	Nil	Nil	1.27

T1-30 Red eyed nymph, T2-60 Live red eyed nymph, T3 - 120 Red eyed nymph, T4- 180 Red eyed nymph, T5- Honey dew symptoms 20%, T6- Honey dew symptoms 30%, T7- Honey dew symptoms 40%, T8- Honey dew symptoms 50%, T9- Treated control (adult), T10- Untreated control.



Table: 203. Ent. 7. Determination of nymphal based ETL estimation and yield losses for cotton whitefly (*Bemisia tabaci*) (2021-22)-North Zone.

Treatment	Name of the Centre: Sriganaganagar												
	Nymph/10tagged plant												
	Honey Dew	***Nymphal count on main stem leaf				Av.Nymph/3leaf/tagged plants	WF/3 leaves	Ant/Plant	Av. Yield Q/Ha	Insecticide sprays			Reduction (%) Over Standard control (T ₉)
		3rd	4th	5th	6th					No. of Spray	Cost of Spray/ha	Insecticide Name	
T1	No	0.00	0.67 (0.27-3.03)	1.03 (0.33-5.57)	0.96 (0.21-5.27)	0.89 (0.27-4.62)	4.86 (1.06-18.73)	0.00	40.69	4	11600	Pyriproxyfen	-6.16
T2	No	0.00	1.76 (0.36-5.43)	1.96 (0.54-8.76)	1.87 (0.26-7.43)	1.87 (0.39-7.21)	7.73 (1.83-24.46)	0.00	40.00	3	8700	Pyriproxyfen	-4.35
T3	No	0.00	4.07 (0.57-10.37)	4.23 (0.87-13.46)	3.96 (0.47-11.76)	4.10 (0.64-11.86)	12.80 (2.26-30.60)	0.00	39.31	2	5800	Pyriproxyfen	-2.54
T4	No	0.00	5.46 (0.68-17.93)	5.97 (1.33-19.07)	5.86 (0.76-16.46)	5.76 (0.92-17.82)	15.96 (2.83-37.86)	0.00	38.47	2	5800	Pyriproxyfen	-0.36
T5	Yes	0.00	9.56 (1.03-22.67)	11.76 (2.96-26.73)	9.54 (2.06-24.80)	10.29 (2.02-24.73)	31.08 (4.66-61.73)	2.21 (0.21-6.86)	37.22	1	2900	Pyriproxyfen	2.90
T6	Yes	0.00	11.97 (1.26-25.72)	13.07 (3.73-29.54)	12.33 (2.17-27.96)	12.46 (2.39-27.74)	34.86 (5.36-65.53)	2.47 (0.33-7.97)	36.11	1	2900	Pyriproxyfen	5.80
T7	Yes	0.00	12.67 (1.87-26.54)	14.56 (3.86-32.86)	13.47 (2.36-28.67)	13.57 (2.70-29.36)	35.07 (6.76-68.76)	2.54 (0.36-8.60)	35.56	1	2900	Pyriproxyfen	7.25
T8	Yes	0.00	12.72 (2.43-27.07)	15.67 (4.03-34.73)	13.63 (3.03-29.60)	14.07 (3.16-30.47)	35.83 (8.03-69.33)	2.73 (0.27-10.33)	35.00	1	2900	Pyriproxyfen	8.70
T9	No	0.00	5.53 (0.72-18.36)	6.26 (1.67-21.63)	6.03 (0.96-17.97)	5.94 (1.13-19.32)	16.08 (3.27-39.96)	0.00	38.33	3	9450	flonicamid, Pyriproxyfen, Dinotefuron	0.00
T10	-	0.00	16.23 (2.56-32.46)	19.04 (4.30-39.46)	18.16 (5.47-36.76)	17.81 (4.12-36.23)	39.36 (8.76-83.67)	2.80 (0.36-11.84)	33.61			-	12.32

T1-30 Red eyed nymph, T2-60 Live red eyed nymph, T3 - 120 Red eyed nymph, T4- 180 Red eyed nymph, T5- Honey dew symptoms 20%, T6- Honey dew symptoms 30%, T7- Honey dew symptoms 40%, T8- Honey dew symptoms 50%, T9- Treated control (adult), T10- Untreated control.



All India Coordinated
Research Project on Cotton

Annual Report:2021-22

Report of Plant Pathology



Project Coordinator (Cotton Improvement)
All India Coordinated Research Project on Cotton
(Indian Council of Agricultural Research)
Central Institute for Cotton Research
Regional Station, Coimbatore- 641003
www.cicr.org.in

CROP PROTECTION PLANT PATHOLOGY

The following experiments were conducted in the discipline of Plant Pathology under All India Coordinated Research Project (AICRP) on Cotton at different centers in North Zone (Faridkot, Bathinda, Hisar, ICAR-CICR RS Sirsa, Sriganaganagar), in Central Zone (Akola, Nanded, Rahuri, Surat, Bharuch, Junagadh, Khandwa, Bhawanipatna, ICAR-CICR-Nagpur) and South Zone (Lam Guntur, Warangal, Dharwad, TNAU Coimbatore):

Project No.	Title of the project	Participating Centers
Path.1	Observations on the occurrence of the diseases (in farmer's field and research farms)	
Path.1(a)	Observations on the occurrence of various diseases (in farmer's field and research farms)	All centers of North, Central, South zones
Path. 1(b)	Disease progress in relation to weather factors	Faridkot, Sriganaganagar, Hisar, ICAR-CICR Sirsa, Nanded, Akola, Surat, Junagarh, Guntur, Dharwad, Coimbatore
Path. 1(c)	Studies on the variability in <i>Alternaria</i> causing leaf spot 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 <i>Corynespora</i> leaf spot in cotton	All centers- ICAR-CICR Sirsa, Junagarh, 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	Sriganaganagar, Hisar, Bathinda
Path. 3	Management of cotton diseases	
Path. 3 (f)	Management of sooty mold (<i>Capnodium</i> spp.) in cotton	Junagarh, Coimbatore, Faridkot, Hisar, CICR Sirsa
Path. 3 (h)	Evaluation of efficacy of bioagents against cotton diseases	Nanded, Surat, Akola, ICAR-CICR Nagpur
Path. 3(i)	Integrated management of CLCuD through its vector management	Bathinda, Faridkot, Sriganaganagar, Hisar and ICAR-CICR Sirsa
Path. 3(j)	Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations (2020-21)	Bathinda, Hisar, Surat, Nagpur, Guntur, Dharwad



Path. 4	Crop loss estimation and distribution pattern of cotton diseases	
Path. 4(e)-	Exp. 1. Crop loss estimation due to CLCuD	Hisar, Faridkot, Sriganganagar
Path. 4(e)-	Exp. 2. Study on the distribution pattern of cotton leaf curl virus disease on local popular Bt hybrid at farmer's fields	Hisar, Faridkot, Bathinda, Sriganganagar
	Concluding Experiments-recommendations	
Path. 3 (f)	Management of sooty mold (<i>Capnodium</i> spp.) in cotton	ICAR-CICR Sirsa, Junagarh,
Path. 3 (h)	Evaluation of efficacy of bioagents against cotton diseases	Nanded, Surat, ICAR-CICR Nagpur
	Agronomy experiments-Organic cultivation practices and Crop geometry study	



Research Findings:

Path.1 Observations on the occurrence of cotton diseases (in farmers' field & research farm)

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 were 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, Muktsar were recorded from cotton hybrids (RCH-773, RCH-776, RCH-650, Sim Sim, Balraj, RCH-653, ACH-177 and US-71) (**Table 1a**). During the early season (20-30 DAS) BLB, 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 0.5-0.6% and 5.7-14.7% respectively. During the late-season (120-150 DAS) the PDI of MLS and CLCuD were observed to be in the range of 4.0-9.4% and 12.7%-27.7%, respectively. The highest CLCuD PDI 27.7% and MLS 9.4% were recorded during the late season. When compared the disease incidence in the popular hybrids, the highest CLCuD and MLS were recorded in the hybrid RCH-773, RCH-776 in the Muktsar and Fazilka districts. The average MLS and CLCuD in district Faridkot were observed to be 7.6% during mid and during late-season 6.3 and 15.2%, respectively. In district Fazilka, the average MLS and CLCuD PDI were observed to be 0.5 and 8.3% during mid and 8.8 and 18.3% during late-season, respectively. While in-district Muktsar, the average CLCuD PDI was observed to be 11.0% during mid and 20% during the late-season, respectively. Comparatively, the MLS and CLCuD were found to be higher in Fazilka and Muktsar. Overall, the PDI of MLS and CLCuD were observed to be 7.2 and 17.4% during the late-season in these districts, respectively. The PDI of CLCuD varied from 12.7 to 18.5, 12.7 to 27.7% and 12.7 to 27.7% in different villages of Faridkot, Fazilka and Muktsar districts, respectively. Bt hybrid RCH 773 BG II and RCH 776 BG II were occupying the major area in the cotton-growing region in these districts. The average PDI of BLB, MLS and CLCuD in these districts was observed to be 9.0, 7.2 and 17.4% in the late season (**Table 1a**).

At Faridkot research farm, the disease incidence and severity were observed on the hybrid RCH-773, RCH-776, RCH-650, F-1861, F-846, F-1378, F-2164, F-2383, F2228, RST-9 and HS-6. The incidence of CLCuD, FFLS was observed in August (PDI 12.3, 2.5%, respectively) and PDI reached its peak in October (44.2, 8.8%, respectively) (**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-9013 NCS-495). During the Kharif season of 2021, the severity of the CLCuD was found to be less in the cotton fields of the Bathinda district of Punjab as compared to the *Kharif* 2020. During *Kharif* 2021, the initial incidence of the CLCuD having the disease severity Grade II was noticed in August, in the farmer's field in the villages (Banger Mohabbat, Shekhpura, Bhagi bander) of block-Marw and Talwandi sabo of district Bathinda. Incidence of root rot with percent disease severity (PDI) ranged from 0-1 % was observed in the isolated pockets at 4-5 locations of the cotton field of Bathinda district after the first irrigation in the farmer's fields. The incidence of fungal leaf spots was also noticed after heavy rains in the last week of September 2021. An incidence of bacterial leaf blight was noticed in traces during mid-season. At the later stages of the cropping season when the crop was about to mature the incidence of BLB was observed to be slightly increased in the farmer's fields. Besides, the problem of the sudden wilt (drying) was also noticed in a few locations in the Bathinda district, particularly in the *Bt* cotton hybrid RCH-773 and RCH-776 (BG II) in September near about 100-120 DAS. During that time a drastic change in the climatic conditions was prevailing but after the first fortnight of October, sudden wilt (drying) have not further spread and in the affected plants dropping of the leaves was reduced. The most popular *Bt* cotton hybrid sown in Bathinda District was found to be RCH-773 RCH-776, US-8, US-51(BG II). During the early season, CLCuD, FFS/MLS, BLB, Root rot, Parawilt and Boll rot were not observed while, during mid-season, the CLCuD, FFS/MLS, BLB, Root rot, Parawilt and Boll rot were observed to be in the range of 1.3-16.7%, 2.5 to 5%, 2.3-5%, 0.5-2.5%, 0.5-2.5% and 0.0-2.5% and 0.5-2.5%, respectively. During the late-season the CLCuD, FFS, BLB, Root rot, Parawilt and Boll rot were recorded to be in the range of 2.5-24.3%, 2.5-12.5%, 1-10%, 0.5-1.0%, 0.5-2.5% and 1.0-7.5%, respectively. The highest CLCuD PDI (24.3%) and FFS/MLS (12.5%) were observed during the late season. When compared to the disease incidence in the popular hybrids, the highest CLCuD PDI was observed in the hybrid RCH-776, while the highest FFS/MLS was observed in the hybrid US-71, RCH-776 in Block-Talwandi sabo. The average PDI of CLCuD in Bathinda was observed at 3.3% during mid and 9.8% during late-season. In the Maur block, the average CLCuD PDI was observed at 6.3% and 8.6% during mid and late-season, respectively while in the block Talwandi sabo, the average CLCuD was observed 5.9% and 8.6%, respectively. In block Sangat, the average CLCuD was observed at 4.2% and 7.1% during mid and late-season, respectively. Comparatively, the CLCuD was found to be higher in Bathinda. Overall, in these districts, the highest PDI of CLCuD (6.4%), FFS/MLS (3.8%), BLB (1.0%), Parawilt (0.1) and Boll rot (1.5%) were recorded during the late-season. **(Table 2a).**

At Bathinda research farm, the disease incidence and severity were recorded on the hybrid RCH-773, RCH776, US51. The CLCuD PDI (33.3, 16.7 and 18.3%) were observed on RCH-773, RCH-776 and US-51 during the first week of August and it reached its peak in Sept. (60.0, 41.7 and 45.0%, respectively). Comparatively, the BLB (2.5-5.0%), CLS (5.0-7.5%), MLS (5.0-10.0%) and CLoS (2.5%) were observed on tested cultivars during September **(Table 2b).**

Sriganganagar and Hanumangarh (Rajasthan)

The farmer's field's data on disease intensity of cotton leaf curl virus was recorded during *Kharif* 2021 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. 31.6% with a maximum disease incidence of 78% in the village 2B Kotha, while



in adjoining cotton areas of the Hanumangarh district, the average disease intensity was 13.4% with a disease incidence of 57% in village Gandeli 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 8.0-14% and 1.3-2.6%, respectively. During mid-season the incidence and PDI of CLCuD were recorded to be in the range of 36.0-83.0% and 6.6-20.8% while, during late-season incidence and PDI were in the range of 47.0-78.0% and 12.6-31.6%, respectively. Whereas in the Hanumangarh district the incidence and PDI of CLCuD in the early season were not recorded but during mid-season, the incidence and PDI of CLCuD were in the range of 22.0-45.0%, 2.2-8.3%, respectively. While, in late-season, the incidence and PDI of CLCuD were recorded to be in the range of 32.0-57.0%, 5.8-13.4%, respectively. The average CLCuD PDI in district Sriganganagar was observed 0.6%, during early, 12.7% during mid and during late-season 19.3%, respectively. While in-district Hanumangarh, the average CLCuD PDI was observed at 0.0%, during early, 4.5% during mid and during late-season 8.5%, respectively. Overall, in these districts, the average CLCuD incidence and PDI were recorded 50.0% and 13.9% 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, RCH-773, US51, ACH-177, NCS-9013, NSPL-53, RST-9, HS-6, F-846, F-2228 and CSH-3075. The incidence and PDI of CLCuD were observed to be in the range of 41.0-77.0% and 12.9-29.5%, respectively from 60 DAS to 120 DAS. While the peak incidence and PDI of CLCuD were observed after 120 of sowing and these were recorded as 77.0% and 29.5%, 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 Palwal) for observation of different diseases in various cotton varieties/ hybrids. During the early season all diseases namely, CLCuD, SM, MLS and RR were not observed. During mid-season, the CLCuD, sooty mold (SM), Myrothecium leaf spot (MLS) and root rot (RR) were observed to be in the range of 0.0-18.4%, 0.0-2.5%, 0.0-8.2% and 0.0-4.6%, respectively. During the late-season, the CLCuD, SM, MLS and RR were observed to be in the range of 0.0-22.0%, 0.0-15.9%, 0.0-12.0% and 0.0-6.0%, respectively. The average PDI 11.0, 0.0%, 4.5%, and 1.4% of CLCuD, SM, MLS and RR were during the mid-season observed in district Hisar, respectively. During the late season, the increased PDI of CLCuD, SM, MLS and RR were observed 13.0%, 8.1%, 5.5% and 1.7%, respectively. In district Fatehabad, the average PDI of CLCuD, SM, MLS and RR was observed during mid-season, 10.0%, 0.0%, 2.0% and 2.0%, while during late-season it was 11.9%, 9.6%, 4.1% and 2.3%, respectively. In district Sirsa, the average PDI of CLCuD, SM, MLS, and RR during mid-season were observed 7.4%, 0.0%, 1.2% and 1.2% during mid-season while 9.3%, 4.9%, 2.9% and 2.3% were recorded during the late season, respectively. In district Jind, the average CLCuD, SM, MLS and RR were observed 10.3%, 0.3%, 3.7% and 1.2% during mid-season and 11.1%, 5.9%, 3.9% and 1.2% during late-season, respectively. In district Bhiwani, the average CLCuD, SM, MLS and RR were observed to be 5.7%, 0.0%, 3.5% and 0.9% during mid-season and 8.4%, 4.9%, 4.2% and 0.9% during late-season, respectively. While in district Palwal, the average CLCuD, SM, MLS and RR were recorded 4.9%, 0.0% 2.4% and 0.5% during mid-season and 7.6%, 5.2%, 3.0% and 0.4%, during late-season, respectively. Comparatively, the highest CLCuD PDI (22.0%) and MLS PDI (12.0%) were observed in Hindwan village of Hisar district followed by SM (15.9%) in Badowala village of Jind district and RR (6.0%) in Dayor village of Fatehabad district. Overall, the CLCuD, SM, MLS and RR were observed to be 10.2%, 6.4%, 3.9% and 1.5% during late-season in these districts, respectively. Overall, in these districts, the highest CLCuD, SM, MLS and RR were recorded to be 22.0%, 15.9%, 12.0% and 6.0% during the late season. When compared the disease incidence in the popular



hybrids, the highest CLCuD, SM MLS and RR 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 19.1, 0.0, 2.0 and 6.5%, respectively in July. While, its peak was observed in October and it was 33.3, 3.98, 2.74 and 3.0%, 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' field in four cotton-growing districts of Maharashtra (Nanded, Jalna, Parbhani and Aurangabad). The data were recorded from cotton hybrids (Ajeet-155, Rashi-659, Vitthal, Vitthal Magic, Raja, Mokaha, Jaadoo, Jai Ho, Supercot, Paras, Brahma and Mallika). In Nanded, during mid-season, *Alternaria* leaf spot (ALS) and bacterial leaf blight (BLB) were recorded in the range of 2.0-3.0% and 2.3-3.1%, respectively. During the late season, the ALS, BLB, GM and Boll rot were recorded in the range of 2.0-3.0, 2.8-3.3, 7.6-8.0 and 6.3-8.0% in the Nanded district. When compared the disease incidence in the popular hybrids, the highest ALS (3.0%), BLB (3.3%) and Boll rot (8.0%) were recorded in the hybrid Rashi 659 and the highest GM (8.0%) were recorded in the hybrid Raja in the Nanded district (**Table 5a**).

The ALB, BLB, GM were not observed during the early season in districts Parbhani and Aurangabad. However, the average incidence of ALS (2.1%, 2.3%) and BLB (3.0%, 3.0%), GM (7.9%) and Boll rot (7.3% and 8.0%) also were recorded in both districts. In Jalna, only GM and Boll rot were observed during the late season (8.3% and 7.5%), respectively. Comparatively, the ALB, BLB, GM and Boll rot was found higher in the Aurangabad district. Overall, in these districts, the highest PDI of ALS, BLB, GM and boll rot were recorded at 2.3, 3.0, 7.9 and 7.5% during late-season. The average PDI of ALS and BLB, Gm and boll rot observed during the late season was 2.3, 3.0, 7.9 and 7.5%, respectively (**Table 5a**).

At the research farm (CRS Nanded), the disease incidence was recorded on the cotton BGII hybrids (RCH 2, Jadoo, NHH 44). The incidence of ALB was initiated in August and reached its maximum (3.7%) in October. However, the incidence of BLB was initiated in August and reached its maximum (5.0%) in October. The incidence of GM (7.2%) was observed in October but it increased in November (8.1%) and later it was decreased up to 2.1% in December. (**Table 5b**).

Akola and Buldhana district (Maharashtra)

During the survey conducted in the farmer's field of Akola and Buldhana district of Maharashtra. The data from farmers' fields were recorded from cotton hybrids (First class BG II, Ajeet-155 Bt, Neo Bt BG II, Jadoo Bt and RCH-659). The three diseases namely BLB, GM and MLS were observed in late-season only and their incidence was recorded in the range of 8.8-26.3%, 4.5-19.5% and 5.3-20.0%, respectively. The average PDI of BLB, GM and MLS in district Akola during the late-season was 13.7, 11.6 and 12.9%, respectively. While, in district Buldhana, the average PDI of BLB, GM and MLS was observed 14.4, 17.0 and 17.8% during late-season, 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 compared the disease incidence in the



popular hybrids, the highest BLB (26.3%) and MLS (20.0%) were observed in the hybrid First class BG II and Ajeet-155 Bt in the Akola district. Whereas, the highest GM (19.5%) was observed in hybrid First class BG II in Buldhana district (**Table 6a**).

At research farm MPKV Akola, among eight cotton BGII hybrids, BLB was observed in all eight hybrids while GM was observed only in Bhakti Bt, AKH-081 Bt and Rajat Bt hybrids. The highest PDI of BLB (20.0%) and GM were recorded in the hybrid (Bhakti Bt) during the boll-development stage. The average PDI of ALS and GM in all the cultivars was recorded to be 14.8 and 3.3% respectively (**Table 6b**).

Bharuch, Narmada and Surat (Gujarat)

The survey was conducted on farmer's fields as well as on the Research farm at CRS Surat. In the case of farmer's fields, a roving survey was carried out on BG II hybrids. The BLB, ALS and wilt (in Desi) were observed as major diseases 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 0.0-3.5%, respectively. During the boll developing stage, the PDI of BLB and ALS was recorded in the range of 0.0-7.0% and 0.0-2.5%, respectively. Overall, in these districts, the average PDI of BLB and ALS were observed to be 4.2% and 0.6% at the boll developing stage, respectively. When compared to the PDI in the popular hybrids, the highest BLB (7.5%) and ALS (2.5%) were recorded in the hybrid BG II in the Bharuch and Narmada districts. (**Table 7a**).

At research farm CRS, Surat, the susceptible cultivars LRA 5166 showed the highest Bacterial leaf blight intensity to the tune of 0.0 to 65.5% and *Alternaria* leaf spot disease varied from 0.0 to 3.0% PDI in different cultivars/hybrids during flowering and boll development stages (**Table 7b**).

Junagarh (Gujarat)

The survey conducted in major cotton-growing districts (Bhavanagar, Rajkot and Junagarh) of Gujarat revealed that the disease Phoma was observed during the early season, while BLB, GM, *Corynespora* leaf spot (CoLS) and ALB were observed during late-season in different cotton hybrids (Jadu, Goldy-333, Raji-621, Radhika, RCH-2, Khanjar-350, ATM, AUM Rudra, KCH-1312, Chadani moti, Navab, Buyer-7576, Neo, Superb ATM, Solar-76, Ajeet-5, Sanket, Varsha, G. Cot. Hy.-24 BG-2, KCHH-2108 BG-2, Ajeet-1155, Ankur-Jay, Navab, RCH-659). During the early season, the PDI of Phoma leaf spot was observed to be in the range of 1.0-6.5%, respectively. In mid-season, the PDI of BLB and CoLS were observed in the range of 0.0-10.5% and 2.2-10.5%, respectively. Whereas, in the late season the CoLS, GM and ALS were recorded in the range of 15.0-55.2%, 2.1-15.5% and 5.8-25.5% in Bhavanagar, Rajkot and Junagarh district, respectively. When compared the PDI in the popular hybrids, the highest PDI of different diseases such as Phoma (6.5%) in Jadu, BLB (10.5%) and ALS (25.5%) in RCH-2, CoLS (55.2%) in ATM and GM (15.5%) in Solar-76 recorded in Bhavanagar and Rajkot districts. Whereas, the highest Phoma (6.0%) and CoLS (41.5%) BLB (6.5%), GM (8.5%) and ALB (16.9%) were recorded in the hybrids Sanket, RCH-659 and Goldy-333 in the Junagadh district. During the mid-season, the PDI of BLB and CoLS were observed 1.5 and 5.8%, respectively. Whereas, in the late season the average PDI of CoLS, GM and ALS were recorded to be 29.0, 4.1 and 12.1% in the Junagarh district, respectively. In district Rajkot, during mid-season and early season, the average PDI of BLB and Phoma leaf spot were observed 2.2 and 3.0%, respectively. Whereas, in the mid-season and late-season the average PDI of CoLS, GM and ALS were observed 8.6, 35.1, 5.4 and 13.4%, respectively. Similarly, the average PDI of Phoma and BLB during early and mid-season were recorded 3.7%, 2.4% and CoLS, during mid and late-season were 6.5, 26.5% Bhavanagar district, respectively. While GM and ALS PDI were 4.8 and 12.6% in the Bhavanagar district, respectively.



Overall average PDI of Phoma during the early season was 3.2%. The PDI of BLB and CoLS in mid-season was 1.9%, 7.0%, and CoLS, GM and ALB during the late-season in all these districts were observed 30.9%, 4.8% and 12.7%, respectively (**Table 8a**).

At the CRS JAU research farm, the incidence of wilt, root rot and boll rot were recorded on the hybrids (RCH-2 and Cot-8 (BG-II)). The intensity of ALS, CLS, ATN, CoLS, BLB and Phoma leaf spot was observed from August to December. The highest incidence of wilt (3.1%) and boll rot (35.4%) were observed in susceptible cultivars viz., Cot-8 (BG-II) in August and September. However, the highest PDI of ALS (35.8%) in Nov., CLS (5.0%) in Oct. and Nov., ATN (17.5%) in Sept., CoLS (55.0%) in Sept., BLB (56.2%) in Aug., GM (10.5%) in Sept. and Phoma (5.0%) in Aug. were recorded on the hybrid RCH-2 (**Table. 8b**).

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 (District name 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 mid-season PDI of ALS, BLB and GM were recorded in the range of 7.5-18.4%, 1.0-5.1% and 1.0-8.9%, respectively. The PDI of ALS, BLB, GM, Rust and Boll rot in the late-season were recorded in the range of 16.2-30.1%, 2.0-8.8%, 5.5-14.7%, 5.6-20.8% and 6.7-20.5%, respectively. When compared to the PDI in the popular hybrids during the late season, the highest ALS and GM were in the hybrid Priya seeds (30.1%) and Jaadu (14.7%) in the Haveri district. However, the BLB, Rust and Boll rot was observed in First class (8.8%), MRC-7383 (20.8%) and Vega and RCH-659 (20.5%) in Dharwad district. In the Belagavi district, the highest average PDI of ALS, BLB, GM, Rust and Boll rot was recorded 20.8, 4.1, 7.5, 9.6 and 13.4% in the late-season, respectively followed by average PDI of ALS (11.6%), BLB (1.9%) and GM (2.8%) in mid-season. In the Dharwad district, the higher average PDI of ALS, BLB, GM, Rust and Boll rot was recorded 21.5, 6.4, 10.6, 19.0 and 18.8% in the late-season, respectively. The average PDI of ALS (12.1%), BLB (2.8%) and GM (6.3%) 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 was observed 17.7, 2.7, 8.4, 10.4 and 7.8% in the late-season, respectively. This was followed by the average PDI of ALS (10.8%), BLB (1.5%) and GM (5.3%) in mid-season. In the Haveri district, the higher average PDI of ALS, BLB, GM, Rust and Boll rot were recorded 28.2, 3.9, 11.8, 15.7 and 12.5%, respectively in the late-season and it was followed by average PDI of ALS (16.7%), BLB (1.9%) and GM (7.1%) in mid-season. In Uttar Khannada district, the higher average PDI of ALS, BLB, GM, Rust and Boll rot were recorded 18.5, 3.7, 11.5, 7.7 and 15.3%, respectively in the late-season and this was followed by average PDI of ALS (10.7%), BLB (2.0%) and GM (5.8%) in mid-season. Comparatively, the higher PDI of ALS and GM were found in Haveri. 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 21.3, 4.2, 10.0, 12.5 and 13.6%, respectively during the boll developing stage. (**Table 9a**).

At UAS Dharwad research farm, the incidence and PDI of wilt, root rot, boll rot, ALS, HLS, CLS, ATN, CoLS, MLS, BLB GM and Rust were recorded on the hybrids (Jaadu, Rashi magic, RCH-368,



JKCH-99, MRC-7383, MRC-7160, Ajit-55, Jalwa, NBC-102, Yuva-72152, RCH-659, Ajit-111, Jai, First class and Dr. Brent). 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 (24.6%) was recorded in December month (**Table. 9b**).

Guntur, Krishna and Prakasam (Andhra Pradesh)

The survey was conducted in major cotton-growing districts (Guntur, Krishna and Prakasam) of Andhra Pradesh for observation of different diseases and diseases namely BLB, ALS, MLS, GM, Wilt, Root rot, Rust and Boll rot in different cotton hybrids. The ALB, MLS were observed in the range of traces to 1.3 during the early season while during mid-season BLB, ALS, MLS and CoLS were recorded in the range of traces to 13.5%, traces to 4.3%, traces to 10.0% and traces to 13.3%, respectively. However, during the late-season, the PDI of BLB ranged from traces to 17.5%, ALS from traces to 12.9%, CoLS from traces to 29%, boll rot from 2.0 to 4.0%, GM from traces to 20.6% and Rust from 0.0-12.8% in all surveyed districts, respectively. The average highest PDI of BLB (17.5%), Boll rot (4.0%), GM (20.6%), ALS (12.9%), CoLS (29.0%) and Rust (12.8%) were recorded in two districts namely in Krishna and Guntur district. When compared the PDI in the popular hybrids, the highest BLB (17.5%), ALS (12.9%), Rust (12.8%), CoLS (29.0%), Boll rot (4.0%) and GM (20.6%) were recorded in the hybrids Tulasi, Jaadoo, US-4753, Akira and Dhan Dev. The highest incidence of BLB, Boll rot and GM were recorded in Krishna districts. However, ALS, CoLS and Rust were recorded in the Guntur district at late-season. Overall average, in these districts the PDI of BLB, ALS, MLS, CoLS, Boll rot, GM and Rust were recorded 2.1, 0.1, 3.3, 18.7, 1.0 1.8 and 1.6, respectively at boll developing stage (**Table. 10a**).

The survey was also conducted to know the incidence of TSV in farmer's fields from July 2021 to October 2021. The disease incidence from trace to 4% was observed in Akira, Adbhut and RCH 659 cultivars from July to August. However, in September month the disease incidence from 2.0 to 12.4% was observed in Tulasi, Target, Thlasi 216, Shooter and Profit plus cultivars. After September the disease incidence was observed from trace to 1.5% in all surveyed farmers' fields of different districts (**Table. 10b**).

At the research farm, Lam, Guntur, the incidence and PDI of BLB, ALS, CoLS, Boll rot, GM and Rust were recorded on the hybrids (BG-II). The incidence of ALS, CoLS was observed during August while the incidence of BLB and GM were initiated during September and rust and Boll rot during October. The highest incidence of boll rot (10.0%) was observed in December month while and CoLS (41.25%) and GM (22.25%) were observed in November. However, the highest PDI of BLB (15.0%) in October and Rust (46.5%) were recorded in December (**Table. 10c**).

Coimbatore, Dindigul, Virudhunagar, Tutukurin, Tirunelveli, Trichy, Salem, Perambalur (Tamil Nadu)

The surveys were conducted in farmer's fields in five cotton-growing districts of Tamil (Coimbatore, Dindigul, Virudhnagar, Tutukurin, Tirunelveli, Trichy, Salem, Perambalur) and observation of the occurrence of diseases was recorded from several popular cotton hybrids in these regions. During the survey, several major diseases (ALS, BLB, GM, RR and Boll rot) were observed at different plant development stages. The incidence of root rot was recorded in the early, mid and late-season of crop development while ALS, BLB, GM were recorded in the mid and late-season. Only the Boll rot disease incidence was observed during the late season. The incidence of root rot was recorded in all seasons. During the early season, the average PDI were 4.6, 4.5, 4.4, 3.3, 4.7, 2.7, 4.1 and 5.7%, in mid-season 2.9, 5.4, 7.4, 2.9, 9.1, 4.3, 5.5 and 6.8%, in Coimbatore, Dindigul,



Virudhnagar, Tutukurin, Tirunelveli, Trichy, Salem and Perambalur districts, respectively. In late season PDI of ALS, BLB, GM, RR and Boll rot were 4.2, 4.1, 3.9, 2.7, 2.4, 3.6, 2.9 and 3.9% in all surveyed districts, respectively. Whereas, in mid-season and late season, the average PDI of ALS was recorded to be 7.4, 12.2, 7.8, 7.3, 7.4, 6.6, 11.7, 10.4% and 7.7, 12.5, 8.3, 7.7, 7.8, 7.2, 12.0, 11.2% in all surveyed districts. The average incidence of BLB (4.7, 7.0, 3.9, 16.6, 12.9% and 5.2, 7.3, 4.4, 17.1, 13.6%) was also recorded during the mid and late season in Coimbatore, Dindigul, Trichy, Salem, Perambalur districts. Whereas, the average incidence (3.2, 8.8, 1.8, 2.1, 15.9, 15.6% and 4.0, 9.2, 2.2, 2.7, 16.3, 16.1%) of grey mildew was recorded during the mid-and late season in Coimbatore, Dindigul, Tutukurin, Trichy, Salem, Perambalur districts. The PDI of root rot, ALS, BLB, GM and Boll rot were observed to be in the range of 2.8-12.5%, 6.0-15.2%, 2.3-19.1%, 2.0-19.3% and 2.0-4.5% in late-season. When compared the PDI in the popular hybrids, the highest root rot (12.5%), ALS (15.2%), BLB (19.1%), GM (19.3%) and Boll rot (4.5%) were recorded in the hybrids RCH-II BGII, RCH-659, Kaveri, Ankur, Jackpot and NEO. Comparatively, the BLB and GM were found to be higher in Salem and Perambalur districts while the ALS in Dindigul, root rot in Tirunelveli and Boll rot in Coimbatore district. Overall, the PDI of ALS, BLB, GM, RR and Boll rot during the late season were observed to be 9.3, 9.5, 8.4, 6.1 and 3.5% in the late-season at all districts, respectively (**Table 11a**).

At research farm TNAU, Coimbatore, the incidence of crown rot, root rot, boll rot, ALS, CLS, MLS, BLB, GM and Rust were recorded on the hybrids (RCH-II-BGII, RCH 659 and Desi varieties C-14 and Co-17). The highest incidence of root rot (7.7%), boll rot (10.0%), ALS (24.5%), CLS (8.5%), MLS (6.7%), BLB (15.5%), GM (23.5) and Rust (7.3%) were observed in January month, whereas the highest PDI of CR (6.5%) was observed in October month. (**Table. 11b**).

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 taken at weekly intervals starting from 25th 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 25th SMW (18-24 June) during this the whitefly population was ranged from 4.0 to 5.1 per three leaves. It was found that CLCuD incidence increased up to 38th SMW and reached 100% in all the varieties. Max PDI was 56.3 followed by 56.2, 53.0 and 51.2% in HS6, RS921, RST9 and F846. The whitefly population was remained around 15.3-17.5 per three leaves in 28th SMW and never crossed ETL level (**Table-12a**). The correlation coefficient studies between weather parameters (Temperature, Relative humidity (RH), rainfall, rainy days and sunshine (hr)) and disease incidence (DI) and PDI revealed that the maximum RH (0.64), minimum RH (0.50), mean RH (0.58), rainfall mm (0.12) and sunshine hr (0.12) were positively correlated with disease incidence (DI) and PDI. Whereas, the maximum temp. (-0.73), minimum temp. (-0.68), mean temp. (-0.79) and rainy days (-0.22) were negatively correlated with DI and PDI (**Table-12b**). The high relative humidity was found to be highly favourable with the observed disease incidence and severity (PDI) with a correlation coefficient ($r > 0.50$). The regression model ($Y = 199.507 - 6.266 * X_{120} - 3.335 * X_{121} + 0.683 * X_{133} + 0.552 * X_{140} + 0.409 * X_{144} - 4.332 * X_{153} + 0.431 * X_{161} + 0.443 * X_{162}$, $R^2 = 0.8230$) 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 2021. The predicted disease incidence was 73.1% against its observed value of 55.3% recorded during 33rd SMW during 2021 (Fig.1).



Susceptible variety RST-9 of cotton was sown on 15 May 2020 in 545 square meter area at **ARS, Sriganaganagar** following recommended package of practices and weekly progress of CLCuD was recorded. CLCuD first appeared in 26 Standard metrological week (18 June to 24 June) after 46 days of sowing with an incidence of 0.1% during this the whitefly population was 1.1 per 3 leaves. However, in the subsequent period, the CLCuD incidence progressed faster reaching its maximum level of 100% during 33rd SMW (16th August). Data indicated that disease incidence was increased significantly from 7.4 % (27th SMW) to 79.9% (30th SMW). In subsequent 31st to 32nd SMW gradual disease progression was found reaching the level of 100% in 33rd SMW. The whitefly population remained around 1.1 to 8.3 per three leaves during the whole crop season. The overall precipitation from June to August (vegetative phase) during this year was 71.4 mm. The average weekly temperature during this period of June to August remained 36.7 to 41.3°C (Maximum), 24.2 to 28.3°C (minimum) and relative humidity ranged between 33.9 to 72.9% (**Table 13a**). The correlation analysis between weather factors and incidence and PDI showed a non-significant positive correlation with minimum temperature, 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. 13b**).

CLCuD susceptible cultivar HS-6 was sown with a spacing of 67.5 x 30 cm at **Hisar, Haryana**. 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 first week of October under field conditions. CLCuD appeared in the 25th SMW (18-24 June) (4.3% incidence) during this the whitefly population was 0.7 per 3 leaves. The CLCuD incidence increases from 4.3 to 97.0% on the 33rd SMW (13-19 August). The percent disease index was increased from 0.7% to up to 49.3% on 42nd SMW, during this period the average maximum and minimum temperature recorded were 35.4 and 25.8°C, whereas, morning and evening relative humidity was from 83.5 to 59.2% having maximum whitefly population 26.0 per three leaves on 30th standard meteorological week (**Table 14a**). The correlation between weekly weather parameters with incidence and PDI showed the highest significant positive correlation with morning (0.830**) and evening (0.611**) relative humidity, while rainfall showed a non-significant positive correlation. However, other weather factors such as maximum & minimum temperature, sunshine hr showed a significant negative correlation with PDI. However, in the case of disease incidence, the minimum temperature was significantly negatively correlated, and the minimum temperature was negatively correlated but nonsignificant. The evening RH and wind speed were showed significant positive (0.500*) and negative correlation (-0.543*) with the whitefly population. Whitefly population was positively correlated with CLCuD disease incidence and PDI though it was non-significant (**Table. 14b**).

The leaf curl virus disease at ICAR-CICR Regional Station, **Sirsa, Haryana** was initiated in 26th SMW (25 June-1 July) on cultivar HS-6 during this period the whitefly population was 1.0 per 3 leaves. The incidence reached its maximum i.e. 99.9% during 33th SMW (13-19 August). An increasing trend of whitefly incidence from 1.0 per 3 leaves up to 14.8 whiteflies per 3 leaves was observed during the season. The whitefly population was remained around 1.0 to 10.4 per three leaves between 26 to 37th SMW and never crossed ETL. The CLCuD PDI was reached 49.3% in 40 SMW (1-7 October). The maximum temperature ranged from 32.3 to 41.7°C, whereas the minimum temperature was 23.8 to 30.5°C. Relative humidity morning and evening ranged between 52.9 – 87.4 and 32.0-73.1%, respectively. The total rainfall received during this period was 317.7 mm (**Table 15a**).

The analysis of the correlation coefficient between weather data, whitefly population, and CLCuD (incidence & PDI) revealed that minimum RH and CLCuD incidence and PDI were significantly positively correlated (0.638, 0.571). On the other hand, minimum relative humidity and whitefly population showed a significant positive correlation. The maximum RH showed a non-significant



positive correlation with CLCuD and whitefly. Whereas maximum & minimum temperature showed a significant negative correlation with CLCuD incidence and PDI as well as with whitefly population. The correlation between whitefly adult (WFA) and PDI of CLCuD showed a strong significant positive correlation (0.945), respectively (**Table 15b**).

CENTRAL ZONE

The first incidence of Bacterial blight in RCH BGII hybrid was noticed during 33th SMW at **Nanded** (RCHII, LRA-5166, PA-255) and PDI was found in the range of 1.2 to 6.7%, while the incidence of *Alternaria* leaf spot (ALS) was observed during 32th SMW and PDI was ranged from 1.1 to 5.5%. The grey mildew was observed during 37th SMW, and the PDI ranged from 1.3 to 12.5%. The highest PDI (6.7, 5.5 and 12.5%) of BLB, ALS and grey mildew (GM) were recorded during 45th and 44th SMW in RCH 2 BG II cultivar (**Table 16a**).

The highly significant and positive correlation (0.02) of BLB and ALS was significantly and positively correlated with maximum temperature (0.05) in RCH 2 BG II cultivar. Whereas, a significant positive correlation of GM was found with evening RH (0.04) in LRA 5166 cultivar. However, the other weather factors were shown a non-significant negative correlation with the disease incidence of BLB, ALS and GM in all tested cultivars. (**Table 16b**).

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 initiation of major diseases such as BLB (5.0 & 8.3) MLS (1.7) and GM (1.7 & 3.3) in 36th, 38th and 40th SMW. The BLB incidence was reached its maximum (21.7%) during 42th SMW and during that period the maximum and minimum temperature was 31.4°C along with relative humidity between the range of 83 and 51 percent while MLS incidence was reached its maximum (5.0%) on cultivar LRA 5166 during 41th SMW. However, Grey Mildew was recorded maximum (5.0%) on cultivar Bhakti Bt during 42th SMW (**Table 17a**).

The maximum temperature has shown a significant positive correlation with bacterial leaf blight at 5% level of significance on LRA-5166 and Bhakti Bt cotton. The rainfall, minimum temperature, relative humidity, and BSH had positive and non-significant correlations in both the cultivars LRA-5166 and Bhakti Bt. The rainfall, morning and evening RH exhibited a negative and non-significant correlation with BLB in cultivar- LRA-5166 (**Table 17b**).

During the season, only Bacterial leaf blight disease was found 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) and it reached its maximum (42.5%) during 41st SMW (8-14 October). Thereafter, the BLB was decreased up to 3.5% in 51st SMW (**Table 18a**). Incidence of Bacterial leaf blight had a positive correlation with the maximum temperature and sunshine hour while minimum temperature, morning humidity, rainfall and rainy days had a negative correlation with disease development (**Table 18b**).

The incidence of bacterial leaf blight disease (BLB) at **CRS JAU, Junagarh** was noticed from 30th SMW (23-29 July) and it reached its maximum disease intensity in the 47th SMW (64.5% PDI). *Alternaria* leaf spot disease incidence was observed in the 46st SMW with the maximum PDI in 48rd SMW (25.5%). The *Corynespora* leaf spot was first noticed this year in 35th SMW and reached its maximum PDI in 39th SMW (70.5%). Thereafter, the incidence of CoLS was reduced gradually upto 50th SMW. The grey mildew was first noticed in 42th SMW and reached its maximum PDI in 45th SMW (27.5%) and thereafter it was gradually decreased (**Table 19a**).



Correlation coefficient studies for bacterial leaf blight disease incidence revealed a positive correlation with maximum temperature (0.7322*) and sunshine hours (0.3798) and negatively correlated at 1% level of significance with relative humidity (morning and evening), rainfall. The ALB was shown a significant negative correlation with minimum temperature (-0.5377*) while rainfall showed a non-significant positive correlation (0.2078). Grey mildew disease had a positive significant correlation with maximum temperature (0.6559*), while minimum temperature (0.3085) and sunshine hours (0.3377) were showed a non-significant positive correlation. The correlation between PDI of CoLS and weather factors were shown a significant positive correlation with minimum temperature (0.6149*) and sunshine hours (0.8214*), whereas rainfall and RH were shown positive correlation 0.3653, 0.4672 while maximum temperature showed a non-significant negative correlation (**Table 19b**).

SOUTH ZONE

At the research station of **UAS, Dharwad**, the observation of diseases namely *Alternaria* leaf blight, bacterial leaf blight, grey mildew and rust disease were recorded from 31st SMW to 46th SMW on the cultivars namely varieties Abhaditha, Jayadhar and hybrids Ajeet 155 Bt and Dr. Brent Bt. *Alternaria* leaf blight incidence was observed in all the cultivars during 34th to 46th SMW, whereas the incidence of Bacterial blight was observed in the cultivar Abadhitha in 41th to 46th SMW as well as on Ajeeth and Dr. Brent Bt during 43th and 46th SMW. The incidence of grey mildew diseases appeared in 34th, 39th and 41th SMW on all cultivars. The incidence of rust was also observed during 44th to 46th SMW on all cultivars. The maximum incidence for all diseases were noticed between 42th to 46th SMW (during October to November) (**Table 20a**). 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 minimum temperature, relative humidity (Morning and evening) and all the genotypes like Abhaditha, Jayadhar, Ajeeth Bt and Dr. Brent Bt (**Table 20b**).

At the research farm of Lam, **Guntur (AP)** 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 25 July 2020 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. *Corynespora* leaf spot was observed in 35th SMW (27 Augst -2 September September) when the mean maximum temperature was 27.6°C; mean minimum temperature was 24°C; mean morning relative humidity of 94.3% (RH I); mean evening relative humidity of 84.7% (RH II); rainfall was 49.9 mm in four rainy days; sunshine hours were 0.7; wind speed 4.1 km/h and evaporation was 2.0. *Corynespora* leaf spot attained a maximum PDI of 44.3% on L 1060 during 47th SMW (19-25 Oct.) during which the mean maximum temperature was 31.3°C; mean minimum temperature was 15.4°C; mean RH I of 72.7%; mean RH II of 62.0%; rainfall was 0.0 mm in 0 days; sunshine hours were 5.6; wind speed 7.7 km/h and evaporation was 3.4 (**Table-21a & 21b**).

Grey mildew disease appeared in 38th and 39th SMW on Jaadoo and RCH 2 BG II cultivars when average maximum temperature was 32.9 & 29.8°C; the average minimum temperature was 25.0 & 24.0°C; mean RH I was 89.3 & 94.1%; mean RH II was 58.6-83.0%, rainfall was 6.4 & 40.2 mm in 1 & 3 rainy days; sunshine hours were 8.2 & 3.1; wind speed was 6.9 & 6.3 km/h and evaporation was 5.6 & 3.4. The disease progressed and reached PDI of 22.3% & 24.0% during 43th & 44th SMW during which the mean maximum temperature was 31.3 & 30.2°C; mean minimum temperature was 23.2 & 22.6°C; mean RH I was 84.7% & 89.9; mean RH II was 64 & 62%; rainfall was 0 & 76.4 mm in 0 & 2 rainy day, sunshine hours were 6.9 & 2.4, wind speed 3.6 & 7.2 kmph and evaporation were 4.6 & 3.7.



Rust disease appeared in 38th SMW (17-23 November) in all the cultivars during that period the maximum temperature was 32.9°C; mean minimum temperature was 25.0°C; mean RH was 89.3%; mean RH II was 58.6%, rainfall was 6.4 mm in one rainy day; sunshine hours were 8.2; wind speed 6.9 km/h and evaporation were 5.6. The disease progressed and reached PDI of 39.5% on RCH 2 BG II during 48th SMW, 35.0% on L 1060 during 52th SMW and 44.3% on NDLH1938 during 47th SMW, respectively (**Table-21a & 21b**).

A negative correlation of *Corynespora* PDI with maximum and minimum temperatures & relative humidity, rainfall and rainy days were recorded. The correlation analysis between weather factors and PDI of *Corynespora* leaf spot revealed that the evaporation and sunshine hours were significantly positively correlated with PDI at 1% level of significance in all tested cultivars. However, the rainfall, rainy days, minimum temperature, morning and evening RH showed a significant negative correlation with PDI in all cultivars at 1% level of significance but the minimum temperature was not significantly correlated with PDI in RCH 2 Bt while wind speed is also showed a negative correlation in all cultivars, respectively (**Table 21c**).

Multiple linear regression analysis revealed that minimum temperature, RH I, rainfall, and no. of rainy days significantly influenced the progress of *Corynespora* leaf spot during Kharif 2021. Evaporation and RH II showed partial influence in L 1060.

$Y = 61.44 - 3.146 \text{ min T} + 0.318 \text{ RH I} + 0.414 \text{ Rf} - 12.377 \text{ Rd}$ (L 1060, $R^2 = 0.979$);

$Y = -9.181 + 6.453 \text{ Evap.}$ (L 1060, $R^2 = 0.424$);

$Y = 87.019 - 0.954 \text{ RH II}$ (L 1060, $R^2 = 0.305$).

In Jaadoo BG II Evaporation, RHI and II showed partial influence.

$Y = 64.102 - 2.327 \text{ minT} + 0.384 \text{ Rf} - 7.520 \text{ Rd}$ (Jaadoo BG II, $R^2 = 0.869$);

$Y = -7.803 + 5.363 \text{ Evap.}$ (Jaadoo BG II, $R^2 = 0.512$)

$Y = 71.064 - 0.777 \text{ RH II}$ (Jaadoo BG II, $R^2 = 0.354$);

$Y = 69.847 - 0.588 \text{ RH I}$ (Jaadoo BG II, $R^2 = 0.317$);

In NDLH 1938 variety, minimum temperature, rainfall and no. of rainy days significantly influenced the progress of *Corynespora* leaf spot. Evaporation, RH I and RH II expressed partial influence.

$Y = 58.789 - 1.942 \text{ minT} + 0.352 \text{ Rf} + 0.352 \text{ Rd}$ (NDLH 1938, $R^2 = 0.956$);

$Y = -7.198 + 7.198 \text{ Evap.}$ (NDLH 1938, $R^2 = 0.486$);

$Y = 73.156 - 0.637 \text{ RH I}$ (NDLH 1938, $R^2 = 0.396$);

$Y = 67.972 - 0.744 \text{ RH II}$ (NDLH 1938, $R^2 = 0.346$).

In the case of RCH 2 BGII multiple linear regression analysis revealed that minimum temperature, rainfall, no. of rainy days and evaporation significantly influenced the progress of *Corynespora* leaf spot. RH I and RH II showed partial influence.

$Y = 50.745 - 2.037 \text{ minT} + 0.126 \text{ Rf} - 3.178 \text{ Rd} + 1.362 \text{ Evap.}$ (RCH 2 BG II, $R^2 = 0.982$);

$Y = 81.456 - 0.748 \text{ RH I}$ (RCH 2 BG II, $R^2 = 0.517$);

$Y = 71.857 - 0.822 \text{ RH II}$ (RCH 2 BG II, $R^2 = 0.399$).

The rainfall and rainy days showed a significant negative correlation with PDI of grey mildew (GM) at 1% RCH 2 BG II and Jaadoo. However, morning RH showed a significant negative correlation with PDI of GM in Jaadoo BG II cultivar at 1% level of significance whereas minimum temperature



was negatively correlated at 5% in the same cultivar. The weather factors were not correlated with the PDI of GM in both cultivars (Table 21d).

Multiple linear regression analysis revealed that rainfall and rainy days significantly influenced the progress of grey mildew during *Kharif* 2021 whereas RH I exhibited partial influence in Jaadoo BG II and RH II in RCH 2 BG II.

$$Y = 15.184 + 0.484R_f - 13.457 R_d \text{ (Jaadoo BG II, } R^2 = 0.836)$$

$$Y = 95.328 - 0.912 RH \text{ I (Jaadoo BG II, } R^2 = 0.44)$$

$$Y = 11.772 + 11.772 R_f - 12.378 R_d \text{ (RCH 2 BG II, } R^2 = 0.685)$$

$$Y = 55.609 - 0.692 RH \text{ II (RCH 2 BG II, } R^2 = 0.357)$$

Disease intensity of rust was positively correlated with wind speed, maximum temperature and evaporation which showed a significant positive correlation while sunshine hours showed a significant negative correlation in all cultivars at 1% level of significance. The minimum temperature was showed a significant negative correlation with PDI of L 1060 and NDLH 1938 cultivar and evening RH was also negatively correlated with PDI of L 1060 and Jaadoo BG II cultivars at 5% level of significance, respectively (**Table 21e**).

Multiple linear regression analysis revealed that R_f , R_d and wind speed influenced the progress of rust during *Kharif* 2021 in hybrids whereas minimum temperature and RH I also influenced the development of rust in varieties. Sunshine hours showed partial influence in all the entries whereas and RH II expressed partial influence in Jaadoo BG II and L 1060.

$$Y = -7.90 + 0.448R_f - 17.936R_d + 6.007 W \text{ (Jaadoo BG II, } R^2 = 0.884)$$

$$Y = 47.096 - 5.724 SSH \text{ (Jaadoo BG II, } R^2 = 0.452)$$

$$Y = 71.154 - 0.818 RH \text{ II (Jaadoo BG II, } R^2 = 0.303)$$

$$Y = -15.979 + 0.76R_f - 23.394 R_d + 6.475W \text{ (RCH 2 BG II, } R^2 = 0.955)$$

$$Y = 47.967 - 6.345SSH \text{ (RCH 2 BG II, } R^2 = 0.617)$$

$$Y = -1.593 - 0.979 \min T + 0.182RH \text{ I} + 0.382 R_f - 12.109R_d + 3.394W \text{ (L 1060, } R^2 = 0.972)$$

$$Y = 27.77 - 3.233 SSH \text{ (L 1060, } R^2 = 0.414)$$

$$Y = 47.321 - 0.562 RH \text{ II (L 1060, } R^2 = 0.279)$$

$$Y = -6.09 - 0.973 \min T + 0.217RH \text{ I} + 0.363R_f - 12.113 R_d + 3.797W \text{ (NDLH 1938, } R^2 = 0.983)$$

$$Y = 30.035 - 3.614 SSH \text{ (NDLH 1938, } R^2 = 0.456)$$

At the research station **TNAU, Coimbatore (Tamil Nadu)**, the disease incidence, progress major diseases in cotton along with the weather parameters were observations and recorded from the field in terms of Percent Disease Index (PDI) in the five selected Hybrids (RCH659, LRA 5166) and varieties Co14, RG8 (*G. herbaceum*), K11 & K12 (*G. arboreum*). It is observed that *Alternaria* Leaf Blight (ALB) started appearing in cotton from 39th SMW (22-28 September), reached its maximum during 50th SMW and continued up to January i.e., 2nd SMW. Tobacco Streak Virus infestation was also started in the 40th SMW on hybrid RCH659 and variety CO14. In these cultivars' disease started accelerating from 40th SMW and the PDI was reached its high level (15.3 & 15.5%) during 49th & 50th SMW and continued up to 2nd SMW. The incidence of grey mildew was initially recorded during 43th SMW in RCH 659, K12 and K11 and reached its maximum in 49th SMW. A conspicuous observation was that the incidence of grey mildew was more pronounced in *G. arboreum* (K11 & K12) during the



rainy and colder months of November, December and January. Collar rot caused by *Rhizoctonia solani* was observed in two phases (early and late stage) on all tested cultivars. The initial (first phase) incidence was observed in 35th SMW and gradually increased during 39th SMW after that it was dropped till 44th SMW. The second phase incidence was again started in 45th SMW and reached its maximum in 01st SMW. **(Table 22b).**

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 (Table 22c).

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 **(Table 23)**

Path 1 (d): Survey and Epidemiology of TSV

During the surveys conducted in Cotton growing districts viz., Guntur, Krishna and Prakasam and Tobacco Streak Virus disease was recorded from July to November 2021. The incidence in different hybrids varied from 0% to 5.0% **(Table 10b & 24)**

The study on TSV progress at Coimbatore inferred that the TSV incidence could be rated as 'Medium or Moderate' as the percentage incidence was 3.3 to 18.5% in all locations except the fields of research farm being maintained at TNAU, Coimbatore where the incidence was upto 18.5% during December. The incidence of TSV Started in October and reached upto 18.5% in December. Thereafter it decreased gradually **(Table 25).**

Path 1 (e) Studies on variability of *Corynespora* leaf spot

Infected leaf samples of cotton were collected from cotton fields in Rajasthan, Haryana, Punjab, Gujarat during 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 $28 \pm 2^\circ\text{C}$ 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), the growth rate of mycelia. The length, width of conidia, and the number of septa per conidium were also done under a compound microscope **(Table 26)**. 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 27)**. 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-28**). Based on the spore structure the species was identified as *Corynespora cassicola*. 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 an either susceptible or moderately susceptible reaction in the susceptible check.

The results of the National trials are given in Tables 29 to 33.

The results of Zonal trials (North Zone) are given in Tables - 34 to 36.

The results of Zonal trials (Central Zone) are given in Tables - 37 to 41

The results of Zonal trials (South Zone) are given in Tables - 42 to 46

Path.2 (b): Confirmation and maintenance of disease-resistant lines.

NORTH ZONE

ARS PAU, Faridkot: Six entries were evaluated under field conditions from 2019 to 2021 with CLCuD susceptible checks. The three entries RS 2909, F 2687, RAH 1076 showed a resistant reaction (R) against CLCuD compared to the checks (susceptible checks- F 2228, F 846 and RST 9 (MS-S) (**Table 47**). At Bathinda, none of the entries was found to be resistant during both the years (2020-21 and 2021-22) (**Table 48**).

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 523, BS2 17, H 1488, RAH 0604 continuously showed resistant reaction against ALB, whereas GJHV 554, GISV 323, RAH 0603, TSH 325 and GISV-557 showed resistance reaction against both the BLB & ALB at CRS-JAU, Junagarh and CRS-NAU, Surat (**Table 49 a to 49c and Table 52 a and 52b**).

Similarly, at **CRS NAU, Surat**, GSHV 329/15, GSHV 829/16, GSHV 797/16, GSHV 780/16 showed constant resistance reaction against BLB. While *Alternaria* leaf blight was not much severe in the field conditions to observe the clear resistance reaction (**Table 54a & 54b**).

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 three years. The three genotypes of *G. barbadense* i.e. GSB 41, DB 16 and DB 1302 were exhibited a high degree of resistance to grey mildew both under field and artificial inoculation conditions. Similarly,



one entry each of *G. arboreum* (SVA 1118), *G. barbadense* (DB 40) *G. hirsutum* (SCS 1206) showed multiple resistance reactions against GM & BLB disease (**Table 55a and 55b**).

Summary of the resistant and multiple resistant entries are mentioned in the below table.

Resistant and multiple resistant entries of *Gossypium* species

Disease (No entry.)	Entry Name	Species	Location
CLCuD (3)	RS 2909, F 2687, RAH 1076	<i>G. hirsutum</i>	ARS PAU, Faridkot
ALB (4)	GJHV 523, BS2 17, H 1488, RAH 0604	<i>G. hirsutum</i>	CRS-JAU, Junagarh & Dharwad
BLB & ALB (5)	GJHV 554, GISV 323, RAH 0603, TSH 325, GISV 557	<i>G. hirsutum</i>	CRS-JAU, Junagarh & Surat & Dharwad
BLB (4)	GSHV 329/15, GSHV 829/16, GSHV 797/16, GSHV 780/16	<i>G. hirsutum</i>	CRS-NAU, Surat
GM (3)	GSB 41, DB 16	<i>G. barbadense</i>	USA, Dharwad
	DB 1302	<i>G. barbadense</i>	
GM & ALB (3)	SVA-1118	<i>G. arboreum</i>	USA, Dharwad
	DB 40	<i>G. barbadense</i>	
	SCS-1206	<i>G. hirsutum</i>	

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/hybrid was much less compared to susceptible varieties/hybrid at Sriganganagar whereas it was almost similar at Bhatinda and Hisar. The cumulative reaction results revealed that all the susceptible varieties showed MS to HS reaction whereas the tolerant varieties showed S to HS reaction. The susceptible and tolerant Bt hybrid showed susceptible and moderately resistant reactions but at Bathinda, they showed moderate susceptible to highly susceptible, respectively (**Table 59**).

Path.3: Management of Diseases of cotton

Path. 3 (f): Management of sooty mold (*Capnodium* spp.) in cotton

For the management of sooty mold, the experiment was conducted as prophylactic spray treatments both under polyhouse (**CICR RS Sirsa**) and field conditions. In the polyhouse experiment at Sirsa, the prophylactic sprays (3 sprays at fortnightly intervals) of propiconazole, neem oil and flonicamid showed the lowest sooty mold and the highest reduction over control treatment at 15 days after the third spray. The highest reduction of whitefly population (per three leaves) 15 days after the third spray was recorded with the treatment of flonicamid followed by neem oil and mancozeb. However, during the season whitefly population was not crossed ETL (**Table 60**).

The field trial conducted at **Faridkot**, where sooty mold was initiated in the range of 13.3-18.6%, revealed that the maximum reduction was observed by Flonicamid spray followed by Neem oil 1500 ppm@ 5 ml/litre of water and Copper oxychloride 50 WP @2.25g/L (**Table 61**). Similarly, at **HAU, Hisar**, among seven treatments the highest average reduction of sooty mold disease was recorded in the treatment propiconazole 25 EC @ 1ml/litre (40.15%) followed by Flonicamid and Copper oxychloride @ 2.50 g/litre (31.54 %) (**Table 62**).



In the field trial conducted at **CRS Junagarh** (Aphid infestation), revealed that among seven treatments including control, Flonicamid 50 WG resulted in significantly lowest disease intensity as well as aphid infestation followed by propiconazole, neem oil and COC 2.5g/L over control 15 days after the first and second spray. The highest yield was recorded in the treatment flonicamid and mancozeb (**Table 63**).

At TNAU Coimbatore, a total of three sprays were given at fortnightly intervals and the observations were recorded on sooty mould incidence after each spray and seed cotton yield was also recorded the experimental. The results revealed that spraying of Copper oxychloride (COC) 50 WP @ 2.25 g/litre of water thrice at 15 days intervals reduced the sooty mould incidence by 72.0 percent. Propiconazole 25EC @ 1ml / litre of water spray ranked next in reducing the sooty mould incidence by recording 68 percent. In the control plot, the incidence of 21 percent was recorded. Foliar spraying (three spray) of Copper oxychloride (COC) 50 WP @ 2.25 g/litre of water also recorded the highest seed cotton yield of 17.5 q/ ha as against 12.7 q/ ha in the control (**Table 64**).

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, bacterial fungal foliar spot disease at Nanded, Akola, Nagpur and Surat (**Table 65**).

Among all treatments, the lowest PDI of *Alternaria* leaf blight **at Nanded** was recorded lowest in the treatment T7 (Pyraclostrobin @ 0.1%); followed by T--6 (ST (Vitavax power @ 0.2%); 2 gm/kg seed) and T1 (ST+ SA of *Bacillus aryabhattai* ST: 10^8 cfu/g @10g per kg of seed at the time of sowing SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost), whereas the lowest *Alternaria* leaf blight **at Surat** was recorded in T-7, T-3 (T1+ T2: ST+ SA of *Bacillus aryabhattai* ST: 10^8 cfu/g @10g per kg of seed at the time of sowing SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost & ST+ SA of *Bacillus tequeilensis* SA: 10^8 cfu/g @10g per kg of seed at the time of sowing SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost), and T2. **At Akola** the lowest *Alternaria* leaf blight PDI was recorded with T-3, followed by T-4, T-5, T-1 (**Table 66**).

The PDI of Bacterial leaf blight (BLB) **at Nanded** was observed to be the lowest in treatment T-7 followed by T-6 and T-5 (ST+ SA of *Pf* C1CR; SA: 10^8 cfu/g @10g per kg of seed at the time of sowing; SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost). Whereas, PDI of BLB **at Surat** was recorded to be the lowest in T-5, T-3 and T-2. At C1CR **Nagpur**, the lowest PDI of BLB was recorded in the treatment T-3 (Combined application of T-1+ T-2) followed by T-6, T-7. **At Akola** the lowest BLB PDI was recorded with T-3, followed by T-4, T-5 (**Table 66**).

The lowest grey mildew (GM) disease PDI at **Nanded** was observed in the treatment T-7, followed by T-6, and T-5. At C1CR **Nagpur**, GM was lowest in treatment T-7, T-3, followed by T-2. **At Akola**, the lowest GM PDI was recorded with T-3, followed by T-5, T-1. The lowest wilt, *Corynespora* leaf spot and *Myrothecium* leaf spot at C1CR, Nagpur were recorded in the T-3 & T-6, T-3& T-7, T-6, T-7 & T-3 (**Table 67**). Overall, the average PDI of *Alternaria* leaf blight was lowest with T-7 and T-3, the lowest PDI of bacterial leaf blight was with T-5 and T-3 and the lowest PDI of Grey mildew was with T-7 and T-3.

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 given in **Table 68**.

At **CICR RS Sirsa**, overall, the highest reduction in the nymphal population was recorded in the Biomodule 1 followed by the existing IPM module, IPM module 2, and Biomodule 2 (**Table 69a**). Similarly, at Sirsa, the highest reduction in the whitefly population (adults/3leaves) was recorded in Biomodule 2 followed by Biomodule-3 and existing IPM modules 1, however, there was not much difference in the IPM and biomodules. The lowest CLCuD PDI at 115 DAS was observed in the existing module followed by Biomodule 2. The highest seed cotton yield was recorded in Biomodule 2 followed by existing IPM module 1, Biomodule1 and biomodule 3 (**Table 69b**).

At **HAU Hisar**, overall, the lowest whitefly nymphal population was recorded in the existing IPM module, followed by IPM module 2, and Biomodule 2. The lowest whitefly adult population was recorded in the existing IPM module, followed by IPM module 1, IPM module 2,3 and Biomodule 2 (**Table 70a**). The lowest CLCuD PDI was recorded with existing IPM modules followed by IPM module 1, and Biomodule 1. However, there was not much difference between IPM and biomodules in terms of CLCuD PDI and seed cotton yield (**Table 70b**).

At **ARS Sriganagar**, the highest reduction in whitefly (per 3 leaves) 7 days after the third spray was observed in the IPM module -1 followed by IPM module-2, Biomodule 2, and Biomodule 3, (**Table 71a**) whereas, the highest reduction in the nymphal population was recorded in IPM module -2 followed by IPM module 3 and existing IPM module (**Table 71 b**). The lowest CLCuD PDI at 115 DAS was observed in the existing IPM module followed by IPM module 1, Biomodule 1. The highest seed cotton yields were recorded in Biomodule 2, followed by Biomodule 3 and IPM module 2. However, the seed cotton yield and CLCuD PDI are not significantly different between IPM and biomodules (**Table 71c**).

At **ARS Bathinda**, the highest reduction in whitefly (per 3 leaves) 7 days after the third spray was observed in the existing IPM module-2 followed by Biomodule 3 and Biomodule-4 (**Table 72a**). However, the highest reduction in the nymphal population was recorded in the existing IPM module followed by IPM module 3, biomodule 1 at 7 days after the fourth spraying (**Table 72b**). The lowest CLCuD PDI at 115 DAS was observed in the existing IPM module followed by IPM modules 1, IPM modules-2 (**Table 72b**).

At **ARS Faridkot**, the highest reduction in whitefly adults (per 3 leaves) at 7 days after the fourth spray was observed in the existing IPM module followed by IPM module 1, IPM module 2 and Biomodule 1 (**Table 73a**). However, the highest reduction in the nymphal population was recorded in the existing IPM module followed by IPM module 3, biomodule 1 at 7 days after the fourth spray (**Table 73b**). The CLCuD PDI at 115 DAS was observed lowest in the existing IPM module followed by new IPM modules 1, 2, and Biomodule-1, Biomodule-4 without much difference between IPM and Biomodules (**Table 73c**).

Overall, the average reduction of whitefly adults (per 3 leaves) over control at 7 days **after the last spray was observed in the existing IPM module followed by IPM module-1, IPM module-2, IPM module-3 and Biomodule-3 (Table 74a)**. Similarly, reduction in average nymphal population was recorded **highest in existing IPM module followed by IPM module-2, IPM module-1, IPM module-3 and Biomodule-2. Biomodule -2 was statistically at par with other modules (Table 74b)**. The average of CLCuD PDI at 115 DAS of all centers revealed that the highest reduction in CLCuD was recorded in the existing IPM module followed by new IPM modules 1, 3 and Biomodule-2, Biomodule-2 (**Table 74c**). There was an increase of 23.3 to 27.7 Q/ha seed cotton yield in IPM and Biomodules. The highest average seed cotton yield was recorded in the existing IPM module followed by IPM module-3, IPM module-1, IPM module-2 and Biomodule-1, Biomodule-3 (**Table 74d**).



Path 3(j): Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations

North Zone: The experiment was conducted at **ARS PAU Bathinda and HAU, Hisar**. During the season (15 DAS) the BLB incidence was observed to be in the range of 3.3 to 96.7% at Bathinda, while at HAU Hisar the FFS (*Myrothecium* leaf spot, *Alternaria* leaf spot) was observed. The highest reduction in the BLB at Bathinda was recorded with Keroxim-methyl followed by the combination product of Azoxystrobin 18.2% W/W + Difenoconazole 11.4 w/w SC and Propineb 70% WP, while at HAU Hisar the highest FFS reduction was recorded with Fluxapyroxad 167 g/l + Pyraclostrobin 333g/l SC followed by Metiram 55% + Pyraclostrobin 5% and Propineb 70% WP. However, increased yield also recorded in T-4 (25.0 Q/ha), T₅ (25.0 Q/ha) and in T-9 (24.0 Q/ha) (**Table 75**).

Central Zone: A total of twelve treatments including control were evaluated in the field trial at **NAU Surat**. Among all the treatments, Fluxapyroxad 167 g/l + Pyraclostrobin 333g/l SC (21.2% PDI) followed by copper oxychloride 50%WP @2.5 g+ streptomycin @0.1% (19.8% PDI) recorded minimum Bacterial leaf blight infection in comparison to the control (40.7% PDI) in RCH 2 BG II hybrid. The lowest boll rot disease was observed in the treatment copper oxychloride 50%WP @2.5 g+ streptomycin @0.1% (13.3% PDI) followed by Fluxapyroxad 167 g/l + Pyraclostrobin 333g/l SC (14.7%) followed by Metiram 55% + Pyraclostrobin 5% WG (16.3%) and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC (18 %PDI) compared to other treatments and control (28.2%) in RCH 2 BG II hybrid. The highest seed cotton yield was recorded in the treatment copper oxychloride 50%WP @2.5 g+ streptomycin @0.1% (26.42 Q/ha) followed by treatment Fluxapyroxad 167 g/l + Pyraclostrobin 333g/l SC (25.98 Q/ha), respectively (**Table 76**).

At Nanded, the lowest *Alternaria* leaf blight was observed in the treatment Fluxapyroxad 167 g/l + Pyraclostrobin 333g/l SC followed by Metiram 55% + Pyraclostrobin 5% and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC. The lowest grey mildew was observed with the treatment by Fluxapyroxad 167 g/l + Pyraclostrobin 333g/l SC followed by Kresoxim-methyl 44.3% SC and Metiram 55% + Pyraclostrobin 5% WG. The highest seed cotton yield was recorded in T₄, and T₅ (**Table 77**).

At CICR Nagpur, the lowest boll rot was observed in the treatment copper oxychloride 50% WP + streptomycin 0.1% (6.7%) followed by copper sulphate 47.15% + Mancozeb 30% WDG (13.3%), Fluxapyroxad 167 g/l + Pyraclostrobin 333g/l SC (20.0%) and Propiconazole 25% EC (20.0%). The lowest *Corynespora* leaf spot disease PDI was recorded in the treatment of Flonicamid/ Difenthiuron (13.0%) and Fluxapyroxad 167 g/l + Pyraclostrobin 333g/l SC (13.0%) followed by Captan 70% + Hexaconazole 5% WP (14.0%). The lowest grey mildew was observed in Kresoxim-methyl 44.3% SC (6.0%) followed by Propiconazole 25% EC (8.3%) and Fluxapyroxad 167 g/l + Pyraclostrobin 333g/l SC (8.3%). The highest seed cotton yield was recorded in T-10, T-5 and T-4 (**Table 78**).

South Zone: At Lam, Guntur: Twelve treatments were evaluated on Cotton hybrid, Jaadoo BG II, which was sown on 25 July 2021 in 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 3 sprays were given when (PDI) crossed more than 10% PDI. *Corynespora* leaf spot PDI was non-significant in all the plots before spray. The highest *Corynespora* leaf spot disease reduction over control treatment (71.3, 67.7 and 67.4%) and minimum PDI (10.5, 11.8 and 11.9% I) were recorded in T₈ (Captan 70% + Hexaconazole 5% WP), T₄ (Fluxapyroxad 167g/l + Pyraclostrobin 333g/l SC) and T₃ (Propineb 70% WP) after third spray. Copper sulphate 47.15% + Mancozeb 30% WG was significantly superior against grey mildew (PDI 0.8%) followed by Propineb



70%WP @ 2.5g/l (1.1% PDI) and Azoxystrobin 18.2% w/w + Difenconazole 11.5% w/w SC @ 1ml/l with 1.4% PDI, respectively. The rust was significantly reduced by Fluxapyroxad 167g/l + Pyraclostrobin 333g/l SC @ 0.6l (8.8% PDI), Azoxystrobin 18.2% w/w + Difenconazole 11.5% w/w SC @ 1ml/l (15.3% PDI) and Captan 70% + Hexaconazole 5% WP @ 1.5g/L (15.6% PDI), respectively. The lowest PDI (0.8, 1.6 and 1.7%) of boll rot was observed in T1 (Kresoxim-methyl 44.3% SC @ 1 ml/l), T8 (Captan 70% + Hexaconazole 5% WP @ 1.5g/L) and T2 (Propiconazole 25% EC @ 1 ml/l) as compared to control (4.4% PDI), respectively. All treatments significantly increased yield. Highest yield of 11.5 q/ha was recorded with Propineb 70% WP @ 2.5g/l followed by Propiconazole 25% EC @ 1ml/l (11.0 q/ha), Kresoxim methyl 44.3% SC @ 1ml/l (10.9 q/ha), Captan 70% + Hexaconazole 5% WP @ 1.5g/l (10.5 q/ha) and Copper sulphate 47.15% + Mancozeb 30% WDG (10.2 qt/ha), respectively (**Table. 79 & 80**).

At UAS Dharwad, the highest reduction in *Alternaria* leaf blight was recorded by Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/l SC (45.1%) followed by Metiram 55% + Pyraclostrobin 5% WG (38.3%) and Azoxystrobin 18.2% w/w + Difenconazole 11.4% w/w SC (38%), whereas, the highest reduction in the rust disease was observed with Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/l SC (32.8%) followed by Metiram 55% + Pyraclostrobin 5% WG (28.4%) and Azoxystrobin 18.2% w/w + Difenconazole 11.4% w/w SC (25.1%). The highest reduction in the boll rot was achieved with the spray treatment of Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/l SC (43%) followed by Metiram 55% + Pyraclostrobin 5% WG (40%) and Azoxystrobin 18.2% w/w + Difenconazole 11.4% w/w SC (33.7%). The highest yield was recorded in the Treatment T-5, T-4 and T-6 (**Table 81**).

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) due to CLCuD in different Bt hybrids varied from 6.3 to 59.7, 4.2 to 38.8, 9.2 to 38.8 and 10.9 to 38.0% in Bt hybrids US-51, RCH 773 BG II, NCS 9013 BGII and ACH177-7 BG II respectively. Based on mixed grades it was 29.5, 22, 26.6 and 24.8%, respectively in US-51, RCH 773 BG II, NCS 9013 BGII and ACH177-7 BG II. A similar trend was observed in the case of reduction in the number of bolls but the reduction in boll weight was varied with the cultivars and the respective CLCuD grades. Overall, reduction in seed cotton yield with respect to the grades over health plants was recorded to be 7.7, 13.7, 24.9 34.7 and 43.6 % under grades 1,2,3,4,5, respectively. Based on mixed grades it was 29.5, 22.0, 26.6 and 24.8%, respectively in US-51, RCH 773 BG II, NCS 9013 BGII and Bioseed 6688 BG II at Faridkot, Hisar and Sriganagar (**Table 82-84**).

Path.4 (e) Expt.2: Distribution pattern of CLCuD on local popular BT hybrid at farmer's field.

The maximum leaf curl disease PDI was noted in Punjab (19.2%) followed by Haryana (12.4%) and Rajasthan (11.4) during the 2021 season. In Punjab, maximum CLCuD was noted in Fazilka followed by Muktsar, and Faridkot and in Haryana, the maximum CLCuD was recorded in Jind followed by Hisar, Fatehabad, Sirsa, Palwal, Bhiwani, and Palwal. In Rajasthan, the Sriganagar district showed maximum CLCuD followed by Hanumangarh. (**Table 85**).



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 at ICAR-CICR Regional Station Sirsa and it is caused by Aphis under field conditions at JAU Junagarh was initiated in 2019-20. For the management of sooty mold, the experiment was conducted as prophylactic spray treatments both under polyhouse (CICR RS Sirsa) and field conditions.

Based on pooled results (2019-20, 2020-21 and 2021-22) of the experiments conducted at **Sirsa** under polyhouse conditions, the highest reduction in the sooty mold caused by whitefly was recorded with the prophylactic sprays (3 sprays at fortnightly interval) of flonicamid, followed by propiconazole, mancozeb and neem oil over control treatment 15 days after the third spray. The highest reduction of whitefly population (per three leaves) 15 days after the third spray was recorded with the treatment of flonicamid followed by neem oil and mancozeb (**Table 86**).

Based on pooled results (2019-20, 2020-21 and 2021-22) of the experiments conducted at **JAU Junagarh** under field conditions, all the treatments showed a numerical reduction of sooty mold over control. In all the treatments the cotton plants were sprayed with the fungicides twice at 15 days intervals. After each spray, a reduction in the sooty mold was observed. Significantly minimum sooty mould was recorded (4.2%) with the Flonicamid 50 WP at 15 days after the second spray which was followed by propiconazole (48.5) which was at par with Mancozeb 75 WP (50.7) (**Table 87**). Effect of different treatments on aphid population in cotton before spray, after 7 and 15 days of two subsequent sprays were presented in Table 88-89 with pooled data of the year 2019, 2020 and 2021. The lowest nymphal population of aphis was recorded with Flonicamid followed by copper oxychloride and control (**Table 89**).

The highest three-year pooled seed cotton yield was observed with flonicamid (26.5 Q/ha) followed by copper oxychloride (22.64 Q/ha) and propiconazole (22.43 Q/ha). Two years of pooled data indicated (**Table-8**) that the statistically significantly height seed cotton yield (2653 kg/ha) was recorded in spraying of Flonicamid 50 WG. The minimum seed cotton yield of 2054 kg/ha was recorded in control.

Looking at the economics of various treatments with fungicides/insecticides, and the highest net realization of Rs 43,462/ha was obtained with the treatment of two sprays of Flonicamid 50 WG followed by copper oxychloride (**Table 91**). The maximum ICBR (1: 5.16) was obtained also in the treatment of Flonicamid 50 WG. However, ICBR among the next best treatments were obtained in treatment spraying of Mancozeb 75 WP (1:4.32). Comparison of the efficacy between different treatments indicated that Flonicamid 50WG @ 0.03% was found superior to suppress the aphid population and ultimately sooty mould in cotton which also gave maximum net realization. All tested fungicides were suppressed sooty mould as compared to control.



Recommendation:
Path.3 (f): Management of sooty mold (*Capnodium* spp.) in cotton

In the North zone, for management of the sooty mold caused by whitefly (2019-20, 2020-21 and 2021-22), it was observed that the prophylactic sprays (3 sprays at fortnightly interval) of flonicamid, followed by propiconazole, mancozeb and neem oil at the fortnightly interval (starting at whitefly population crossing ETL) may provide better management and seed cotton yield (Table 86).

The farmers of Junagarh and Central Agro Climatic Zone growing Bt cotton may be advised to spray Flonicamid 50 WG @ 3 g/10 liter of water 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. The next best treatment is the spray of Mancozeb 75 WP twice at an interval of 15 days. The secretion of honeydew-like substances is medium for saprophytic fungi.

Path. 3 (h): Evaluation of efficacy of bioagents against cotton diseases

The eight treatments including control were evaluated during 2019-20, 2020-21 and 2021-22 under field conditions at Nanded, Nagpur, Surat (Table 92). **At Nanded**, the pooled data of all three-year results indicated that the lowest *Alternaria* leaf blight was recorded with T-7 (Foliar application of Pyraclostrobin @ 0.1%; gm/lit of water) followed by T-6 (Chemical ST (Carboxin 37.5+ Thiram 37.5%WS @ 0.2%); 2 gm/kg seed) and T-3 (ST+ SA of *Bacillus tequilensis* + *Bacillus aryabhatai* ST: each with 10^8 cfu/g @10g per kg of seed at the time of sowing SA: each @ 2.5 kg/ha (30 & 60 DAS) with FYM/compost). The lowest Bacterial leaf blight and grey mildew were recorded with T-7 (Foliar application of Pyraclostrobin @ 0.1%; gm/lit of water) followed by T-6 (Chemical ST (Carboxin 37.5+ Thiram 37.5%WS @ 0.2%); 2 gm/kg seed) and T-5 (ST+ SA of *Pf* CICR; SA: 10^8 cfu/g @10g per kg of seed at the time of sowing; SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost). The highest seed cotton yield was recorded with T-6 followed by T-1 (ST+ SA of *Bacillus aryabhatai* ST: 10^8 cfu/g @10g per kg of seed at the time of sowing SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost) and T-5 (Table 93).

At CICR Nagpur, the lowest pooled root rot incidence was recorded with T-3 followed by T-6 (Chemical ST (Carboxin 37.5+ Thiram 37.5%WS @ 0.2%); 2 gm/kg seed) and T-2 (ST+ SA of *Bacillus tequilensis* SA: 10^8 cfu/g @10g per kg of seed at the time of sowing SA: 2.5 kg/ha (30 & 60 DAS) with FYM/compost). Whereas the lowest Myrothecium leaf blight was observed with the treatment T-6 followed by T-7 (Foliar application of Pyraclostrobin @ 0.1%; gm/lit of water) and T-3. The lowest *Corynespora* leaf spot disease severity was recorded with the treatment T-7 followed by T-3 and T-4 (ST+ SA of Commercial product *Bacillus subtilis* SA: 10^8 cfu/g @10g per kg of seed at the time of sowing; Soil application: 2.5 kg/ha (30 & 60 DAS) with FYM/compost). The lowest Bacterial blight severity was recorded with treatment T-3 followed by T-4 and T-2 however, the lowest grey mildew severity was recorded with treatment T-7, T-3 and T-2. Overall, the highest pooled mean seed cotton yield was obtained with T-3 followed by T-2 and T-1 (Table 94 & 95).

At MCRC Surat, 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 (Table 96)



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 31.8 was recorded in treatment-9, 3, and 4 and maximum recorded in treatment T8. The lowest BLB was recorded in the treatment T3, T7, T8 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 97**).

Surat (G. Cot. 20): In this experiment, a total of eleven different treatment combinations including control were evaluated against the Bacterial leaf blight, *Alternaria* leaf spot disease. Out of all treatments, in treatment T5, T4, and combinations of these treatments T8, T9, lower bacterial leaf blight severity was observed. Whereas in the case of *Alternaria* leaf spot disease all the treatment combinations were disease-free from the infection except T-8 (**Table. 98**).

Dharwad (G. arboreum): The results indicate that the treatment – 12, T-11, T-10 has the least incidence of *Alternaria* leaf blight, rust. The highest *Alternaria* leaf blight and rust disease were observed in the treatment T1 (absolute control with non-organic and non-inorganic) followed by T 3 (RD of Nutrient through organic based on P equivalent basis) (**Table. 99**)

Agron. Standardization of geometry for Bt varieties

Junagarh: Among all the spacing evaluated for *Corynespora* disease severity. In Suraj Bt, maximum *Corynespora* leaf spot disease intensity (27.12) was recorded in spacing 60x15 cm which was statistically at par with 60x15 cm (23.25). Minimum disease intensity was recorded in spacing 90x30 cm (10.99). PKV 081 Bt maximum *Corynespora* leaf spot disease intensity (31.34) was recorded in spacing 60x15 cm. Minimum disease intensity was recorded in spacing 90x30 cm (13.49). Rajat Bt maximum *Corynespora* leaf spot disease intensity (13.76) was recorded in spacing 60x30 cm which was statistically at par with 60x15 cm (13.24) GJHV374 Bt maximum *Corynespora* leaf spot disease intensity (18.24) was recorded in spacing 60x15 cm. Minimum disease intensity was recorded in all the cultivars with the spacing of 90x60 cm which was statistically at par with 90x15 cm. All over trends of disease intensity was if increase the spacing disease intensity was decreased. In the case of varieties reaction against *Corynespora* leaf spot, Suraj Bt and PKV 081 were found moderately resistant (Table 100).

Junagarh: Among different intercropping systems the incidence of *Corynespora* disease severity, the Farmers practice having cotton and sesamum one row each (1:1) with a spacing of 120 x 45 cm followed by sole Bt cotton crop with a spacing of 120 x45 cm showed lowest disease severity (Table 101).

Surat: A total of twelve different treatment combinations of Plant spacing (S) with Nitrogen levels (N) were evaluated against the *Bacterial* leaf blight, *Corynespora* leaf spot and *Alternaria* leaf spot disease, out of which all the treatment combinations were observed as disease-free against the Bacterial leaf blight infection. Whereas in the case of *Corynespora* leaf spot disease, three treatment combinations i.e., S_1N_2 , S_1N_3 and S_2N_3 observed as moderately resistant in grade 2, one treatment combination S_4N_2 as disease-free and the remaining other treatment combinations were resistant from the infection. *Alternaria* leaf spot disease incidence was not observed during the season in this trial (**Table 102**)



Research Findings: AICRP on Cotton-Plant Pathology (2021-22)

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
A	Name of the District										
	Faridkot										
1	Kingra	RCH 773, RCH 776, RCH 650	0	0	0	0	0	7.3	0.0	6.3	12.7
2	Deep Singh Wala	RCH 773, RCH 776	0	0	0	0	0	6.3	0.0	4.4	15.0
3	Mehmuana	RCH 773, RCH 776	0	0	0	0	0	8.0	0.0	5.5	16.1
4	Mani singh wala	RCH 773, RCH 776, Sim Sim	0	0	0	0	0	5.7	0.0	6.3	13.3
5	Pakka	RCH 773, RCH 776, Balraj	0	0	0	0	0	9.2	0.0	7.0	16.7
6	Dhab sher singh wala	RCH 773, RCH 776, RCH 653	0	0	0	0	0	8.8	0.0	4.0	14.1
7	Chahal	RCH 773, RCH 776	0	0	0	0	0	7.0	0.0	7.5	18.5
8	Pakka	RCH 773, RCH 776	0	0	0	0	0	6.7	0.0	6.9	16.0
9	Tehna	RCH 773, RCH 776, US 71	0	0	0	0	0	8.3	0.0	8.1	18.3
10	Kaler	RCH 773, RCH 776	0	0	0	0	0	7.9	0.0	6.5	15.7
11	Nathewala	RCH 773, RCH 776	0	0	0	0	0	8.8	0.0	7.0	12.7
12	Sandhwan	RCH 773, RCH 776	0	0	0	0	0	7.0	0.0	6.3	13.3
	Average							7.6		6.3	15.2
	Fazilka										
1	Patti taja	RCH 773, RCH 776, ACH 177	0	0	0	0	0	9.3	0.0	8.8	20.0
2	Kundal	RCH 773, RCH 776, Sim Sim	0	0	0	0	0	10.4	0.0	9.0	18.7
3	Gobindgarh	RCH 773, RCH 776, RCH 653	0	0	0	0	0	11.7	0.0	7.5	17.3



4	Abohar		0	0	0	0	0.6	14.7	0.0	9.4	27.7
5	Churiwala Dhanna	RCH 773, RCH 776, ACH 177	0	0	0	0	0	12.3	0.0	8.8	23.3
6	Khuikhera	RCH 773, RCH 776, RCH 650	0	0	0	0	0.5	7.3	0.0	6.3	12.7
7	Roopnagar	RCH 773, RCH 776, RCH 650, RCH 653, Balraj	0	0	0	0	0	6.3	0.0	4.4	15.0
8	Bareka	RCH 773, RCH 776	0	0	0	0	0	8.0	0.0	5.5	16.1
9	Faridkhera	RCH 773, RCH 776	0	0	0	0	0	5.7	0.0	6.3	13.3
10	Khuian sarwar	RCH 773, RCH 776, Balraj, RCH 650	0	0	0	0	0	9.2	0.0	7.0	16.7
11	Maujgarh	RCH 773, RCH 776, US 71	0	0	0	0	0	8.8	0.0	4.0	14.1
12	Jandwala Hanwanta	RCH 773, RCH 776, RCH 653, ACH 177	0	0	0	0	0	7.0	0.0	7.5	18.5
13	Kallarkhera	RCH 773, RCH 776, Sim Sim	0	0	0	0	0	6.7	0.0	6.9	16.0
								8.3	0.0	8.1	18.3
	Muktsar							7.9	0.0	6.5	15.7
1	Mahan bhaddar	RCH 773, RCH 776, US 71	0	0	0	0	0	8.8	0.0	7.0	12.7
2	Bam	RCH 773, RCH 776, Sim Sim	0	0	0	0	0	7.0	0.0	6.3	13.3
3	Mohlan	RCH 773, RCH 776, RCH 650	0	0	0	0	0.5	8.8	0.0	7.0	17.0
4	Ratta tibba	RCH 773, RCH 776, RCH 653, Balraj	0	0	0	0	0				
5	Sherewala	RCH 773, RCH 776, RCH 650, US 71	0	0	0	0	0	9.3	0.0	8.8	20.0
6	Bhange wal	RCH 773, RCH 776, RCH 650	0	0	0	0	0	10.4	0.0	9.0	18.7
7	Seer wali	RCH 773, RCH 776	0	0	0	0	0	11.7	0.0	7.5	17.3
8	Dohak	RCH 773, RCH 776	0	0	0	0	0	14.7	0.0	9.4	27.7
9	Enakhera	RCH 773, RCH 776	0	0	0	0	0	12.3	0.0	8.8	23.3
10	Muktsar	RCH 773, RCH 776, Balraj	0	0	0	0	0	7.3	0.0	6.3	12.7
	Average							11.0		8.3	20.0
	Overall average							9.0		7.2	17.4



Table1b: Observations on the occurrence of cotton diseases at research farm (RRS-PAU Faridkot)

Days after sowing	Bt hybrids/ Varieties	CLCuD (PDI)	FFLS (PDI)
60	RCH 773, RCH 776, RCH 650, F 1861, F 846, F 1378, F 2164, F 2383, F2228, RST 9, HS 6	6.4	0.0
75		12.3	2.5
90		27.7	5.6
105		36.3	7.5
120		44.2	8.8
Average		25.4	4.9



Table 2a: Observations on the occurrence of cotton diseases at farmer's fields in Bathinda, Talwandi sabo and Sangat (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	FFLS/MLS	BLB	Root rot (%)	Parawilt (%)	Boll rot (%)
A	Bathinda District																			
	Block -Bathinda																			
1	Behmandwana	RCH 773, RCH 776	0	0	0	0	0	0	0	0	0	0-1	0	0	5	0	0	0	0	1
2	Jhumbe	RCH 776, US51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0-1	0
3	Kotshamir	RCH 776	0	0	0	0	0	0	6.7	0	0	0	1	0	8.3	0	Trs	0	0	1
4	Bangi Kalan	RCH 773, RCH 776	0	0	0	0	0	0	0	0	0	0-1	2.5	0	8.0	0	0	0-1	0	0
5	Jodhpur Romana	RCH 773	0	0	0	0	0	0	10.0	2.5	0	0	1	0	11.7	5.0	0	0	0	1
	Average								3.3	0.5	0.0	0.0	0.9	0.0	6.6	1.0	0.0	0.0	0.0	0.6
	Block-Maur																			
6	Bhai Bakhtaur	RCH 776	0	0	0	0	0	0	0	5.0	0	2.5	2.5	2.5	8.3	7.5	0	0	0	1
7	Jatri	RCH 773, US 81	0	0	0	0	0	0	8.3	2.5	Traces	0	0	0	11.7	10.0	0	0	0	0
8	Maesar Khana	US 71	0	0	0	0	0	0	5.0	0	2.5	0	0.5	0	6.7	5.0	0	0	0	0
9	Kotbhara	RCH 773, RCH 926	0	0	0	0	0	0	5.0	0	0	0	0.5	0-1	8.3	2.5	0	0	0	2.5
10	Kotfatta	RCH 776	0	0	0	0	0	0	0	0	0	0-1	0.5	0-3	0	5	0	0	0	0
11	Ramgarh Bhunder	RCH 653	0	0	0	0	0	0	10	0	0	0	0.5	0	11.7	0	0	0	0	0
12	Banger Mohabbat	RCH 776	0	0	0	0	0	0	11.7	0	0	0	1.0	0	11.7	7.5	0	0	0	2.5
13	Burj Mansa	RCH 773, US 81	0	0	0	0	0	0	10.0	0	0	0.5	0.5	0	10.0	10.0	0	0.5	0.5	2.5
	Average								6.3	0.9	0.4	0.4	0.8	0.4	8.6	5.9		0.1	0.1	1.1
	Block – Talwandi Sabo																			
14	Pattawallu	RCH 773, US 51, US 21	0	0	0	0	0	0	5.0	0	0	0.5	1.0	1.5	8.3	10.0	10.0	0	0	2.5
15	Shekhpura	RCH 773, RCH 650, US 51	0	0	0	0	0	0	11.7	5	0	0	0	0	11.7	12.5	2.5	0	0	2.5
16	Rama Mandi	RCH 776	0	0	0	0	0	0	0	0	0	0	0	0	0	5.0	0	0	0	2.5
17	Jewan singh wala	RCH 776, US 81	0	0	0	0	0	0	5.0	0	5.0	0.5	0.5	0	8.3	0	7.5	0	0	0



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18	Lehri	RCH 776	0	0	0	0	0	0	0	0	0	0.5	0.5	0-2	0	2.5	0	0	0	2.5
19	Pucca Kalan	RCH 773	0	0	0	0	0	0	8.3	0	0	0	0.5	0-5	10	0	0	0	0	0
20	Laleana	RCH 773, US 51	0	0	0	0	0	0	0	2.5	0	0	1.5	0	0	10	0	0	0	0
21	Bhagi bander	RCH 776, SP 7172	0	0	0	0	0-2	0	16.7	0	0	0.5	2.5	0-5	16.7	10	0	0	0	2.5
22	Jaga Ram Tirth	RCH 776, US 71	0	0	0	0	0	0	8.3	0	2.5	0.5	0.5	0-1	8.3	12.5	5	0	0	2.5
23	Singhu	RCH 776	0	0	0	0	0	0	11.7	0	0	0	0	0	24.3	2.5	5	0	0	0
24	Lehri	US 51	0	0	0	0	0	0	5.0	0	0	0.5	1.5	0.5	8.3	5.0	5.0	0	0	2.5
25	Bangikalan	US 81, US 51, NCS 9013	0	0	0	0	0	0	0	0	0	0	0	0	7.5	0	0	0	0	2.5
	Average								6.9	0.6	0.6	0.3	0.7	0.2	8.6	5.8	2.9	0.0	0.0	1.7
Block – Sangat																				
26	Sangat Mandi	RCH 773, NCS 495	0	0	0	0	0	0	5	0	0	0	0	0	8.3	0	0	0	0	5.0
27	Mehta	RCH 773, RCH 776	0	0	0	0	0	0	6.7	0	0	0	0	0	6.7	0	0	0	0	2.5
28	Gursar Sainewala	RCH 773, RCH 776	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	2.5
29	Chak Ruldu Singh Wala	RCH 773, RCH 776	0	0	0	0	0	0	5	0	0	0	0	0	8.3	0	0	0	0	2.5
	Average								4.2						7.1					3.1
Block -Nathana																				
30	Bhuchookhurd	RCH 773,	0	0	0	0	0	0	10	0	0	0.5	1.5	0.5	10	5	0	0	2.5	2.5
31	Chak Fateh Singh Wala	RCH 773	0	0	0	0	0	0	8.3	0	0	0	0	0	11.7	0	0	0	0	0
32	Chak Ram Singh Wala	RCH 773	0	0	0	0	0	0	0	0	0	0.5	2.5	0-2	0	7.5	0	0	0	2.5
33	Bhuchoo Kalan	RCH 776	0	0	0	0	0	0	8.3	0	0	0.5	2.5	0	8.3	10	0	0	0	5
34	Bega Lehra	RCH 776, US 71	0	0	0	0	0	0	0	0	0	0	1.5	0	0	2.5	0	0	0	2.5
35	Lehra Mohabat	US 51	0	0	0	0	0	0	3.3	0	1	0	1	1	2.5	5	1	0	0	7.5
36	Dhelwan	RCH 776, US 71	0	0	0	0	0	0	5	0	0	0	1	0	0	0	0	0	0	0
37	Sema	RCH 776, US 71	0	0	0	0	0	0	3.3	0	0	0	2.5	0	5.0	10	0	0	0	2.5
38	Gobindpura	RCH 776,	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5	0	0	0	0
39	Nathana	RCH 776, US 51	0	0	0	0	0	0	6.7	0	0	0	0	0	8.3	0	0	0	0	0
40	Bibiwala	RCH 773, RCH 776	0	0	0	0	0	0	0	0	0	0	0.5	0.5	5.0	5	0	0	0	2.5
41	Laverisar	US 71	0	0	0	0	0	0	0	0	0	0	0	0-1	0	7.5	0	0	0	2.5
42	Bucho Khurad	RCH 776	0	0	0	0	0	0	5	0	0	0	0	0	8.3	0	0	0	0	2.5
43	Poohali	RCH 776, US 51	0	0	0	0	0	0	0	0	2.3	0.5	2.5	0	0	0	5	0	0	2.5
44	Ganga	RCH 773, RCH 776	0	0	0	0	0	0	5	0	0	0	0.5	0.5	8.3	1	0	0	0	0
	Average								3.7		0.2	0.1	1.1	0.2	4.5	3.7	0.4	0.0	0.2	2.2
Block -Rampura																				
45	Balianwali	RCH 773, RCH 776	0	0	0	0	0	0	0	0	0	0.5	2.5	0.5	11.67	6	1	0	0	2.5
46	Daulatpura	RCH 776, US 71	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
47	Mandi Khurad	RCH 776, US 51	0	0	0	0	0	0	0	0	0	0	0	0.5	3.3	5	0	0	0	0
48	Ramnagar (Bhullar Dhani)	RCH 773, RCH 776	0	0	0	0	0	0	0	0	0	0	0	0.5	6.7	7.5	0	0	0	0
49	Dhadde	RCH 776, US 71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



50	Kotrha	RCH 776, US 51	0	0	0	0	0	0	3.3	0	0	0	0	0	5	0	0	0	0	0
51	Rampura	RCH 773, RCH 776	0	0	0	0	0	0	1.3	0	2.5	0.5	5	0.5	3.3	10	5	0	0	2.5
52	Khokhar	RCH 776, US 71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	Chaoke	RCH 776, US 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	Lehra Sondha	RCH 776,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	Bhunder	RCH 776, US 71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	Lehra Dhurkot	RCH 776	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		Average							0.4		0.2	0.1	0.7	0.2	2.9	2.4	0.5			0.4
		Overall average							4.0	0.6	0.3	0.1	0.8	0.1	6.4	3.8	1.0	0.0	0.1	1.5

Table 2b: Observations on the occurrence of cotton diseases at research farm of ARS PAU Bathinda (Punjab)

DAS	Date/Month	Mean Percent Disease Intensity (PDI)													%Incidence		
		BLB			CLCuD			CLS			MLS			CoLS	Boll Rot (Fungal)		
		RCH 773	RCH 776	US 51	RCH 773	RCH 776	US 51	RCH 773	RCH 776	US 51	RCH 773	RCH 776	US 51	RCH776	RCH 773	RCH 776	US 51
60	Jul-15	0.0	0.0	0.0	0.0	0.00	5.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	--	--
75	Aug-01	0.0	0.0	0.0	33.3	16.7	18.3	0.0	0.0	0.0	0.0	0.0	0.0	--	--	--	--
90	Aug-15	0.0	0.0	0.0	50.0	23.3	26.7	0.0	0.0	0.0	0.0	0.0	2.5	--	--	--	--
105	Sep-01	0.0	2.5	2.5	55.0	30.0	33.3	5.0	7.5	5.0	5.0	5.0	5.0	--	--	0.1	0.1
120	Sep-15	2.5	5.0	5.0	60.0	41.7	45.0	7.5	10.0	7.5	7.5	7.5	7.5	2.5	0.1	0.1	0.1



Table 3a: Observations on the occurrence of CLCuD at farmer's fields in Sriganganagar and Hanumangarh (Rajasthan)

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/ Boll development (120-150 DAS)		
		Incidence (%)	PDI	Disease range	Incidence (%)	PDI	Disease range	Incidence (%)	PDI	Disease range
Sriganganagar District										
1. Kaliyan	RCH773	0.0	0.0	-	64.0	15.4	10.0-21.66	69.0	20.3	11.66-31.66
2. 1E	RCH 776	8.0	1.3	0.0-1.66	40.0	6.6	3.33-11.66	64.0	18.7	10.00-26.66
3. 3C Badi	ACH 177	0.0	0.0	-	58.0	12.5	6.66-26.66	59.0	14.3	8.33-25.00
4. 2B Kotha	RCH 926	19.0	1.8	0-3.33	60.0	13.3	3.33-20.00	62.0	21.1	13.33-26.66
5. Khakha	RCH 650	14.0	2.6	0-3.33	83.0	20.8	10.0-23.33	78.0	31.6	18.33-40.00
6. Renuka	US71	0.0	0.0	-	36.0	6.6	3.33-8.33	67.0	19.4	16.66-28.33
7. 9Y	SP7272	0.0	0.0	-	40.0	13.3	5.00-16.66	52.0	18.5	8.33-20.00
8. Mirjewala	Sim-Sim	0.0	0.0	-	40.0	16.6	10.00-25.00	57.0	20.1	1.66-31.66
9. Arayan	Moti	0.0	0.0	-	60.0	13.3	6.66-20.00	64.0	16.2	11.66-25.0
10. Chunavad	Katha									
	Ankur Ajay	0.0	0.0	-	40.0	8.3	6.66-23.33	47.0	12.6	8.33-18.33
	Balraj									
Average		4.1	0.6		52.1	12.7		61.9	19.3	
Hanumangarh District										
1. Jandwali	RCH773	0.0	0.0	-	22.0	5.0	3.33-10.0	36.0	8.3	3.33-16.66
2. 12. Pakkasaharna	RCH 776	0.0	0.0	-	31.0	4.4	3.33-10.0	38.0	11.2	5.00-18.33
3. 13.Rodawali	RCH 926	0.0	0.0	-	28.0	5.8	3.33-11.66	34.0	5.8	5.00-16.66
4. Nawan	RCH 650	0.0	0.0	-	32.0	3.1	1.66-8.33	32.0	6.6	1.66-13.33
5. 9NTW Nathwana	ACH 177	0.0	0.0	-	45.0	5.2	1.66-6.66	49.0	9.5	3.33-11.66
6. Gandeli	US 51	0.0	0.0	-	42.0	8.3	3.33-13.33	57.0	13.4	5.00-36.66
7. Jakhdawali	US71	0.0	0.0	-	34.0	3.5	1.66-10.0	40.0	8.9	1.66-15.0
8. Prempura	SP7272	0.0	0.0	-	37.0	2.9	1.66-6.66	36.0	6.3	3.33-11.66
9. Makkasar	NCS9024	0.0	0.0	-	28.0	2.2	1.66-15.0	35.0	8.4	6.66-18.33
10. Munda	Balraj	0.0	0.0	-	33.0	4.6	1.66-8.33	39.0	6.8	5.00-11.66
	Pass Pass									
Average		0.0	0.0		33.2	4.5		39.6	8.5	
Overall average		2.1	0.3		42.7	8.6		50.8	13.9	



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		
	Incidence (%)	PDI	Range	Incidence (%)	PDI	Range	Incidence (%)	PDI	Range	Incidence (%)	PDI	Range	Incidence (%)	PDI	Range
RCH773, US 51, ACH 177, NCS 9013, NSPL53, RST-9, HS-6, F846, F2228, CSH 3075	41.0	12.9	5.0-26.7	53.0	15.8	8.3-35.0	59.0	23.7	10.0-41.7	73.0	27.1	16.7-46.7	77.0	29.5	16.7-46.7

Table 4a: Observations on the occurrence of cotton diseases at Farmers fields in Hisar, Fatehabad, Sirsa, Jind, Bhiwani and Palwal 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	Fransi	US 51, BIO 6317	12.0	0.0	3.0	0.0	14.0	8.0	6.2	0.0
2	Ludas	RCH 773,776	8.6	0.0	4.1	4.6	10.0	13.0	4.8	2.4
3	Adampur	US 51, BIO 6488	12.5	0.0	4.0	0.0	14.0	10.2	5.2	2.0
4	Khairampur	RCH 776, US 51	11.0	0.0	2.0	2.0	13.5	9.8	2.0	3.0
5	Fransi	RCH 653, US 51	12.0	0.0	7.0	1.0	14.6	3.2	6.2	1.0
6	Kalirawana	BIO 6588, RCH 773	12.0	0.0	5.0	2.0	12.0	9.6	5.0	2.0
7	Kohli	RCH 773, US 51	8.0	0.0	8.0	1.0	11.2	5.3	9.2	1.0
8	Bherian	US 51 Krishana 555	4.5	0.0	6.3	0.0	8.0	15.8	2.4	2.5
9	Patan	Katha, US 51	12.0	0.0	4.2	1.2	12.0	15.0	4.2	2.3
10	Hindwan	RCH 776, US 51	18.4	0.0	5.0	4.6	22.0	7.0	12.0	2.8
11	Ragho Luhari	US 51, BIO 6488	10.8	0.0	2.4	0.0	11.0	0.0	6.2	1.6
12	Hansi	RCH 776, US 51	10.5	0.0	3.5	0.0	13.6	0.0	2.4	0.0
	Average		11.0	0.0	4.5	1.4	13.0	8.1	5.5	1.7
II	Fatehabad									
1	Ramsara	US 51, RCH 773	6.9	0.0	0.0	0.0	10.0	11.1	5.0	0.0
2	KharaKheri	US 51, RCH 776	8.2	0.0	3.0	2.2	11.0	11.0	3.0	2.2



3	Bhattu Kalan	RCH 773, 776	11.0	0.0	0.0	4.0	9.0	10.0	4.0	5.0
4	Dayor	US 51, RCH 773,	9.2	0.0	4.0	5.0	15.0	8.4	4.0	6.0
5	Jandawala	RCH 776, BIO 6688	11.0	0.0	2.0	0.0	12.0	12.0	3.0	0.0
6	Jandli Kalan	RCH 650, 773	9.4	0.0	0.0	0.0	12.0	7.0	5.0	0.0
7	PiliMandori	RCH 773, 776	14.0	0.0	5.0	3.0	14.0	8.0	5.0	3.0
	Average		10.0	0.0	2.0	2.0	11.9	9.6	4.1	2.3
III	Sirsa									
1	Ding	US 51,	8.0	0.0	2.0	1.0	10.0	2.0	2.0	2.0
2	Kukarthana	RCH 650, 776	10.0	0.0	1.5	3.0	12.0	7.0	3.0	3.0
3	Chaharwala	RCH 776, US 51	11.0	0.0	1.0	2.0	14.0	6.0	3.0	2.0
4	Haripura	RCH 776, BIO 6317	9.0	0.0	0.0	4.0	10.0	8.2	6.0	4.0
5	Dabra Kala	BIO 6488, RCH 650	4.0	0.0	2.5	2.5	6.0	3.5	2.5	2.5
6	Kherka	RCH 773, 776	2.4	0.0	0.0	0.0	4.0	2.5	1.0	0.0
	Average		7.4	0.0	1.2	2.1	9.3	4.9	2.9	2.3
IV	Jind									
1	Karsindhu	Katha	15.0	0.0	4.0	2.0	15.0	3.2	4.0	2.0
2	Palwan	RCH 650, 776	9.6	0.0	1.0	1.0	10.0	5.4	2.0	1.0
3	Intal Khurd	RCH 773, 776	9.8	0.0	5.8	1.0	10.0	10.0	5.8	1.0
4	Badowala	RCH 602, 773	14.0	0.0	8.2	2.2	14.5	15.9	8.2	2.2
5	Sunder Pura	RCH 650, 776	14.0	0.0	3.2	2.0	14.5	7.2	4.0	2.0
6	Uchana	RCH 602,	10.0	0.0	7.0	1.0	12.6	5.4	7.2	1.0
7	Milakpur	RCH 776, 773	6.4	2.5	0.0	0.0	8.0	0.0	0.0	0.0
8	Hebatpur	RCH 650, BIO 6588	3.2	0.0	0.0	0.0	4.2	0.0	0.0	0.0
	Average		10.3	0.3	3.7	1.2	11.1	5.9	3.9	1.2
V	Bhiwani									
1	Mandoli Kalan	RCH 650, 773	10.4	0.0	4.0	2.4	12.0	12.0	5.0	2.4
2	Isharwal	RCH 602, 650	2.0	0.0	5.0	4.0	9.0	10.9	6.0	4.0
3	Manfra	RCH 776, 773	8.0	0.0	5.0	0.0	10.5	8.0	5.0	0.0
4	Dhigawa	RCH 602, 776	9.0	0.0	5.0	0.0	10.0	8.4	9.0	0.0
5	Juhi Kalan	RCH 650, RCH 653	6.2	0.0	4.0	0.0	8.0	4.2	4.0	0.0
6	Dariyapur	RCH 650, BIO 6588	8.0	0.0	3.0	2.0	12.0	7.0	3.0	2.0
7	Bidhwan	RCH 650, 776	4.2	0.0	1.8	1.2	10.2	2.0	2.8	1.2
8	Budheda	RCH 602, 650	12.0	0.0	5.2	1.2	14.0	11.5	5.2	1.2



9	Bairan	RCH 602, Bio 6317	10.2	0.0	3.0	1.2	12.0	4.3	3.0	1.2
10	Kharkadi	RCH 773, BIO 6588	2.4	0.0	1.4	0.0	8.0	0.0	2.0	0.0
11	Jhuppa Kalan	US 51, BIO 6317	4.2	0.0	2.4	0.0	6.8	0.0	4.0	0.0
12	Jhuppa Khurd	RCH 773, 776	0.0	0.0	2.5	0.0	0.0	0.0	3.0	0.0
13	Barwas	RCH 773, BIO 6588	0.0	0.0	1.4	0.0	1.4	0.0	2.4	0.0
14	Gagarwas	US 51, BIO 6317	2.8	0.0	5.0	0.0	4.0	0.0	5.0	0.0
	Average		5.7	0.0	3.5	0.9	8.4	4.9	4.2	0.9
VI	Palwal									
1	Khokiyaka	RCH 773, BIO 6588	4.5	0.0	5.0	0.0	8.0	3.0	5.0	0.0
2	Pondri	US 51, BIO 6317	8.4	0.0	1.0	0.0	8.5	10.2	2.3	0.0
3	Indri	RCH 773, 776	2.4	0.0	4.0	2.0	11.2	8.2	4.0	1.0
4	Aluka	Ankur 3028, RCH 776	6.4	0.0	4.0	1.0	7.0	7.6	4.0	1.0
5	Mandkola	RCH 776, US 51	9.0	0.0	3.2	0.0	13.0	10.2	3.2	0.0
6	Dhateer	RCH 773, RCH 650	5.0	0.0	2.2	0.0	8.0	2.0	5.2	0.0
7	Maheshpur	US 51, BIO 6317	1.4	0.0	0.0	1.0	2.4	0.0	0.0	1.5
8	Janacholi	RCH 773, 776	2.4	0.0	0.0	0.0	3.0	0.0	0.0	0.0
	Average		4.9	0.0	2.4	0.5	7.6	5.2	3.0	0.4
	Overall average		8.2	0.1	2.9	1.4	10.2	6.4	3.9	1.5

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	0.0	0.0	0.0	0.0	0.0
July	RCH 773, 776, US 51	19.1	0.0	2.0	6.5	4.4	0.0	1.0	3.0
August	RCH 773, 776, US 51	29.9	6.4	6.5	8.0	20.3	4.2	3.0	3.5
September	RCH 773, 776, US 51	45.0	10.2	8.5	6.0	33.3	7.3	5.0	4.0
October	RCH 773, 776, US 51	50.5	11.0	10.8	6.5	33.3	8.4	4.7	4.5



CENTRAL ZONE**Table 5.a: Observations on the occurrence of cotton diseases at farmer's fields in Nanded, Jalna, Parbhani 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	ALS	BLB	GM	Boll rot
A	Nanded											
	1. Paimpalgaon Ardhapur,	Ajeet 155	-	-	-	2.0	2.8	-	2.0	3.0	7.6	6.3
	2. Degaon Tq. Ardhapur,	Rashi 659	-	-	-	3.0	3.1	-	3.0	3.3	7.7	8.0
	3. Jamrun Tq. Ardhapur,	Rashi 659	-	-	-	2.5	2.5	-	2.5	3.0	7.9	7.1
	4. Wadeपुरi Tq. Loha,	Vitthal	-	-	-	2.0	2.3	-	2.5	2.8	7.9	6.5
	5. Mustapur, tq. Naigaon,	Vitthal, Magic				2.4	3.0	-	2.4	3.1	7.7	7.8
	6. Dugaon, tq. Biloli	Raja				2.4	2.5	-	2.4	3.0	8.0	7.8
	Average					2.4	2.7		2.4	3.0	7.8	7.2
B	Jalna											
	1. Sipora-Ambhora, Tq. Jafrabad	Moksha, Rashi 659	-	-	-	-	-	-	-	-	8.3	7.5
C	Parbhani											
	7. Babhalgaon Tq. Pathari	Moksha, Jaadoo, Jai Ho	-	-	-	2.1	2.3	-	2.1	2.9	8.0	7.4
	8. Nipani Takali Tq. Selu	Jadoo	-	-	-	2.2	2.9	-	2.2	3.1	7.8	7.2
	Average					2.1	2.6		2.1	3.0	7.9	7.3
D	Aurangabad											
	9. Tidka, Tq. Soegaon	Supercot, Paras, Brahma, Mallika	-	-	-	2.2	2.4		2.2	3.1	7.6	8.0
	Overall average					2.2	2.5		2.3	3.0	7.9	7.5

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
June	RCH 2 BG II, Jadoo BG II, NHH 44 BG II	-	-	-	-	-
July		-	-	-	-	-
Aug		-	-	Trace	1.1	-
Sept.		-	-	3.5	4.5	-
Oct.		-	Trace (LRA 5166)	3.7	5.0	7.2
Nov.		-	-	-	-	8.1
Dec.		-	-	-	-	2.1



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	Chachondi	First class BG II	-	-	-	-	-	-	8.8	-	-
		Ajeet 155 Bt	-	-	-	-	-	-	11.3	-	20.0
		Neo Bt BG II	-	-	-	-	-	-	12.3	4.5	-
		JadooBt	-	-	-	-	-	-	11.3	10.0	-
2	Sanglud	Ajeet 155 Bt	-	-	-	-	-	-	14.3	-	-
		JadooBt	-	-	-	-	-	-	9.3	-	-
3	Umara	Ajeet 155 Bt							17.5	13.3	-
		JadooBt	-	-	-	-	-	-	15.8	-	5.3
		First class BG II	-	-	-	-	-	-	26.3	18.5	13.3
		RCH 659 Bt	-	-	-	-	-	-	9.3	-	-
4	Mathodi	First class BG II	-	-	-	-	-	-	15.7	-	-
		Ajeet 155 Bt							12.9		
									13.7	11.6	12.9
B	Buldhana district										
5	Jalgoan (Ja)	First class BG II	-	-	-	-	-	-	13.3	-	-
		Neo Bt BG II							17.1		
6	Zadegaon	Ajeet 155 Bt	-	-	-	-	-	-	13.5	14.6	-
		First class BG II	-	-	-	-	-	-	10.0	-	-
7	Paturda	Ajeet 155 Bt	-	-	-	-	-	-	13.3	-	-
		First class BG II	-	-	-	-	-	-	15.8	19.5	-
8	Jastgaon	Ajeet 155 Bt	-	-	-	-	-	-	17.5	-	17.8
									14.4	17.0	17.8
									14.1	12.5	12.9



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
Bhakti Bt	-	-	-	-	-	-	20.0	5.0	-
AKH 081 Bt	-	-	-	-	-	-	11.7	3.3	-
Rajat Bt	-	-	-	-	-	-	16.7	1.7	-
Mallika Bt	-	-	-	-	-	-	18.3	-	-
Ajeet 155 Bt	-	-	-	-	-	-	10.0	-	-
PKV Hy 2 Bt	-	-	-	-	-	-	15.0	-	-
Rasi 2 Bt							11.7		
Average							14.8	3.3	

BLB- Bacterial leaf blight,

GM- Grey Mildew, MLS-*Myrothecium* leaf spot**Table 7a: Observations on the occurrence of the diseases in farmer's field in Bharuch and Narmada (Gujarat)**

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	Wilt %	BLB	ALS	Wilt %	BLB	ALS	Wilt %
Bharuch										
1. Nikora : 21.47'21" °N:73.08'06" °E	ATM BG II	0.0	0.0	0.0	0.0-0.0	0.0	0.0	0.0-2.0	0.0	0.0
2. Karjan : 21.45'43" °N: 73.04'50" °E	BG II	0.0	0.0	0.0	0.0-2.0	0.0	0.0	0.0-4.5	0.0-2.5	0.0
3. Tankaria: 21.52'26" °N: 73.0'19" °E	BG II	0.0	0.0	0.0	0.0-1.0	0.0	0.0	0.0-3.5	0.0	0.0
4. Navetha: 21.72'18" °N: 72.82'48" °E	BG II	0.0	0.0	0.0	0.0-2.0	0.0	0.0	0.0-6.5	0.0-2.0	0.0
5. Hingalla: 21.55'7" °N: 73.0'4" °E	BG II	0.0	0.0	0.0	0.0-1.0	0.0	0.0	0.0-3.5	0.0	0.0
6. Bambusar: 21.48'44" °N: 73.3'19" °E	BG II	0.0	0.00	0.0	0.0-3.5	0.0	0.0	0.0-7.0	0.0	0.0
7. Magnad: 21.1'50" °N: 75.50'50" °E	BG II	0.0	0.00	0.0	0.0-0.0	0.0	0.0	0.0-2.5	0.0	0.0
Average					0.0-1.6			0.0-4.2	0.0-0.6	
Narmada										
1. Patgam: 21.1'50" °N: 75.50'50" °E	BG II	0.0	0.00	0.0	0.0-1.0	0.0	0.0	0.0-3.0	0.0-2.0	0.0
2. Ghatoli: 26.66'61" °N: 73.55'71" °E	BG II	0.0	0.00	0.0	0.0-1.5	0.0	0.0	0.0-3.5	0.0	0.0
3. Timbapada: 26.66'61" °N: 73.55'71" °E	BG II	0.0	0.00	0.0	0.0-0.0	0.0	0.0	0.0-2.0	0.0	0.0
Average					0.0-0.8			0.0-2.8	0.0-0.7	
Overall average					0.0-1.2			0.0-3.5	0.0-0.7	



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	Wilt %	BLB	ALS	Wilt %	BLB	ALS	Wilt %
G. Cot. Hy.8 BGII	0.0	0.0	0.0	0.0-5.5	0.0	0.0	0.0-9.5	0.0	0.0
G. Cot.Hy.10 BGII	0.0	0.0	0.0	0.0-7.5	0.0	0.0	0.0-15.0	0.0	0.0
G. Cot.Hy.12 BGII	0.0	0.0	0.0	0.0-10.5	0.0	0.0	0.0-18.5	0.0	0.0
GTHH 49 BGII	0.0	0.0	0.0	0.0-1.0	0.0	0.0	0.0-2.5	0.0	0.0
G. Cot. Hy.102	0.0	0.0	0.0	0.0-1.0	0.0	0.0	0.0-1.5	0.0	0.0
GSHH 08/17	0.0	0.0	0.0	0.0-4.5	0.0	0.0	0.0-8.5	0.0	0.0
GISV 328	0.0	0.0	0.0	0.0-1.0	0.0	0.0	0.0-2.0	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	0.0	0.0
G. Cot. Hy.8	0.0	0.0	0.0	0.0-5.0	0.0	0.0	0.0-9.0	0.0-2.0	0.0
G. Cot. Hy.10	0.0	0.0	0.0	0.0-4.0	0.0	0.0	0.0-8.0	0.0	0.0
G. Cot. Hy.12	0.0	0.0	0.0	0.0-25.5	0.0	0.0	0.0-42.5	0.0-3.0	0.0
GN Cot. Hy. 14	0.0	0.0	0.0	0.0-10.5	0.0	0.0	0.0-16.5	0.0	0.0
GSHH 19/11	0.0	0.0	0.0	0.0-11.5	0.0	0.0	0.0-18.5	0.0	0.0
GSHH 19/19	0.0	0.0	0.0	0.0-2.5	0.0	0.0	0.0-5.5	0.0	0.0
G. Cot. 16	0.0	0.0	0.0	0.0-2.0	0.0	0.0	0.0-5.0	0.0	0.0
G. Cot. 34	0.0	0.0	0.0	0.0-1.0	0.0	0.0	0.0-3.5	0.0	0.0
G. Cot. 42	0.0	0.0	0.0	0.0-4.5	0.0	0.0	0.0-6.5	0.0	0.0
G. Cot. 36	0.0	0.0	0.0	0.0-0.0	0.0	0.0	0.0-2.0	0.0	0.0
G. Cot. 25	0.0	0.0	0.0	0.0-0.0	0.0	0.0	0.0-0.0	0.0	0.0
G. Cot. 23	0.0	0.0	0.0	0.0-0.0	0.0	0.0	0.0-0.0	0.0	0.0
GN Cot. 22	0.0	0.0	0.0	0.0-1.5	0.0	0.0	0.0-3.5	0.0	0.0
GSHH 24/17	0.0	0.0	0.0	0.0-0.0	0.0	0.0	0.0-2.5	0.0	0.0
GSHH 15008	0.0	0.0	0.0	0.0-5.5	0.0	0.0	0.0-10.0	0.0	0.0
GN Cot. Hy. 18	0.0	0.0	0.0	0.0-4.0	0.0	0.0	0.0-8.5	0.0	0.0
LRA 5166	15.5	0.0	0.0	0.0-40.5	0.0	0.0	0.0-65.5	0.0	0.0
Average	0.0-15.5			0.0-40.5			0.0-65.5	0.0-3.0	



Table 8a: Observations on the occurrence of the diseases in farmer's field in Junagarh (Gujarat)

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	GM	Phoma	BLB	GM	CoLS	Cols	GM	ALS
	Bhavanagar										
1	Bagadana-1	Jadu	0.0	0.0	6.5	1.0	0.0	5.0	40.1	2.3	11.5
2	Bagadana-2	Goldy333	0.0	0.0	4.0	0.5	0.0	8.5	35.2	4.5	10.2
3	Bagadana-3	Raji-621	0.0	0.0	2.3	1.9	0.0	4.2	25.5	4.0	15.5
4	Bagadana-4	Radhika	0.0	0.0	1.6	2.5	0.0	5.0	33.5	5.0	18.3
5	Bagadana-5	Jadu	0.0	0.0	3.2	0.5	0.0	6.2	18.9	6.5	5.8
6	Varal I	Jadu	0.0	0.0	6.1	1.5	0.0	6.0	26.8	6.6	6.3
7	Varal 2	RCH-2	0.0	0.0	4.0	10.5	0.0	5.5	15.9	2.1	25.5
8	Varal 3	Jadu	0.0	0.0	1.2	0.5	0.0	7.2	24.0	4.5	8.9
9	Varal 4	Khanjar-350	0.0	0.0	5.0	3.2	0.0	8.0	22.6	6.9	11.5
10	Varal 5	Goldy-333	0.0	0.0	3.0	1.5	0.0	9.0	22.5	5.5	12.3
	Average				3.7	2.4	0	6.5	26.5	4.8	12.6
	Rajkot										
11	Fareni-1	ATM	0.0	0.0	1.2	0.0	0.0	10.2	38.5	6.8	11.0
12	Fareni-2	AUM Rudra	0.0	0.0	1.0	2.5	0.0	8.5	45.5	5.5	11.5
13	Fareni-3	ATM	0.0	0.0	3.5	0.0	0.0	10.5	40.5	3.5	12.5
14	Fareni-4	ATM	0.0	0.0	6.3	2.5	0.0	8.9	40.5	3.0	13.0
15	Fareni-5	KCH-1312	0.0	0.0	4.1	5.6	0.0	10.5	32.5	2.5	11.0
16	Fareni-5	ATM	0.0	0.0	5.0	2.5	0.0	10.0	41.0	4.6	16.5
17	Parabdi-1	Chadan moti	0.0	0.0	1.4	1.5	0.0	9.5	40.0	3.0	19.0
18	Parabdi-2	Navab	0.0	0.0	1.5	0.0	0.0	5.5	15.0	5.0	10.5
19	Parabdi-3	ATM	0.0	0.0	3.1	2.0	0.0	8.5	35.0	8.0	11.6
20	Jamtimbdi 1	Goldy-333	0.0	0.0	6.1	4.2	0.0	8.2	29.5	8.5	25.2
21	Jamtimbdi 2	Buyer7576	0.0	0.0	4.6	2.5	0.0	7.5	32.5	5.3	11.2
22	Jamtimbdi 3	ATM	0.0	0.0	1.0	2.1	0.0	6.5	25.5	4.5	10.3
23	Jamtimbdi 4	ATM	0.0	0.0	2.0	2.5	0.0	9.6	20.2	4.5	12.5
24	Jamtimbdi 5	Neo	0.0	0.0	2.5	2.6	0.0	5.0	30.5	3.6	12.0



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25	Jamtimbdi 6	Superb ATM	0.0	0.0	3.5	3.2	0.0	10.2	29.5	4.6	13.5
26	Jamtimbdi 7	Solar 76	0.0	0.0	1.5	1.0	0.0	10.3	35.5	15.5	14.5
27	Jamtimbdi 8	ATM	0.0	0.0	3.2	1.0	0.0	10.5	55.2	5.0	18.8
28	Jamtimbdi 9	ATM	0.0	0.0	1.2	2.5	0.0	7.5	34.5	5.5	10.5
29	Jamtimbdi 10	ATM	0.0	0.0	4.8	3.5	0.0	6.0	45.0	4.5	10.0
	Average				3.0	2.2	0.0	8.6	35.1	5.4	13.4
	Junagadh										
30	Dholva-1	Ajeet-5	0.0	0.0	3.5	1.0	0.0	8.8	28.5	3.5	15.5
31	Dholva-2	Goldy-333	0.0	0.0	3.0	1.0	0.0	7.5	33.2	8.5	16.9
32	Dholva-3	Ajeet-5	0.0	0.0	5.0	1.0	0.0	8.2	37.8	7.4	15.0
33	Dholva-4	Sanket	0.0	0.0	6.0	2.5	0.0	5.6	41.5	2.5	11.5
34	Dholva-5	Ajeet-5	0.0	0.0	5.0	3.5	0.0	7.0	33.8	3.5	10.0
35	Dholva-6	Jadu	0.0	0.0	2.3	0.5	0.0	8.6	31.2	5.6	9.00
36	Dholva-7	Varsha	0.0	0.0	1.5	1.0	0.0	5.5	39.1	2.6	12.5
37	Dholva-8	Varsha	0.0	0.0	1.5	1.0	0.0	3.5	30.2	3.5	11.4
38	Dholva-9	Ajeet-155	0.0	0.0	1.5	1.0	0.0	4.2	15.5	2.5	10.5
39	Dholva-10	Ajeet-5	0.0	0.0	2.0	1.5	0.0	3.5	20.5	3.5	12.5
40	Chuda-1	G. Cot. Hy.-24 BG-II	0.0	0.0	1.0	2.5	0.0	2.2	22.5	2.5	9.0
41	Chuda-1	KCHH-2108 BG-2	0.0	0.0	3.2	2.0	0.0	5.5	34.5	3.5	12.6
42	Chuda-1	Ajeet-1155	0.0	0.0	5.1	00	0.0	8.6	20.6	4.5	13.0
43	Chuda-1	Ankur-Jay	0.0	0.0	4.2	00	0.0	6.3	26.5	3.2	10.0
44	Chanaka-1	Navab	0.0	0.0	2.2	1.5	0.0	3.4	21.5	3.5	10.5
45	Chanaka-2	ATM	0.0	0.0	2.0	0.5	0.0	5.5	33.4	4.5	15.3
46	Chanaka-3	RCH 659	0.0	0.0	2.5	6.5	0.0	3.2	30.0	3.6	12.2
47	Chanaka-4	ATM	0.0	0.0	3.2	0.5	0.0	8.5	31.5	4.8	10.8
48	Chanaka-5	Navab	0.0	0.0	2.5	0.5	0.0	4.5	19.5	5.5	12.5
	Average				3.0	1.5	0.0	5.8	29.0	4.1	12.1
	Overall Average				3.2	1.9	0.0	7.0	30.9	4.8	12.7

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 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	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	0.0	0.0	0.0	0.0	0.0	0.0
Aug-	RCH-2 (BG-II)	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.2	0.0	2.5
	G. Cot. Hy. 8 (BG-II)	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2	0.0	5.0
Sept.	RCH-2 (BG-II)	0.0	0.0	20.0	0.0	0.0	0.0	10.5	25.5	0.0	10.5	2.5	0.0
	G. Cot. Hy. 8 (BG-II)	0.0	0.0	35.4	0.0	0.0	0.0	17.5	55.0	0.0	5.0	10.5	0.0
Oct.	RCH-2 (BG-II)	0.0	0.0	5.0	0.0	0.0	5.0	0.0	12.5	0.0	34.5	5.0	0.0
	G. Cot. Hy. 8 (BG-II)	0.0	0.0	8.0	0.0	0.0	3.5	0.0	25.5	0.0	6.5	8.9	0.0
Nov.	RCH-2 (BG-II)	0.0	0.0	2.0	35.8	0.0	5.0	0.0	2.0	0.0	0.0	0.0	0.0
	G. Cot. Hy. 8 (BG-II)	0.0	0.0	5.0	10.5	0.0	3.5	0.0	5.0	0.0	0.0	0.0	0.0
Dec.	RCH-2 (BG-II)	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	G. Cot. Hy. 8 (BG-II)	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Average	0.5	0.0	6.3	5.1	0.0	1.4	2.3	10.5	0.0	10.2	2.2	0.6

ALS=Alternaria leaf spot, HLS=Helminthosporium leaf spot, ATN= Anthracnose, CoLS= Corynespora leaf spot, GM= Grey mildew,



SOUTH ZONE**Table 9a: 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 (20-30 DAS)				Mid-season/Flowering (60-80 DAS)				Late/ Boll development (120-150 DAS)				
			ALS	BLB	GM	Boll rot	ALS	BLB	GM	Boll rot	ALS	BLB	GM	Rust	Boll rot
A	Name of the District: Belagavi														
1	1: Bevinkoppa	First class	0	0	0	0	9.6	1.0	1.0	0.0	19.7	4.0	6.8	7.7	14.5
		Yuva	0	0	0	0	15.5	1.2	1.8	0.0	20.7	4.4	6.0	10.0	11.6
		RCH-659	0	0	0	0	13.1	2.3	4.0	0.0	18.4	2.8	8.8	7.9	10.8
		Jadu	0	0	0	0	11.8	1.5	2.2	0.0	23.6	4.6	9.0	10.6	13.3
		Puli	0	0	0	0	10.0	1.9	3.7	0.0	20.1	5.1	7.1	9.8	10.9
2	2: Neginal	Malini	0	0	0	0	7.5	1.8	2.1	0.0	19.4	4.0	6.1	9.9	15.7
		Chiranjeevi	0	0	0	0	9.9	2.1	3.8	0.0	18.9	3.7	8.2	8.7	13.6
		MRC7351	0	0	0	0	12.3	3.0	1.6	0.0	24.1	3.0	7.6	7.1	13.0
		Jwala	0	0	0	0	10.5	3.1	2.2	0.0	22.3	4.5	8.8	6.5	14.9
		Money maker	0	0	0	0	13.7	1.1	2.9	0.0	21.5	5.2	5.5	10.1	15.0
3	3: Murgod	Lotus	0	0	0	0	10.8	1.7	3.1	0.0	19.1	4.6	7.4	10.9	14.7
		Super cot	0	0	0	0	9.3	1.8	1.7	0.0	23.0	3.8	9.3	9.6	13.7
		Rasi magic	0	0	0	0	13.9	2.3	2.0	0.0	16.7	5.0	8.0	11.8	10.8
		Bhaskar	0	0	0	0	15.2	2.6	3.6	0.0	25.6	5.2	6.6	9.9	14.2
		Soumya	0	0	0	0	9.1	2.4	5.4	0.0	18.8	3.8	6.0	7.5	14.0
4	4: Belawadi	First class	0	0	0	0	8.5	2.0	2.5	0.0	21.7	5.0	8.1	12.0	14.9
		Ajeet155	0	0	0	0	14.4	1.0	2.2	0.0	22.7	5.1	4.8	10.5	15.3
		RCH-659	0	0	0	0	12.9	2.0	1.1	0.0	21.5	2.0	7.9	9.7	10.7
		Soumya	0	0	0	0	9.9	1.7	4.4	0.0	20.5	2.8	8.2	7.1	13.3
		Puli	0	0	0	0	10.7	2.0	3.9	0.0	17.3	3.7	6.7	10.1	14.5
5	5: Hosur	Malini	0	0	0	0	11.5	1.0	2.8	0.0	25.1	3.0	9.0	10.6	13.7
		Chiranjeevi	0	0	0	0	14.4	1.7	2.0	0.0	17.9	4.8	8.3	9.9	14.7
		MRC7351	0	0	0	0	12.1	2.0	5.0	0.0	21.9	3.3	7.7	11.3	12.5
		Jwala	0	0	0	0	9.1	2.0	3.8	0.0	20.6	5.1	6.8	9.0	11.5



		Money maker	0	0	0	0	15.1	2.5	2.1	0.0	19.8	3.9	9.0	11.2	13.3
	Average		0.0	0.0	0.0	0.0	11.6	1.9	2.8	0.0	20.8	4.1	7.5	9.6	13.4
B	Name of the district: Dharwad														
6	1: Morab	First class, RCH-659	0	0	0	0	12.7	1.5	5.8	0.0	20.0	6.8	9.9	20.7	18.1
		Vaibhav	0	0	0	0	12.4	2.3	7.2	0.0	22.7	5.5	9.0	18.8	20.1
		Jwala	0	0	0	0	9.9	3.1	8.0	0.0	17.8	4.8	10.7	17.7	19.9
		Vega	0	0	0	0	13.1	1.2	6.2	0.0	21.1	7.8	9.7	19.8	18.9
		MRC7351	0	0	0	0	12.9	2.2	5.6	0.0	21.0	7.0	10.9	18.8	17.8
7	2: Kundgol	First class	0	0	0	0	8.8	3.5	7.2	0.0	23.3	8.8	11.2	17.7	18.1
		Mahadev	0	0	0	0	9.9	1.9	5.6	0.0	16.6	6.8	9.8	19.9	17.8
		RCH-659	0	0	0	0	11.2	4.3	6.3	0.0	19.8	7.7	12.6	18.9	20.5
		Soumya	0	0	0	0	10.9	1.8	4.6	0.0	22.5	5.5	10.9	18.8	20.0
		Ajeet 155	0	0	0	0	12.6	2.2	6.8	0.0	24.6	7.0	11.5	20.5	19.3
8	3: Shivalli	Ajeet 199	0	0	0	0	8.6	3.7	7.1	0.0	21.2	7.8	12.2	18.7	19.2
		MRC7383	0	0	0	0	14.8	2.8	7.9	0.0	25.0	5.7	9.9	20.8	18.7
		Jwala	0	0	0	0	13.2	4.4	6.1	0.0	19.9	4.1	10.1	16.8	17.8
		Vega	0	0	0	0	14.1	1.9	6.7	0.0	21.5	6.7	10.5	18.9	20.5
		MRC7351	0	0	0	0	11.0	5.1	4.9	0.0	24.0	5.8	11.8	20.6	18.7
9	4: Kundagol	First class	0	0	0	0	13.8	2.3	7.7	0.0	19.7	5.8	12.8	19.6	18.2
		Super cot,	0	0	0	0	15.5	4.0	5.1	0.0	20.8	5.9	11.8	20.4	17.8
		Jwala	0	0	0	0	9.9	3.0	4.8	0.0	24.6	6.1	10.9	18.7	20.1
		MRC7351	0	0	0	0	11.9	2.6	7.0	0.0	21.8	7.8	11.1	18.8	18.2
		RCH-659	0	0	0	0	10.7	2.8	5.9	0.0	17.7	4.9	9.9	17.5	18.0
10	5: Noolvi	Bhaskar	0	0	0	0	13.7	1.5	6.5	0.0	20.8	6.1	8.1	19.4	17.7
		First class	0	0	0	0	12.1	4.8	7.2	0.0	22.5	7.9	9.9	18.6	18.0
		RCH-659	0	0	0	0	14.3	1.8	5.9	0.0	24.0	5.9	10.6	17.8	18.0
		Soumya	0	0	0	0	13.7	3.5	6.5	0.0	20.0	4.5	8.8	19.3	20.0
		Ajeet 155	0	0	0	0	12.3	2.8	5.5	0.0	24.2	6.7	9.9	18.8	19.8
	Average		0.0	0.0	0.0	0.0	12.1	2.8	6.3	0.0	21.5	6.4	10.6	19.0	18.8
C	Name of the district: Gadag														
11	1: Shirahatti	Rasi 659	0	0	0	0	9.6	1.0	4.6	0.0	18.5	2.3	7.8	10.6	8.6
		First class	0	0	0	0	10.8	1.3	5.6	0.0	18.0	2.0	6.7	9.4	6.7



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		Super cot	0	0	0	0	12.1	1.0	4.9	0.0	17.8	2.7	8.9	11.0	8.9
		Rasi magic	0	0	0	0	10.5	2.3	6.0	0.0	16.6	3.3	8.0	10.4	6.0
		MRC7383	0	0	0	0	9.9	1.0	3.5	0.0	16.9	2.0	7.8	11.7	8.2
12	2: Timmapur	Everest	0	0	0	0	10.6	1.8	4.5	0.0	18.0	2.8	10.0	9.8	7.4
		Ajeet 155	0	0	0	0	12.7	1.9	5.9	0.0	18.8	3.5	9.0	9.0	7.0
		RCH-659	0	0	0	0	10.0	1.0	5.9	0.0	17.9	3.9	8.9	10.6	6.6
		Bhaskar	0	0	0	0	11.7	2.1	4.8	0.0	16.4	3.0	8.9	11.4	8.4
		Rasi 659	0	0	0	0	12.5	1.7	6.1	0.0	16.6	2.6	7.8	11.7	7.7
13	3: Kadakol	MRC7351	0	0	0	0	10.8	1.0	5.9	0.0	17.7	2.9	9.0	10.6	9.0
		First class	0	0	0	0	9.9	1.0	4.6	0.0	17.7	3.0	8.9	8.9	8.9
		Super cot	0	0	0	0	9.6	1.0	5.0	0.0	16.2	3.1	7.8	10.0	7.7
		Jadu	0	0	0	0	12.2	1.7	4.7	0.0	18.0	3.1	8.2	11.4	8.5
		Ajeet199	0	0	0	0	10.1	1.7	5.7	0.0	18.8	3.0	8.1	11.2	6.8
14	4: Veerapur	Everest	0	0	0	0	10.5	1.9	5.7	0.0	17.7	2.9	7.8	10.0	9.0
		Ajeet 155	0	0	0	0	9.7	2.0	4.9	0.0	18.4	2.4	9.2	9.0	7.8
		RCH-659	0	0	0	0	12.0	2.0	4.0	0.0	18.0	2.7	8.7	10.0	6.7
		Bhaskar	0	0	0	0	10.0	1.9	5.9	0.0	16.6	3.0	7.5	9.4	8.0
		MRC7351	0	0	0	0	11.8	1.0	5.0	0.0	18.8	3.0	8.0	11.5	7.6
15	5: Allipur	Rasi 659	0	0	0	0	12.7	1.4	5.7	0.0	17.7	2.7	9.6	11.5	8.0
		First class	0	0	0	0	10.5	1.7	6.4	0.0	18.0	2.0	8.6	11.0	8.4
		Super fiber,	0	0	0	0	10.0	2.2	6.0	0.0	16.7	2.8	9.2	9.7	6.7
		Jiaho	0	0	0	0	9.3	1.0	5.9	0.0	18.0	2.0	7.2	9.9	7.8
		Jadu	0	0	0	0	11.0	1.8	5.0	0.0	18.0	2.0	8.0	10.0	8.0
	Average						10.8	1.5	5.3	0.0	17.7	2.7	8.4	10.4	7.8
D	Name of the district: Haveri														
16	1 :Bankapur	MRC7351	0	0	0	0	16.6	2.0	6.7	0.0	26.5	3.4	12.4	16.7	13.0
		MRC 7383	0	0	0	0	15.4	1.7	8.9	0.0	28.6	4.7	9.8	15.5	13.5
		Jaadu	0	0	0	0	14.0	2.9	5.7	0.0	26.0	2.0	14.7	16.7	14.0
		First class	0	0	0	0	13.9	1.0	7.8	0.0	27.8	3.8	10.0	14.5	12.5
		Rasi-659	0	0	0	0	17.5	1.0	8.0	0.0	28.0	4.7	9.6	15.1	12.0
17	2: Bisanahalli	First class	0	0	0	0	15.5	3.0	6.7	0.0	27.0	4.7	11.9	16.0	12.7
		Priya seeds	0	0	0	0	18.0	1.0	5.9	0.0	27.8	3.8	14.5	15.7	11.5
		MRC7351	0	0	0	0	15.6	3.0	8.9	0.0	26.7	3.2	10.6	16.0	15.0



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		Dhanya	0	0	0	0	16.7	2.0	5.6	0.0	29.0	4.0	9.7	14.0	12.0
		Puli	0	0	0	0	18.0	1.0	7.1	0.0	27.8	3.0	14.5	15.8	13.7
18	3: Motebennur	Mahadev	0	0	0	0	16.7	2.7	6.6	0.0	28.2	3.5	10.6	17.0	10.9
		MRC7351	0	0	0	0	18.3	1.9	8.0	0.0	30.0	4.7	12.9	14.5	13.9
		MRC 7383	0	0	0	0	17.8	2.0	7.6	0.0	28.9	3.0	14.5	16.0	14.0
		Jaadu	0	0	0	0	16.0	2.2	6.0	0.0	27.5	5.0	10.4	15.5	14.0
		First class	0	0	0	0	15.9	1.8	8.4	0.0	30.0	5.0	8.7	14.0	10.1
19	4: Tavaragi	Ajeet 155	0	0	0	0	17.8	2.8	6.7	0.0	27.0	4.0	13.7	16.0	12.9
		MRC 7383	0	0	0	0	16.4	1.0	7.8	0.0	29.7	4.0	14.0	14.0	13.0
		Jaadu	0	0	0	0	15.9	3.0	8.0	0.0	28.9	3.7	12.7	17.8	11.9
		First class	0	0	0	0	18.0	1.0	5.6	0.0	27.7	3.9	10.5	16.9	10.9
		Ajeet 199	0	0	0	0	18.4	2.2	8.2	0.0	29.0	4.0	14.0	15.5	13.0
20	5: Hosalli	First class	0	0	0	0	16.8	1.2	5.7	0.0	26.0	3.2	13.0	16.0	14.2
		Priya seeds	0	0	0	0	17.6	2.2	7.9	0.0	30.1	4.0	9.7	14.9	10.0
		Yuva	0	0	0	0	16.6	1.9	6.6	0.0	30.0	4.7	8.9	14.0	11.2
		MRC 7383	0	0	0	0	17.0	3.0	7.7	0.0	27.7	3.9	11.0	17.0	12.3
		Puli	0	0	0	0	18.0	1.0	5.6	0.0	28.0	4.0	14.0	17.0	10.0
	Average						16.7	1.9	7.1	0.0	28.2	3.9	11.8	15.7	12.5
E	Name of the district: Uttar Kannada														
21	1: Koppa	First class	0	0	0	0	9.2	1.0	5.5	0.0	17.8	3.0	13.4	7.8	16.6
		MRC 7383	0	0	0	0	12.5	2.0	7.7	0.0	15.5	2.7	12.0	6.7	15.0
		Jaadu	0	0	0	0	8.9	2.0	8.4	0.0	16.6	3.0	10.6	7.0	14.5
		Everest	0	0	0	0	10.5	2.0	5.8	0.0	15.5	3.2	11.1	6.4	17.0
		Mahadev	0	0	0	0	11.1	2.0	8.0	0.0	18.4	2.7	12.4	8.0	16.6
22	2: Mundagod	First class	0	0	0	0	12.0	1.6	7.8	0.0	20.6	4.2	13.4	8.5	14.5
		Yuva	0	0	0	0	11.0	2.0	8.5	0.0	16.4	3.7	10.0	8.9	15.0
		Priya seeds	0	0	0	0	9.6	3.0	5.5	0.0	18.6	4.0	12.0	7.5	14.6
		Puli	0	0	0	0	12.0	2.0	7.0	0.0	20.0	4.3	9.9	6.7	13.9
		Chiranjeevi	0	0	0	0	8.6	1.7	8.4	0.0	20.0	3.9	12.7	9.0	14.0
23	3: Bachunaki	Dhanya	0	0	0	0	9.5	2.0	5.1	0.0	20.0	3.0	13.7	8.6	15.5
		MRC 7383	0	0	0	0	12.6	1.7	7.7	0.0	18.8	2.0	12.7	7.8	16.7
		Jaadu	0	0	0	0	11.0	1.7	7.7	0.0	16.4	3.0	10.0	8.1	16.4
		Chiranjeevi	0	0	0	0	9.6	2.0	8.0	0.0	21.0	4.7	12.2	8.3	15.9



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		Mahadev	0	0	0	0	12.0	2.0	7.0	0.0	18.5	3.7	10.4	7.8	15.0
24	4: Hundagol	First class	0	0	0	0	10.1	2.0	6.6	0.0	20.0	4.0	9.7	7.6	16.0
		MRC 7383	0	0	0	0	8.1	2.0	8.9	0.0	19.6	3.7	10.5	6.7	14.8
		Yuva	0	0	0	0	9.1	1.0	8.0	0.0	18.4	3.8	13.6	5.6	15.0
		Priya seeds	0	0	0	0	10.5	1.6	7.7	0.0	17.7	4.2	12.0	6.8	15.1
		Puli	0	0	0	0	10.0	1.4	7.2	0.0	16.4	4.2	11.8	7.6	16.6
25	5: Bachanaki	Chiranjeevi	0	0	0	0	7.9	2.1	8.5	0.0	18.0	3.6	12.4	8.1	14.2
		MRC 7383	0	0	0	0	12.2	1.6	7.0	0.0	17.6	4.2	9.7	9.0	15.5
		Jaadu	0	0	0	0	13.0	2.0	6.0	0.0	16.7	4.0	8.4	6.8	16.7
		Everest	0	0	0	0	13.6	2.0	6.6	0.0	17.8	4.9	10.4	7.3	14.0
		Mahadev	0	0	0	0	12.4	1.7	8.0	0.0	20.8	3.0	13.7	8.5	14.5
	Average		0	0	0	0	10.7	1.9	7.3	0.0	18.5	3.7	11.5	7.7	15.3
	Overall average						12.4	2.0	5.8	0.0	21.3	4.2	10.0	12.5	13.6

ALS=Alternaria leaf spot, BLB= Bacterial leaf blight, CoLS= Corynespora leaf spot, GM= Grey mildew, MLS=Myrothecium leaf spot, RR= Root rot.



Table 9b: Observations on the occurrence of diseases at 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-21	DPC-7065, Rashi magic, Money maker, Malini, Raja NCS-954,MRC7017,MRC7373,MRC7383,Zoradar,NBC102,Yuva7215-2,RCH659,Ajit111-2, Jwala, Jai, First class and Dr Brent.	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. - 21	DPC-7065, Rashi magic, Money maker, Malini, Raja NCS-954,MRC7017,MRC7373,MRC7383,Zoradar,NBC102,Yuva7215-2,RCH659,Ajit111-2, Jwala, Jai, First class and Dr Brent.	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.-21	DPC-7065, Rashi magic, Money maker, Malini, Raja NCS-954,MRC7017,MRC7373,MRC7383,Zoradar,NBC102,Yuva7215-2,RCH659,Ajit111-2, Jwala, Jai, First class and Dr Brent.	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. - 21	DPC-7065, Rashi magic, Money maker, Malini, Raja NCS-954,MRC7017,MRC7373,MRC7383,Zoradar,NBC102,Yuva7215-2,RCH659,Ajit111-2, Jwala, Jai, First class and Dr Brent.	0.0	6.5	8.8	18.8	0.0	0.0	0.0	0.0	0.0	17.5	6.5	18.5
Dec.-21	DPC-7065, Rashi magic, Money maker, Malini, Raja NCS-954,MRC7017,MRC7373,MRC7383,Zoradar,NBC102,Yuva7215-2,RCH659,Ajit111-2, Jwala, Jai, First class and Dr Brent.	0.0	0.0	15.6	8.9	0.0	0.0	0.0	0.0	0.0	5.4	4.5	24.6
	Average	0.0	3.2	6.8	12.9	0.0	0.0	0.0	0.0	0.0	9.8	6.8	11.1

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



Table10a: Observations on the occurrence of diseases in Guntur, Krishna and Prakasam 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	Name of the District: Guntur																		
1	Tadikonda crossroads	Sheetal	0	Traces	0														
2	Ponnekllu	US 4708	0	Traces	0														
		Platinum	0	Traces	0														
3	Ravela	Akira	0	Traces	0														
4	Pamulapadu	US 4077	0	Traces	0														
5	Mandepudi	Jaadoo	0	Traces	0														
6	Kambhampadu	KCH 111	0	Traces	0														
7	Parasa	Akira	0	0	0														
8	75 Thalluru	RCH 659	0	0	0														
9	Attaluru	Sadananda	0	0	0														
10	Jupudi	Akira	0	0	0														
11	Malladi	ATM	0	0	0														
12	Didugu	UPL 767	0	Traces	0														
		Money maker	0	0	0														
13	Muttayapalem	US 7067	0	Traces	0														
14	Dharanikota	Akira	0	0	0														
15	Amaravathi	RCH 659	0	0	0														
16	Lemalle	Akira	0	0	0														
17	14 th Mile	Jaadoo	0	0	0														
18	Mothadaka	RCH 659	0	0	0														
19	Nidumukkala	Akira	0	0	0														
20	Lam	Magic	0	0	0														
21	Perecherla	Crystal 999		0	0														
22	Visadala	Akira		0	0														
23	Medikonduru	Akira		0	0														
24	Bhimenivaripalem,	Crystal 999		0	0														
25	Kantepudi	Asha		0	0														
26	Dhulipalla,	US 4753		Traces	Traces														
27	Reddigudem,	Asheerwad		0	0														
28	Rajupalem	Jaadoo		0	0														
29	Kota Nemalipuri,	Akira		0	0														
30	Piduguralla	Akira		0	Traces														
		Adbhut		1.0	1.3														
31	Brahmanapalle	US 4753		Traces	1.0														



32	Thummalacheruvu,	Sadananda		Traces	1.0													
33	Kesanupalle	US 7067		Traces	0													
		Suraj		0	0													
		Jaadoo		0	0													
		Akira		0	0													
34	Nadikudi	Asha		0	0													
35	Gurazala	Suraj		0	0													
36	Kambhampadu	Tulasi 216		Traces	Traces													
37	Paluvai Junction	Tulasi 7		0	0													
38	Rayavaram	RCH 659					1.0		2.0									
39	Durgi	Moksha					0		0									
		Target					0		0									
		KCH 100					0		0									
40	Obulesunipalle	Geetha		0	0													
41	Adigoppula	Mudra					0		9									
42	Narmalapadu	Mudra		Traces	Traces													
43	Oppicharla	RCH 659					0		0									
44	Karempudi	RCH 659		0	0													
45	Julakallu	Akira		Traces	Traces													
46	Raviapdu	Big Boss		0	0													
47	Satuluru	Money Maker		0	0													
48	Mothadaka	Akira		0	0													
49	Mandepudi	US 4708 -wilt		0	0											Traces		
50	Phirangipuram	Akira		0	0													
51	Jonnalagadda	Akira-wilt		0	0													
52	Jonnalagadda	Akira		0	0													
53	Venegadla	RCH 659		0	0													
54	Bayyaram	Asheerwad		0	0													
55	Achempet	Tulasi 7		0	0													
56	Tadikonda	Money Maker		0	0													
57	Amaravati	RCH 659		0	0													
58	Lam	Magic		0	0													
59	Tatireddypalem	U 7067		0	0													
60	Satuluru	RCH 659		0	0													
61	Gollapalli	Tulasi 7					Traces		0									
62	Dupadu	Tulasi 7					Traces		0									
63	Bezathpuram,	Akira		Traces	Traces													
64	Pamulapadu	RCH 659					1.0		5.2									
65	Ponnekallu	US 4708					1.0		1.5									
66	Ravela	US 4708					Traces		Traces									



67	Tadikonda	Akira				Traces		Traces										
		US 7067				Traces		Traces										
68	Tatireddypalem	Tulasi 216		0.8	1.25													
69	Nidumukkala	Akira				Traces		Traces										
		US 4708				Traces		Traces										
70	Mandepudi	Asha				Traces		Traces										
71	Mothadaka	Akira				Traces		Traces										
72	Bayyaram	Tulasi 45				Traces		Traces										
73	Pedaparimi	Akira			0	2.1		2.0										
		RCH 659			0	4.3		3.8										
74	Borupalem	US 4078			0	4.3		5.8										
75	Vikunthapuram	RCH 659			0	1.8		1.5										
76	Amravathi	Akira			Traces	2.0	10.0	3.0										
77	Dharanikota	Jaadoo			13.5	0		13.3										
78	Bayyavaram	NCS 971			4.0	2.3		1.8										
		Crystal 999			0	Traces		Traces										
79	Vipparla	US 7067			0	Traces		Traces										
80	Grandhasiri	Crystal 999			0	3.5		3.8										
81	Velpuru	RCH 659			0	3.5		3.0										
		Crystal 999			0	Traces		Traces										
82	Garikapadu	Crystal 999			7.0	Traces	Traces	Traces										
83	Reddigudem	Akira			0	Traces		Traces										
84	Rajupalem	US 4078			0	0		0										
		Crystal 999			0	5.5		6.0										
85	Bellamkonda	RCH 659			0	Traces		Traces										
86	Chandrajupalem	US 4078			0	0		0										
87	Visadala	Akira			0	Traces		6.1										
88	Medikonduru	Superb			0	Traces		3.5										
89	Siripuram	RCH 797			0	0		4.1										
		Akira			0	Traces		Traces										
		Money maker			Traces	Traces		Traces										
90	Paladugu	US 7067			Traces	Traces		3.7										
		Tulasi 45			0	0		4.5										
91	Kantepudi	Bhakthi			0	1.5		5.8										
92	Sattenapalli	US 111			0	0		Traces										
		Akira			0	Traces		2.7										
93	Chagantivaripalem	Neo			1.5	0		5.3										
94	Lankalkurapadu	Siri			Traces	0		Traces										
95	Chandavaram	Jaadoo			2.0	0		14.5										
96	Nadendla				0	0		1.5										
97	Chirumamilla	Nava Mallika			Traces	1.0		2.9										



98	Tupadu	Asheerwad				0	Traces		Traces									
99	Solasa, Edlapadu	Tulasi 7				0	1.3		1.9									
100	Changhiskhanpet	Akira				1.3	0		4.7									
101	Kondaveedu	Akira																
102	Phirangipuram	US 7067				0	0		3.0									
103	Tadikonda	US 7067									Traces	0	16.6					
104	Tatireddypalem	Tulasi 216				0	0		4.8									
105	Pedaparimi,	Revanth				0	0		1.9									
		Siri									Traces	0	6.9					
106	Badepuram,	US 4078									0	0	21.6					
107	Neerukonda,	Akira				0	0		1.3									
108	Thulluru	Siri				0	0		8.0									
109	Mothadaka,	Akira									0	0	1.4					
110	LacchannaGudipudi	Tulasi 216				0	0		4.5									
111	Lemalle	Akira									Traces	Traces	12.6					
112	Endroyi	Akira									Traces	0	22.2					
113	Nidumukkala,	RCH 659									Traces	0	11.5					
114	Lam	Akira				0	0		7.41									
Nov	Kurnoothala,	Akira									Traces	0	6.6					
115	Koyavaripalem	RCH 659									4.0	0	9.0					
116	Tikkireddypalem	Jaadoo									7.7	0	10.0					
117	Prattipadu	Satya									13.5	1.3	7.6					
118	Pedanandipadu	Jaadoo									0	12.9	23.1					
119	Gundalpadu,	RCH 659									0	0	8.0					
120	Phirangipuram	Jaadoo									0	0	15.0					
		Tulasi 7									0	0	10.0					
121	Rudravaram,	Nava Mallika									7.3	0	28.8			2	Traces	0
122	Dhulipalla	Sadanand									0	0	17.9			5	10.4	8.8
123	Reddigudem,	RCH 659									0	0	17.3			2	3.68	0
124	Bellamkonda										7.0	0	11.4			0	0	0
125	Chowtapapayapalem	Akira									0	0	10.1			0	0	0
126	Piduguralla	US 7067									0	0	9.9			0	0	0
127	Brahmanapalli	US 4753									0	0	29.0			0	7.5	10.4
128	Thummalacheruvu	Sadananda									0	0	15.1			1.9	0	9.5
129	Keasanpalli,	Komali									0	0	21.1			1.3	0	0
130	Gamalapadu	Magna									0	0	7.5			1.8	0	0
131	KottaAmbapuram,	Akira									11.8	0	23.5			2.8	5.0	0
132	Gurazala	Suraj									0	0	9.1			1.2	9.0	9.2
133	Rentachintala	Tulasi 7									0	0	12.5			2.0	0	0
134	Kambhampadu	Tulasi 216									0	0	19.3			1.5	8.3	2.0
135	Veldhurthi	Syerra									0	0	13.3			1	0	0



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136	Rayavaram	RCH 659									5.7	0	10.3			0	0	0
137	Polepalli,	Jaadoo									0	0	17.0			1.9	0	12.8
138	Naramalapadu	Mudra									0	0	9.2			3.5	0	6.7
139	Karempudi	RCH 659									0	0	14.7			3	0	0
140	Gundlapalli,	Akira									0	0	16.7			2	0	0
			0.0	0.0	0.1	0.8	1.0		3.7		2.0	0.4	14.2			1.6	2.3	3.0
	Krishna																	
1	G. Konduru	Tulasi 7		Traces	Traces													
		Akira		0	0													
2	Venkatapuram	Dhan Dev		0	0													
		Tulasi 7		0	0													
3	Chandragudem	Jaadoo		Traces	Traces													
4	Pulluru	Tulasi 216		0	0													
		Dhan Dev		0	0													
		RCH 756		0	0													
		Super 971		0	0													
5	Ramachandrapuram	Nava Mallika		0	0													
		Khiladi		0	0													
		Bijli		0	0													
		RCH 659		0	0													
		Super 971		0	0													
		Dhan Dev		0	0													
6	Kambhampadu	RCH 659					0	0	0									
		Dhan dev					0	0	0									
		Jaadoo		0	0													
		ATM		0	0													
7	G. Kotturu	Nava Mallika		0	0													
8	Ganugapadu	Target		0	0													
		RCH 659		0	0													
9	Challagundlavaripalem	Asheerwad		0	0													
10	Anigandlapadu	NCS 2778		0	0													
11	Chillakallu	US 7067		0	0													
12	Bhimavaram	Plantinum		0	0													
13	Makkapeta	RCH 659		Traces	Traces													
14	Ambarupeta	US 7067		0	0													
15	Moguluru	Asha					0		Traces									
		Big boss					0		0									
16	G. Konduru	Tulasi 7									17.5	0	25.3			0	4.6	10.0
17	Venkatapuram	Akira									5.2	0	25.5			0	15.4	0
18	Chevuturu	Dhan Dev									9.2	0	24.2			0	20.6	0
19	Mylavaram	RCH 659									2.5	0	22.5			0	16.8	5.8



20	Pulluru	Tulasi 216										5.0	0	24.5			2.0	13.5	0
21	Krishnaraopalem	Akira										0	0	26.0			4.0	13.7	0
22	Kambhampadu	RCH 659										5.0	0	27.0			0	2.0	0
23	Polisetipadu, AKonduru	Tulasi 7										0	0	23.8			1.5	15.6	0
24	Tiruvuru	Dhan Dev										6.3	0	10.0			0	5.6	2.0
25	Rajeevnagar	Target										0	0	10.2			0	2.5	0
26	Gampalagudem	RCH 659										0	0	18.9			0	0	10.0
27	Challagundlavariipalem	Asheerwad										0	0	8.0			0	0	0
28	Penugolanu	RCH 659										0	0	19.0			0	19.5	0
29	Thalluru	Asheerwad										0	0	21.0			0	5.0	5.8
30	Lingamgudem	RCH 659										3.0	0	19.0			0	Traces	0
31	Penuganchhprolu	Tulasi 7										4.5	0	19.0			0	0	0
32	Bhimavaram	Sadananda										0	0	21.3			0	1.9	0
33	Gowravaram,	RCH 659										8.4	0	18.8			0	6.5	0
34	Nandigama	Dhan Dev										0	0	26.8			0	2.7	0
35	Keesara,	RCH 659										4.8	0	24.5			0	3.8	2.0
	Average		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	3.6	0.0	20.8			0.4	2.9	1.8
	Prakasam																		
1	Thokapalli,	Target					Traces		0	0	0	0							
2	Gobburu,	Shakthi					Traces		0	0	0	4.2							
3	Nikarampalli,	Tulasi 216					3.0		2.0	0	0	Traces							
4	Chinthaguntla	Dhan Dev		Traces	0	0													
5	Besthavaripeta	Shooter					Traces		0	0	0	0							
6	Errapalem,	Profit Plus					Traces		Traces	0	0	0							
7	Narsireddipalli	Pratap					Traces		0	0	0	0							
8	Turumalle	Pradeep					Traces		0	0	0	0							
9	Ankireddypalem	RCH 659				0	0		13.3	0	0								
10	Vankayalapadu	Jaadoo				0	0		6.6	1.0	0								
11	Pusapadu	Tulasi 7				2.25	0		7.1	Traces	0								
12	Bobbepalli	Nava Mallika											0	26.0				0	0
		Sadanand											0	21.6				1.0	0
13	Marturu	RCH 659											0	15.7				0	0
			0.0	0.0	0.0	0.6	0.8	0.0	3.2	0.1	0.0	0.7	0.0	21.1				0.3	0.0
			0.0	0.0	0.0	0.5	0.6	3.3	2.3	0.3	0.2	2.1	0.1	18.7				1.0	1.8

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, RR= Root rot



Table-10b: 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)	TSV Incidence (%)
July'21	Guntur	Tadikonda crossroads	Sheetal	10-15	0
		Ponnekllu	US 4708	15	0
			Platinum	15	0
		Ravela	Akira	7-15	0
		Pamulapadu	US 4077	10-15	0
		Mandepudi	Jaadoo	10-15	0
		Kambhampadu	KCH 111	15-20	0
		Parasa	Akira	7-10	0
		75 Thalluru	RCH 659	7-10	0
		Attaluru	Sadananda	10-20	0
		Jupudi	Akira	7-10	0
		Malladi	ATM	15-20	0
		Didugu	UPL 767	7-10	0
			Money maker	7-10	0
		Muttayapalem	US 7067	7-10	0
		Dharanikota	Akira	15-20	0
		Amaravathi	RCH 659	7-15	0
		Lemalle	Akira	7-15	0
		14 th Mile	Jaadoo	7-15	0
		Mothadaka	RCH 659	7-15	0
		Nidumukkala	Akira	7-15	0
		Lam	Magic	7-15	0
		Perecherla	Crystal 999	15	0
		Visadala	Akira	10-15	0
		Medikonduru	Akira	10-15	0
		Bhiminenivaripalem	Crystal 999	10-15	0
		Kantepudi	Asha	10-15	0
		Dhulipalla,	US 4753	7-15	0
		Reddigudem,	Asheerwad	7-15	0
		Rajupalem	Jaadoo	10-15	0



		Kota Nemalipuri	Akira	10-15	0
		Piduguralla	Akira	7-10	1-2%
			Adbhut	30	2-3%
		Brahmanapalle,	US 4753	20	Traces
		Thummalacheruvu	Sadananda	20	Traces
		Kesanupalle	US 7067	10-15	Traces
			Suraj	7-10	0
			Jaadoo	7-10	0
			Akira	7-10	0
		Nadikudi	Asha	10-15	0
		Gurazala	Suraj	10-15	Traces
		Kambhampadu	Tulasi 216	40-50	Traces
		Paluvai Junction	Tulasi 7	40-50	Traces
		Rayavaram	RCH 659	40-55	0
		Durgi	Moksha	50-55	0
			Target	90	0
			KCH 100	90	0
		Obulesunipalle	Geetha	7-10	0
		Adigoppula	Mudra	50-60	0
		Narmalapadu	Mudra	10-15	0
		Oppicharla	RCH 659	50-60	0
		Karempudi	RCH 659	20-25	2-4%
		Julakallu	Akira	15-20	0
		Raviapdu	Big Boss	10-15	0
		Satuluru	Money Maker	15-20	0
Aug.'21	Krishna	G. Konduru	Tulasi 7	30	0
			Akira	30	0
		Venkatapuram	Dhan Dev	30	0
			Tulasi 7	30	0
		Chandragudem	Jaadoo	30	0
		Pulluru	Tulasi 216	30-35	0
			Dhan Dev	30-35	0
			RCH 756	30-35	0



			Super 971	30-35	0
		Ramachandrapuram	Nava Mallika	40	0
			Khiladi	40	0
			Bijli	40	0
			RCH 659	40	0
			Super 971	30-40	0
			Dhan Dev	30-40	0
		Kambhampadu	RCH 659	50-55	0
			Dhan dev	50-55	0
			Jaadoo	30	0
			ATM	30	0
		G. Kotturu	Nava Mallika	30	0
		Ganugapadu	Target	30-40	0
			RCH 659	30-40	0
		Challagundlavaripalem	Asheerwad	30-40	0
		Anigandlapadu	NCS 2778	10-15	0
		Chillakallu	US 7067	30-40	0
		Bhimavaram	Plantinum	30-35	0
		Makkapeta	RCH 659	25-30	Traces
		Ambarupeta	US 7067	25-30	0
		Moguluru	Asha	55	0
			Big boss	60	0
	Guntur	Mothadaka	Akira	27	0
		Mandepudi	US 4708	50	0
		Phirangipuram	Akira	45	0
		Jonnalagadda	Akira	50	0
		Venegadla	RCH 659	50	0
Sept.'21		Bayyaram	Asheerwad	40	0
		Achempet	Tulasi 7	40	0
		Tadikonda	Money Maker	50	0
		Amaravati	RCH 659	45	0
		Lam	Magic	45	0
		Tatireddypalem	U 7067	45	0



		SatuluruNarasaraopet	RCH 659	50	0
	Prakasam	Gollapalli	Tulasi 7	60	12.4
	Guntur	Dupadu	Tulasi 7	70	10.0
	Prakasam	Thokapalli,	Target	80	3.53
		Gobburu	Shakthi	60	1.5
		Nikarampalli	Tulasi 216	60	4.0
		Chinthaguntla	Dhan Dev	50	Traces
		Besthavaripeta	Shooter	65	4.5
		Errapalem	Profit Plus	70	2.0
		Narsireddipalli	Pratap	80	Traces
		Turumalle	Pradeep	80	Traces
	Guntur	Bezathpuram, Tadikonda	Akira	40	1.0
		Pamulapadu	RCH 659	60	2.6
		Ponnekallu	US 4708	60	1.0
		Ravela	US 4708	60	0
		Tadikonda	Akira	80	0
			US 7067	80	0
		Tatireddypalem	Tulasi 216	20	2.0
		Nidumukkala	Akira	60	0
			US 4708	60	0
		Mandepudi, Amaravathi	Asha	60	0
		Mothadaka	Akira	60	0
		Bayyaram	Tulasi 45	60	0
		Pedaparimi,	Akira	75-80	0
			RCH 659	80-90	Traces
		Borupalem	US 4078	75	Traces
		Vikunthapuram	RCH 659	70-80	Traces
		Amravathi	Akira	75-80	Traces
		Dharanikota	Jaadoo	90	0
		Bayyavaram	NCS 971	80	Traces
			Crystal 999	60	0
		Vipparla	US 7067	80	0
		Grandhasiri	Crystal 999	80	0



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		Velpuru	RCH 659	60-70	Traces
			Crystal 999	80-90	0
		Garikapadu	Crystal 999	65	2.0
		Reddigudem	Akira	60	Traces
		Rajupalem	US 4078	50-60	0
			Crystal 999	50	Traces
		Bellamkonda	RCH 659	60-70	Traces
		Chandrajupalem	US 4078	70	0
Oct.'21		Visadala,	Akira	85	1.5
		Medikonduru	Superb	80-90	0
		Siripuram	RCH 797	90	2
			Akira	90	Traces
			Money maker	90	2.5
		Paladugu	US 7067	100	1.5
			Tulasi 45	100	1.0
		Kantepudi	Bhakthi	90	Traces
		Sattenapalli	US 111	90	0
			Akira	90	Traces
		Chagantivaripalem,	Neo	90	Traces
		Lankalkurapadu	Siri	90	Traces
		Chandavaram, Nadendla	Jaadoo	80	0
		Chirumamilla	Nava Mallika	90	2.0
		Tupadu	Asheerwad	100	Traces
		Solasa	Tulasi 7	90	0
		Changhiskhanpet	Akira	90	0
		Kondaveedu	Akira	90	0
		Phirangipuram	US 7067	90	0
		Tadikonda,	US 7067	120	Traces
		Tatireddypalem,	Tulasi 216	100	0
		Pedaparimi,	Revanth	80-90	0
			Siri	115	0
		Badepuram,	US 4078	110	Traces
		Neerukonda,	Akira	80	Traces



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		Thulluru	Siri	90-100	Traces
		Mothadaka,	Akira	110	Traces
		LacchannaGudipudi,	Tulasi 216	100	0
		Lemalle,	Akira	100-110	0
		Endroyi,	Akira	120	0
		Nidumukkala,	RCH 659	100-110	Traces
		Lam	Akira	100	2.0
Nov.'21		Kurnoothala, Vatticherukuru	Akira	120	Traces
		Koyavaripalem, Prattipadu	RCH 659	110-120	0
		Tikkireddypalem	Jaadoo	120	0
		Prattipadu	Satya	120	0
		Pedanandipadu	Jaadoo	110-120	0
	Prakasam	Ankireddypalem,	RCH 659	90-100	Traces
		Vankayalapadu	Jaadoo	90	0
		Pusapadu	Tulasi 7	100	0
		Bobbepalli	Nava Mallika	120	0
			Sadanand	120	0
		Marturu	RCH 659	120	0
	Guntur	Gundalpadu, Phirangipuram	Akira	120	0
		Phirangipuram	US 7067	120	0
		Rudravaram	Akira	120	Traces
		Dhulipalla	US 4753	120	Traces
		Reddigudem, Rajupalem	US 4078	120	Traces
		Bellamkonda	Akira	120	Traces
		Chowtapapayapalem	Jaadoo	120	0
		Piduguralla	Jaadoo	120	0
		Brahmanapalli	US 4753	140	0
		Thummalacheruvu	Sadananda	120	0
		Keasanpalli	Komali	140	0
		Gamalapadu	Magna	120	5.0
		KottaAmbapuram,	Akira	120	Traces
		Gurazala	Suraj	120	2.0
		Rentachintala	Tulasi 7	140	Traces



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		Kambhampadu,	Tulasi 216	140	0
		Veldhurthi	Syerra	170	0
		Rayavaram	RCH 659	170	0
		Polepalli	Jaadoo	120	0
		Naramalapadu	Mudra	120	0
		Karempudi	RCH 659	120	Traces
		Gundlapalli, Nekarikallu	Akira	140	0
	Krishna	G. Konduru	Tulasi 7	135	Traces
		Venkatapuram	Akira	140	0
		Chevuturu	Dhan Dev	130	Traces
		Mylavaram	RCH 659	140	0
		Pulluru	Tulasi 216	160	0
		Krishnaraopalem	Akira	155	Traces
		KambhampaduAKonduru	RCH 659	150	0
		Polisettipadu, AKonduru	Tulasi 7	155	0
		Tiruvuru	Dhan Dev	150	0
		Rajeevnagar	Target	155	0
		Gampalagudem	RCH 659	140	0
		Challagundlavaripalem	Asheerwad	155	0
		Penugolanu	RCH 659	150	0
		Thalluru	Asheerwad	150	0
		Lingamgudem	RCH 659	160	0
		Penuganchhprolu	Tulasi 7	160	0
		Bhimavaram,	Sadananda	140	Traces
		Gowravaram,	RCH 659	150	0
		Nandigama	Dhan Dev	140	0
		Keesara	RCH 659	140	0



Table 10.c. Observations on the occurrence of diseases in at research farm (LAM Farm Guntur-Andhra Pradesh)

Month	Hybrids (BG II)	Incidence (%)			Mean Percent Disease Index (PDI)								
		Wilt	Root rot	Boll Rot	ALS	HLS	CLS	ATN	CoLS	MLS	BB	GM	Rust
Aug-2021	Varieties and hybrids of cotton trials	0.0	0.0	0.0	Traces	0.0	0.0	0.0	Traces	0.0	0.0	0.0	0.0
Sept. 2021		0.0	0.0	0.0	0.0-0.25	0.0	0.0	0.0	1.0-4.75	0.0	0.0-4.75	0.0-4.5	0.0
Oct. 2021		0.0	0.0	0.0-2.0	0.0-3.5	0.0	0.0	0.0	1.0-16.5	0.0	0.0-15.0	0.0 to 18.5	0.0-5.0
Nov. 2021		0.0	0.0	2.0 to 5.0	0.0	0.0	0.0	0.0	5.0 to 41.25	0.0	0.0 to 5.0	0.0 to 22.25	6.0 to 41.0
Dec. 2021		0.0	0.0	3.0 to 10.0	0.0	0.0	0.0	0.0	8.0-37.5	0.0	Traces	0.0 to 12.5	8.0- 46.5

Table 11a: Observations on the occurrence diseases in farmer's fields in Coimbatore, Dindigul, Virudhnagar, Tutukurin, Trichy, Salem, Perambalur (Tamil Nadu)

S.No	District and Villages	Variety / Hybrid	Stage of Sampling									
			Per cent Disease Index (PDI) / Per cent Disease Incidence									
			Early season/ seedling stage (20- 30DAS)	Mid-season/ flowering stage (60- 80 DAS)				Late--season / boll development stage (120- 150 days)				
				Root rot	ALB	BB	GM	RR	ALB	BB	GM	RR
Coimbatore												
1	Kallipalayam	RCHII BGII, RCH 659, Ankur	5.3	5.8	4.5	2.5	2.3	6.0	5.0	3.0	3.0	4.3
2	Senthoorpalayam	RCHIIBGII, Kaveri, RCH 659	5.0	6.3	.5.0	2.3	3.5	6.7	.5.5	3.0	4.2	4.0
3	Kovilpalayam	RCHIIBGII, RCH 659, Jackpo	4.7	7.5	3.3	2.7	2.5	8.3	3.5	3.2	2.8	3.0
4	Vellamadai	RCHIIBGII, NEO, RCH 659,	4.0	8.3	5.0	4.2	3.2	.8.7	5.3	4.5	4.5	4.1
5	Thottipalayam	RCHIIBGII, RCH 659	3.8	7.2	5.3	4.5	3.0	7.5	5.8	4.8	4.7	5.3
6	Samainayakkanpalayam	RCHIIBGII, Kaveri, RCH 659, Jackpot	4.5	9.5	5.5	.5.0	2.7	9.8	6.0	5.5	3.3	4.5
	Average		4.6	7.4	4.7	3.2	2.9	7.7	5.2	4.0	3.8	4.2
Dindigul												



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1	Guvayanayakanpatti	RCHIBGII, Kaveri, RCH 659, Ankur	5.0	15.0	10.5	6.5	4.2	15.2	11	6.8	4.5	5.5
2	Kariyagoundanpatti	RCHIBGII, RCH 659, Ankur	4.7	14.3	5.3	3.5	4.5	14.6	5.6	4.0	4.7	4.3
3	Boothipuram	RCHIBGII, Kaveri, RCH 659, Ankur	4.3	12.0	7.7	18.0	8.8	12.3	8.0	18.5	9.3	3.7
4	Ambaligai	RCHIBGII, RCH 659, Ankur	4.1	7.5	4.5	7.0	4.0	8.0	4.7	7.3	4.5	3.0
	Average		4.5	12.2	7.0	8.8	5.4	12.5	7.3	9.2	5.8	4.1
Virudhunagar												
1	Subramaniapuram	RCHIBGII, RCH 659	4.0	7.5	-	-	4.0	8.3	-	-	4.3	3.4
2	Shanmugapuram	RCHIBGII, RCH 659	4.3	8.3	-	-	12.0	8.7	-	-	12.5	3.7
3	Ramalingapuram	RCHIBGII, RCH 659	4.5	7.8	-	-	7.0	8.2	-	-	7.7	4.1
4	Sholapuram	RCHIBGII, RCH 659	4.7	7.5	-	-	6.5	7.8	-	-	8.0	4.5
	Average		4.4	7.8			7.4	8.3			8.1	3.9
Tutukurin												
1	Villicheri	RCHIBGII, RCH 659, Kaveri,	3.0	8.7	-	1.7	4.0	9.0	-	2.0	4.5	2.3
2	Nalattumuthoor	RCHIBGII, RCH 659, Kaveri,	3.3	7.0	-	1.3	2.1	7.3	-	1.7	3.0	2.7
3	Nalattupudur	RCHIBGII, RCH 659, Kaveri,	3.5	6.3	-	2.5	2.5	6.8	-	3.0	3.5	3.2
	Average		3.3	7.3		1.8	2.9	7.7		2.2	3.7	2.7
Tirunelveli												
1	Sankarankovil	RCHIBGII, RCH 659, Kaveri,	4.7	7.0	-	-	11.3	7.5	-	-	12.0	2.5
2	Perumalpathi	RCHIBGII, RCH 659, Kaveri,	5.4	8.5	-	-	10.0	9.1	-		10.5	2.0
3	Manoor	RCHIBGII, RCH 659, Kaveri,	3.5	7.3	-	-	7.3	7.7	-		8.4	2.3
4	Perumalpatti	RCHIBGII, RCH 659, Kaveri,	5.0	6.7	-	-	7.7	7.0	-		8.0	2.7
	Average		4.7	7.4			9.1	7.8			9.7	2.4
Trichy												
1	Muthuvathoor	RCHIBGII, Kaveri, RCH 659, Ankur, Jackpot	2.5	6.5	5.7	2.5	3.0	7.0	6.2	3.0	3.5	3.0
2	Kallagudi	RCHIBGII, RCH 659, Ankur, Jackpot	2.3	7.3	4.4	1.7	4.7	7.7	4.7	2.4	5.3	3.4
3	Varakkuppai	RCHIBGII, RCH 659, Ankur	3.2	6.0	1.5	2.0	5.3	6.8	2.3	2.7	5.5	4.3
	Average		2.7	6.6	3.9	2.1	4.3	7.2	4.4	2.7	4.8	3.6
Salem												
1	Thamukkapalaym	RCH 659, Jackpot, Bagubali	4.7	12.0	14.7	12.5	5.7	12.3	15.0	12.8	6.1	2.3



2	Ramanathapuram	RCH 659, Ankur, Jackpot	3.5	10.7	18.8	17.5	4.3	11.0	19.1	17.7	4.5	3.5
3	Vazhapadi	RCH 659, Ankur	4.0	12.5	16.3	17.7	6.5	12.7	17.2	18.3	6.7	2.8
	Average		4.1	11.7	16.6	15.9	5.5	12.0	17.1	16.3	5.8	2.9
Perambalur												
1	Veppamthattai	RCHIIBGII, NEO, RCH 659	6.5	10.3	15.0	18.5	7.5	11.3	15.5	19.3	7.8	4.5
2	Nergunam	RCHIIBGII, Kaveri, RCH 659, Bagubali	5.3	9.5	12.0	15.5	6.0	10.2	12.3	15.7	6.3	3.3
3	Venbavoor	RCHIIBGII, Kaveri, RCH 659, Ankur, Bagubali	5.0	11.3	13.4	14.7	7.0	11.7	13.9	15.0	7.5	3.7
4	Krishnapuram	RCHIIBGII, Kaveri, NEO, RCH 659, Ankur	6.1	10.5	11.3	13.7	6.5	11.5	12.7	14.2	6.7	4.2
	Average		5.7	10.4	12.9	15.6	6.8	11.2	13.6	16.1	7.1	3.9
	Overall Average		4.3	8.9	9.0	7.9	5.5	9.3	9.5	8.4	6.1	3.5

ALS=Alternaria leaf spot, BLB= Bacterial leaf blight, GM= Grey mildew, MLS=Myrothecium leaf spot, RR= Root rot

Table 11b: 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-2021	RCHIIBGII, RCH 659 and varieties Co14 and Co17	3.0		-	-	-	-	-	-	-
Sept. 2021		5.0		-	5.7	-	4.7	5.0	-	-
Oct. 2021		6.5		-	10.5	5.7	5.5	7.5	7.0	-
Nov. 2021		-	6.0	-	23.0	7.4	6.2	10.3	13.5	-
Dec. 2021		-	7.5	5-10	24.5	8.5	6.7	15.5	23.5	5.5
Jan.2022		-	7.7	5-10	24.5	8.5	6.7	15.5	23.5	7.3
	Average	2.4	7.1	5-10	17.6	7.5	5.9	10.8	16.9	6.4



Path 1(b) Disease progress in relation to weather factors

NORTH ZONE

Table 12a: Disease progress in relation to weather factors at ARS, PAU Faridkot (Punjab)

SMW	Temperature (°C)			Relative humidity (%)			Wind Speed	Sunshine	Rainfall	Rainy days	CLCuD (%) (F 846)		WF Adult	CLCuD (%) (HS6)		WF Adult	CLCuD (%) (RS921)		WF Adult	CLCuD (%) (RST 9)		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
25	37.2	25.3	31.2	70	35	53	5.5	8.5	31.0	1	0.7	0.2	5.1	0.7	0.1	5.2	0.2	0.0	4.0	0.5	0.1	4.9
26	39.2	27.4	33.3	58	35	47	5.9	8.0	0.0	0	0.9	0.2	4.4	0.7	0.2	4.9	0.5	0.1	3.5	0.7	0.1	3.9
27	39.0	28.0	33.5	62	38	50	6.6	6.5	1.0	1	1.2	0.2	9.2	1.2	0.2	9.5	0.7	0.2	7.9	0.9	0.2	8.5
28	35.3	27.6	31.4	76	69	73	9.2	4.3	7.0	2	9.1	1.6	16.1	8.6	1.4	15.3	10.6	2.3	17.5	4.5	2.2	16.3
29	34.2	27.3	30.7	85	67	76	8.0	4.3	47.0	2	15.9	5.5	8.1	16.8	6.8	8.9	18.3	7.0	8.1	9.3	3.9	6.7
30	33.7	27.2	30.4	86	70	78	6.0	2.2	65.4	3	32.5	8.4	4.3	37.6	10.7	4.5	35.4	13.1	4.9	22.5	9.9	4.1
31	33.7	26.6	30.1	86	72	79	4.5	4.8	15.0	3	42.8	13.7	3.7	43.9	17.2	4.2	45.3	19.5	3.9	39.0	17.8	3.6
32	33.8	26.4	30.1	83	64	74	4.0	7.6	78.6	2	49.7	21.5	1.7	50.5	29.0	1.6	52.3	28.3	2.3	45.6	25.2	1.9
33	36.3	28.1	32.2	76	53	65	4.3	8.6	0.0	0	69.0	31.9	5.7	62.8	39.4	5.1	61.3	37.8	5.5	55.3	33.5	4.9
34	33.0	27.1	30.0	83	70	77	5.0	4.6	18.2	2	82.3	36.7	4.0	75.0	47.1	3.9	78.9	43.3	3.4	78.5	44.0	3.6
35	34.2	26.0	30.1	83	59	71	5.1	6.6	0.0	0	88.7	42.2	2.9	91.2	49.3	3.1	86.8	44.2	3.0	85.3	46.9	2.7
36	32.5	26.0	29.2	86	74	80	4.4	5.9	38.4	1	95.0	45.8	2.5	96.8	50.4	2.9	94.0	47.3	3.1	87.0	47.7	2.5
37	31.1	25.1	28.1	89	72	81	4.7	5.3	40.2	3	98.2	48.9	2.3	99.2	51.3	3.1	97.9	48.6	2.6	100.0	48.8	1.9
38	31.4	24.7	28.0	85	70	78	4.5	4.7	98.4	1	100.0	49.6	2.0	100.0	53.8	2.6	98.3	52.9	2.2	100.0	51.0	2.2
39	33.3	24.3	28.8	86	64	75	2.9	8.0	0.0	0	100.0	50.4	1.7	100.0	55.1	1.6	100.0	55.0	1.2	100.0	51.7	1.9
40	34.0	24.3	29.1	85	58	72	2.8	7.7	0	0	100.0	51.2	2.0	100.0	56.3	1.8	100.0	56.2	1.0	100.0	53.0	1.5

Table 12b: 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)	-0.76	-0.73
2.	Minimum temperature (°C)	-0.64	-0.68
3.	Mean temperature (°C)	-0.80	-0.79
4.	Maximum relative humidity (%)	0.70	0.64
5.	Minimum relative humidity (%)	0.56	0.50
6.	Mean relative humidity (%)	0.64	0.58
7.	Rainfall (mm)	0.11	0.12
8.	Rainy days (#)	-0.19	-0.22
9.	Sunshine (hour)	0.05	0.12



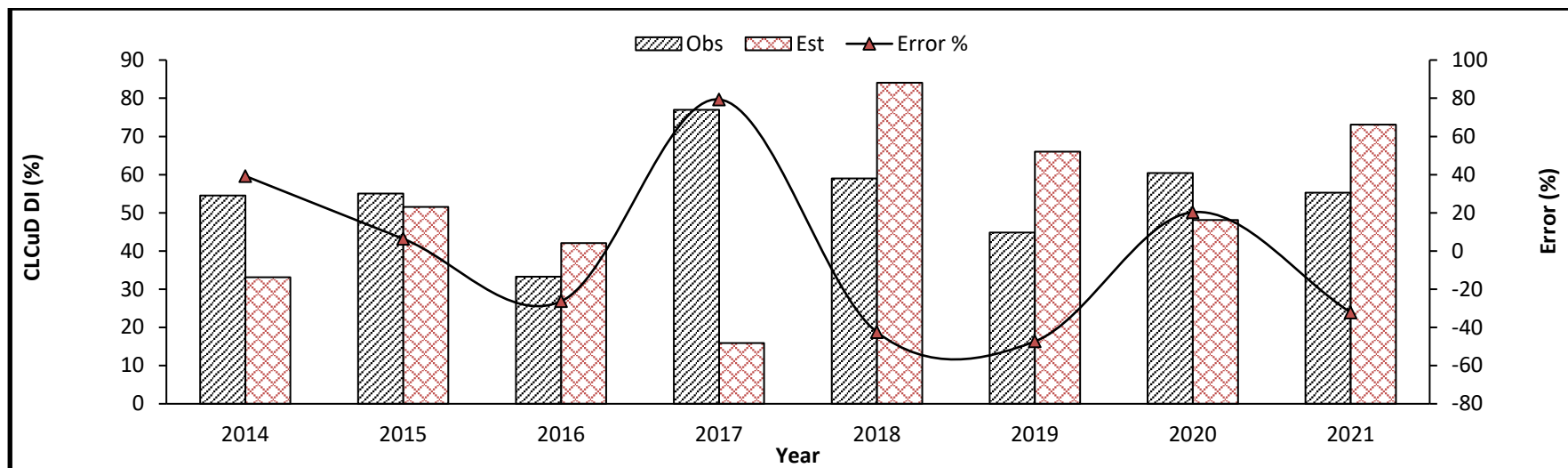


Fig. 1: Observed and estimated CLCuD incidence for 2014-2021 by Monga et al. (2018)

Table13: Disease progress in relation to weather factors at ARS SKRAU, Sriganganagar (Rajasthan)

S. No.	Date of Observation	Std. week No.	Disease incidence (%)	PDI (%)	Whitefly/3 leaves	Meteorological data				
						Rain fall (mm)	Temperature (°C)		RH (%)	
							Max	Min	8.30 AM	17.30 PM
1	22.06.21	25	0.1	0.0	1.1	0.0	40.5	24.9	69.3	34.9
2	01.07.21	26	2.5	1.6	2.4	58.2	41.0	24.2	63.0	44.0
3	07.07.21	27	7.4	3.1	5.3	0.0	41.3	28.3	59.4	39.9
4	13.07.21	28	24.9	9.5	4.0	0.0	39.5	27.7	71.1	40.0
5	19.07.21	29	63.6	20.4	3.2	13.2	38.5	27.4	69.0	48.1
6	26.07.21	30	79.9	26.5	8.3	0.2	36.7	26.8	72.9	56.4
7	03.08.21	31	91.4	29.0	5.0	0.5	37.4	26.3	68.6	54.0
8	09.08.21	32	94.3	38.9	4.2	0.0	38.2	26.0	70.0	44.3
9	16.08.21	33	100.0	42.0	5.1	0.0	38.9	26.6	61.1	43.6



Table 13b: Correlation values between weather parameters and CLCuD of cotton ARS Sriganaganagar [Correlation coefficient (r)]

S.No	Weather parameters	Correlation coefficient		
		Disease incidence (%)	PDI (%)	Whitefly/3 leaves
1.	Rain fall (mm)	-0.407 ^{NS}	-0.395 ^{NS}	0.007 ^{NS}
2.	Temp Max (°C)	-0.855 ^{**}	-0.759 [*]	-0.238 ^{NS}
3.	Temp Min (°C)	0.177 ^{NS}	0.143 ^{NS}	-0.238 ^{NS}
4.	RH morning (%)	0.249 ^{NS}	0.154 ^{NS}	0.459 [*]
5.	RH Evening (%)	0.664 ^{NS}	0.531 ^{NS}	0.165 ^{NS}
6.	Whitefly/3 leaves	0.554 ^{NS}	0.503 ^{NS}	
7.	t-value	0.679		
8.	Significance	0.516		
9.	Standard Error	3.270		



Table 14: Disease progress in relation to weather factors at HAU, Hisar (Haryana) (Cultivar HS-6)

Std. Met. Week	Period	Rainy Days	Rain fall (mm)	Temp. (°C)		RH (%)		Sunshine hours/day	WS KM/H	WF/3 leaves	CLCuD (%)		
				Max.	Min.	Morn	Even				Incidence	Change	PDI
23	04.6.21 - 10.6.21	0	0.0	40.2	28.1	64	37	7.4	8.6	0.8	0.0	0.0	0.0
24	11.6.21 - 17.6.21	4	51.8	37.9	25.1	81	56	7.4	6.1	1.8	0.0	0.0	0.0
25	18.6.21 - 24.6.21	0	0.0	37.0	26.3	73	45	6.0	8.4	2.6	4.3	0.0	0.7
26	25.6.21 - 01.7.21	1	8.9	40.0	26.8	63	35	6.9	8.1	4.3	5.7	1.3	0.9
27	02.7.21 - 08.7.21	0	0.0	41.4	27.9	65	38	7.8	8.0	7.6	7.7	2.0	1.3
28	09.7.21 - 15.7.21	3	18.5	37.8	28.1	80	61	8.8	5.2	11.8	18.3	10.7	3.2
29	16.7.21 - 22.7.21	1	9.0	35.9	26.9	86	63	7.6	4.3	19.8	67.3	49.0	12.2
30	23.7.21 - 29.7.21	3	56.0	33.7	27.4	92	76	6.2	3.5	26.0	72.0	4.7	14.2
31	30.7.21 - 05.8.21	4	149.9	31.9	26.5	94	79	3.8	2.6	11.3	91.0	19.0	25.3
32	06.8.21 - 12.8.21	0	0.0	35.6	26.6	88	58	5.3	7.6	9.2	96.0	5.0	30.0
33	13.8.21 - 19.8.21	0	0.0	37.1	26.3	80	54	6.6	9.6	8.0	97.0	1.0	35.7
34	20.8.21 - 26.8.21	0	0.5	34.7	26.7	86	69	6.1	5.2	21.8	97.0	0.0	39.3
35	27.8.21 - 02.9.21	1	15.7	35.9	25.9	88	65	6.6	6.7	23.1	97.0	0.0	42.7
36	03.9.21 - 09.9.21	2	100.2	32.7	25.8	95	75	4.8	4.3	10.2	97.0	0.0	42.7
37	10.9.21 - 16.9.21	2	44.3	31.8	25.2	89	72	6.5	4.7	7.4	97.0	0.0	48.1
38	17.9.21 - 23.9.21	1	142.0	32.3	25.2	89	76	5.8	6.1	5.2	97.0	0.0	48.8
39	24.9.21 - 30.9.21	2	126.0	31.9	25.4	91	71	3.7	5.7	6.3	97.0	0.0	49.3
40	01.10.21 - 07.10.21	1	5.5	33.3	25.3	93	66	3.1	6.7	3.8	97.0	0.0	49.3
41	08.10.21 - 14.10.21	0	0.0	34.8	21.6	86	37	1.9	8.2	3.5	97.0	0.0	49.3
42	15.10.21 - 21.10.21	0	0.0	31.3	18.4	86	50	2.8	6.3	8.0	97.0	0.0	49.3



Table 14b: 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	Rain fall (mm)	0.300 ^{NS}	0.273 ^{NS}	-0.008 ^{NS}
2	Temp Max (°C)	-0.817**	-0.794**	-0.194 ^{NS}
3	Temp Min (°C)	-0.423 ^{NS}	-0.583**	0.230 ^{NS}
4	RH Morn (%)	0.830**	0.718**	0.395 ^{NS}
5	RH Morn (%)	0.611**	0.463*	0.500*
6	Sunshine (Hr)	-0.626**	-0.702**	0.202 ^{NS}
7	Wind speed (Km/h)	-0.323 ^{NS}	-0.150 ^{NS}	-0.543*
8	WF/3 leaves	0.348 ^{NS}	0.084 ^{NS}	
	t-value	0.037		
	Significance	0.971		
	Standard Error	0.287		

Table 15a: Disease progress in relation to weather factors at CICR-RS, Sirsa (Haryana) (Cultivar HS-6)

SMW	Temp. (°C)		RH (%)		Rainfall (mm)	CLCuD (%)		Whitefly adult (Per 3 leaves)
	Max	Min	Max	Min		Incidence	PDI	
23	41.4	29.4	52.9	32.0	0.0	0.0	0.0	0.0
24	37.4	27.8	68.7	44.1	127.7	0.0	0.0	0.0
25	39.1	28.6	66.9	41.3	9.6	0.0	0.0	0.0
26	41.7	29.7	57.6	31.9	0.0	3.2	0.7	1.0
27	40.3	30.5	58.4	37.3	0.0	7.0	1.5	1.5
29	37.4	27.1	79.0	55.6	1.8	30.4	5.8	2.8
30	33.8	27.1	85.3	73.1	46.5	51.4	9.8	6.0
31	34.5	26.7	87.4	67.4	1.5	78.4	15.0	3.3
32	37.1	27.6	70.4	52.0	0.0	99.8	20.8	5.6
33	38.4	28.9	66.4	48.3	2.6	99.9	21.9	5.3
34	35.1	26.3	82.7	62.4	30.5	99.9	31.1	6.3
35	34.6	25.6	83.0	60.9	0.0	99.9	34.6	10.0
36	33.1	24.9	30.9	70.6	19.7	99.9	37.4	9.7
37	32.3	23.9	81.9	67.6	41.1	99.9	39.0	10.4
38	32.6	24.5	79.4	67.7	32.7	99.9	41.8	13.1
39	33.5	23.8	86.9	65.6	0.0	99.9	45.6	14.8
40	34.6	24.5	85.4	57.0	4.0	99.9	49.3	12.1



Table 15b: Correlation values between weather parameters and CLCuD of cotton CICR RS, Sirsa [Correlation coefficient (r)]

Weather parameters	Correlation coefficient			
	CLCuD (DI)	CLCuD PDI	White fly adult (WFA)	WFA and CLCuD
Maximum temperature (°C)	-0.732**	-0.755**	-0.786**	0.945**
Minimum temperature (°C)	-0.731**	-0.882**	-0.893**	
Maximum relative humidity (%)	0.236NS	0.216NS	0.265NS	
Minimum relative humidity (%)	0.638*	0.571*	0.617*	
Rainfall (mm)	-0.218NS	0.220NS	0.277NS	



CENTRAL ZONE**Table 16a: Disease progress in relation to weather factors at CRS NAU, Nanded (Maharashtra)**

Met. Week	Period	Rainfall (mm)	Temperature °C		Relative Humidity (%)		RCH 2 BG II PDI (%)			LRA-05166 PDI (%)			PA-255 PDI (%)
			Max	Min	Morn	Even	BLB	ALS	GM	BLB	ALS	GM	GM
28	09 – 15 Jul	5.8	32	18	92	71	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	16 – 22 Jul	3.4	33	19	77	66	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	23 – 29 Jul	0.0	35	20	52	45	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	30 – 05 Aug	61.2	30	16	92	77	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	06 – 12 Aug	9.8	29	16	94	84	0.0	1.0	0.0	0.0	0.0	0.0	0.0
33	13 – 19 Aug	34.4	30	15	83	70	1.2	1.1	0.0	0.0	1.0	0.0	0.0
34	20 – 26 Aug	0.0	33	20	77	66	1.3	1.8	0.0	1.2	1.3	0.0	0.0
35	27 – 02 Sep	0.0	34	19	84	55	1.7	2.0	0.0	1.3	1.2	0.0	0.0
36	03 – 09 Sep	0.0	35	21	77	55	1.8	2.5	0.0	2.1	2.0	0.0	0.0
37	10 – 16 Sep	5.2	31	15	92	78	1.9	2.5	1.3	2.0	3.0	0.0	0.0
38	17 – 23 Sep	0.0	34	18	77	55	2.2	3.0	2.3	2.1	3.3	1.7	1.0
39	24 – 30 Sep	3.4	28	18	83	92	3.0	3.3	4.2	2.2	3.3	2.4	2.2
40	01 – 07 Oct	0.0	31	21	84	78	3.5	3.8	4.3	3.0	3.5	3.0	3.0
41	08 – 14 Oct	0.0	29	21	71	84	4.0	4.0	6.5	3.5	4.0	5.2	3.5
42	15 – 21 Oct	5.2	31	16	92	71	4.3	4.5	7.0	4.0	4.5	6.3	6.1
43	22 – 28 Oct	0.0	33	17	77	66	4.8	5.5	12.0	4.5	5.0	9.0	7.0
44	29 – 04 Nov	5.2	31	20	84	78	5.9	5.5	12.5	4.7	4.0	11.5	9.0
45	05 – 11 Nov	0.0	34	19	70	60	6.7	5.0	10.0	5.6	4.0	9.0	8.0
46	12 – 18 Nov	0.0	30	18	78	63	6.6	3.5	8.5	4.1	3.0	7.3	7.5
47	19 – 25 Nov	0.0	32	17	68	59	4.8	3.0	7.0	4.6	2.0	6.5	7.0
48	26 - 02 Dec	4.4	32	20	61	47	3.7	2.5	6.5	3.0	2.0	6.0	6.0
49	03 - 09 Dec	0.0	31	18	84	78	2.0	1.5	6.0	2.0	2.0	5.5	5.0
50	10 - 16 Dec	0.0	29	20	77	76	0.0	0.0	3.0	1.5	1.5	3.0	3.0
51	17 - 23 Dec	0.0	32	18	70	65	0.0	0.0	2.0	0.0	0.0	2.0	2.5
52	24 - 31 Dec	0.0	30	16	65	62	0.0	0.0	1.5	0.0	0.0	0.0	0.0



Table 16b: 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
	ALS	BLB	GM	ALS	BLB	GM	GM
Rainfall (mm)	-0.288	-0.273	-0.282	-0.306	-0.350	-0.262	-0.271
Temp. Maximum (°C)	0.050	0.018	-0.097	-0.043	0.056	-0.060	-0.068
Temp. Minimum (°C)	0.156	0.160	0.127	0.141	0.215	0.168	0.138
Morning RH (%)	0.072	-0.081	-0.125	0.097	-0.091	-0.134	-0.158
Evening RH (%)	0.106	-0.020	0.086	0.194	-0.009	0.041	-0.008
Note. * $p < .05$, ** $p < .01$							



Table 17a: 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.		
				°C		%				(PDI)			(PDI)		
				Max.	Min.	Morn.	Even			BSH	BLB	MLS	GM	BLB	MLS
34	20-26 Aug	1	26.9	29.3	23.1	91	70	4.6	3.2						
35	27-2 Sept	3	50.5	31.2	23.5	90	63	5.1	3.4						
36	3-9 Sept	3	80	30.9	23.1	94	71	3.9	2.2	5.0			8.3		
37	10-16Sept	0	7.6	30.7	23.2	89	69	2.8	3.5	5.0			10.0		
38	17-23 Sept	3	28.9	30.3	22.9	90	68	3.2	2.5	8.3	1.7		11.7	1.7	
39	24-30Sept	4	68.1	30.1	22.6	93	74	3.2	3.7	10.0	1.7		15.0	1.7	
40	1-7 Oct	1	17.1	32.5	23.3	92	64	7.4	0.5	11.7	3.3	1.7	15.0	1.7	3.3
41	8-14 Oct	0	0	34.3	22.3	88	43	7.8	0.9	16.7	5.0	1.7	16.7	3.3	1.7
42	15-21 Oct	2	54.9	31.4	19.8	83	51	6.3	2.2	21.7	3.3	3.3	20.0	3.3	5.0
43	22-28 Oct	0	0	31.7	16.2	83	40	8.9	0.2	18.3	1.7	5.0	21.7	1.7	1.7
44	29-4 Nov	0	0	31.2	13.5	80	36	8.3	0.4	16.7	1.7	3.3	16.7	1.7	3.3
45	5-11 Nov	0	0	31.3	13.8	81	32	7.8	0.7	20.0	1.7	1.7	15.0	3.3	1.7
46	12-18 Nov	0	0	31.3	19.1	77	49	5.9	1.4	18.3		1.7	10.0	1.7	1.7
47	19-25 Nov	0	1.4	32.1	20.4	86	51	5.4	2.1	13.3		1.7	11.7	1.7	3.3
48	26-2 Dec	0	0	30.5	14.5	73	29	6.8	1.2	5.0		0.0	5.0		3.3
49	3-9 Dec	0	0	28	15.8	85	44	3.2	0.8	3.3			5.0		1.7
50	10-16 Dec	0	0	29.1	13.4	79	36	6.3	1.4	3.3			3.3		
51	17-23 Dec	0	0	27.6	8.8	83	29	7.0	0.6	0.0			3.3		
52	24-31 Dec	1	42.6	27.2	12.5	87	50	5.5	1.2				0.0		



Table 17b: Correlation values between weather parameters and bacterial blight of cotton at Akola (Maharashtra) [Correlation coefficient (r)]

Sr. No.	Particulars	Rainfall (mm)	Temperature (°C)		R.H. (%)		Sunshine hours/BSH
			Max.	Mini	Morn.	Even.	
1	LRA-5166 % Disease intensity	-0.02854	0.705166*	0.16429	-0.15006	-0.08592	0.508513
2	Bhakti Bt % Disease intensity	0.052204	0.763994*	0.436213	0.151761	0.153751	0.36787

('r') values: * Significant at 5% 0.482,

** Significant at 1% 0.606



Table 18a. Disease progress in relation to weather factors at NAU, Surat (Gujrat) cultivar-G. Cot. Hy. 12 (Non Bt).

Sr. No	STD Met Week	Period	Weather parameter, 2021							BLB PDI (%)
			Temp (°C)		Humidity (%)		Sunshine	Rain fall	Rainy days	
			Max	Min	Morning	Evening	hour	(mm)		
1	25	19-06-21	32.2	26.1	96.0	71.0	1.3	198.5	7.0	0.0
2	26	25-06-21	33.6	27.4	94.0	65.0	1.5	34.5	2.0	0.0
3	27	2/7/2021	35.1	28.2	86.0	53.0	3.3	0.0	0.0	0.0
4	28	9/7/2021	33.1	23.6	94.0	68.0	1.3	49.5	6.0	0.0
5	29	16-07-21	31.4	26.5	98.0	78.0	1.1	96.5	7.0	2.0
6	30	23-07-21	30.7	27.4	93.0	78.0	0.1	15.0	4.0	6.0
7	31	30-07-21	30.8	26.8	93.4	75.7	0.7	19.0	5.0	7.5
8	32	6/8/2021	32.3	26.9	94.0	67.9	2.9	13.0	4.0	8.0
9	33	13-08-21	31.3	24.8	95.7	72.7	1.8	66.0	3.0	9.5
10	34	20-08-21	31	24	98.0	74.4	3.7	31.0	3.0	11.5
11	35	27-08-21	31.1	22.8	97.0	72.0	2.5	48.0	5.0	15.5
12	36	3/9/2021	31.4	26.1	98.7	76.7	2.8	245.5	6.0	19.0
13	37	10/9/2021	30.3	25.8	99.0	80.6	1.2	117.5	7.0	20.5
14	38	17-09-21	31.6	26.4	98.1	72.1	3.1	15.5	7.0	24.5
15	39	24-09-21	31	25.4	100.0	76.6	1.9	185.2	7.0	29.5
16	40	1/10/2021	33.9	26.1	99.0	63.0	4.9	7.5	2.0	33.5
17	41	8/10/2021	34.3	23.4	100.0	60.7	4.7	14.5	3.0	42.5
18	42	15-10-21	34.5	20.8	95.1	32.0	8.1	0.0	0.0	38.0
19	43	22-10-21	33.5	21.2	92.5	36.1	7.1	0.0	0.0	36.0
20	44	29-10-21	34.4	21.2	66.0	28.0	7.4	0.0	0.0	32.5
21	45	5/11/2021	33.4	22.7	62.0	28.0	5.7	0.0	0.0	29.5
22	46	12/11/2021	33.4	22.6	61.0	37.0	5.5	0.0	0.0	25.5
23	47	19-11-21	33.8	24.4	90.0	47.0	6.2	4.5	1.0	23.5
24	48	26-11-21	23.9	14.5	81.0	49.0	4.8	56.0	2.0	14.5
25	49	3/12/2021	30.7	20.2	92.0	89.0	4.4	0.0	0.0	9.5
26	50	10/12/2021	29.3	20.0	82.0	78.0	5.7	0.0	0.0	6.5
27	51	17-12-21	29.6	15.6	82.0	93.0	7.1	0.0	0.0	3.5



Table 18b: Correlation values between weather parameters and bacterial blight of cotton at MCRS, Surat

Factors	Temp		Humidity		Sunshine hour	Rain fall	Rainy days
	Max	Min	Morning	Evening			
Correlation matrix	0.33	-0.1757	-0.1193	-0.5783	0.5776	-0.1404	-0.227

*significant at 5 % (r=0.381) and ** 1% (r=0.487) level of significance at n-2 degree of freedom

Table 19a: Disease progress in relation to weather factors at JAU, Junagarh (Gujrat)

Met. Week	Period	Rainy days	Rainfall in mm	Temperature °C		R. Humidity %		Sunshine hours (BSH)	Wind speed (km/hr)	LRA-5166			
				Max.	Min.	Morn.	Even			BLB	ALS	CoLS	GM
30	23-07-21 to 29-07-21	2	123.8	30.3	24.6	92	82	0.0	10.1	6.5	0.0	0.0	0.0
31	30-07-21 to 05-08-21	0	2.0	30.5	24.8	85	71	0.1	12.3	10.5	0.0	0.0	0.0
32	06-08-21 to 12-08-21	1	7.6	32.5	24.3	88	65	1.4	7.5	22.5	0.0	0.0	0.0
33	13-08-21 to 19-08-21	1	8.1	32.9	24.3	84	57	3.5	6.5	28.0	0.0	0.0	0.0
34	20-08-21 to 26-08-21	1	14.4	31.8	23.8	90	73	2.3	4.6	27.0	0.0	0.0	0.0
35	27-08-21 to 02-09-21	3	69.2	32.3	23.4	89	69	3.4	5.4	23.0	0.0	6.0	0.0
36	03-09-21 to 09-09-21	6	179.3	30.1	23.7	94	83	1.4	5.5	16.5	0.0	25.0	0.0
37	10-09-21 to 16-09-21	4	393.4	29.3	24.5	96	88	0.9	4.7	0.5	0.0	49.5	0.0
38	17-09-21 to 23-09-21	4	55.7	30.4	25.5	94	77	2.3	5.0	3.5	0.0	64.0	0.0
39	29-09-21 to 30-09-21	5	156.6	30.6	24.2	92	80	3.5	4.6	9.5	0.0	70.5	0.0
40	01-10-21 to 07-10-21	1	16.7	33.1	25.1	86	61	8.3	5.0	16.5	0.0	54.5	0.0
41	08-10-21 to 14-10-21	4	60.0	34.1	24.3	81	68	6.1	3.0	24.0	0.0	43.0	0.0
42	15-10-21 to 21-10-21	0	0	34.5	20.2	72	35	9.5	3.1	36.0	0.0	36.0	3.0
43	22-10-21 to 28-10-21	0	0	33.1	20.2	78	39	9.8	3.6	32.5	0.0	27.5	10.0
44	29-10-21 to 4-11-21	0	0	33.9	16.2	69	32	9.5	2.5	34.0	0.0	32.0	15.5
45	05-11-21 to 11-11-21	0	0	33.7	17.4	63	28	5.5	2.7	32.5	0.0	33.5	27.5
46	12-11-21 to 18-11-21	0	0	32.8	15.9	68	35	6.9	4.2	62.0	5.5	25.0	12.0
47	19-11-21 to 25-11-21	0	0	32.7	20.8	73	49	4.1	3.7	64.5	15.6	25.0	9.5
48	26-11-21 to 02-12-21	0	0	32.1	16.2	77	49	6.0	2.8	22.0	25.5	11.5	0.0
49	03-12-21 to 09-12-21	0	0	28.6	16.8	70	45	2.8	4.5	8.5	15.2	5.0	0.0
50	10-12-21 to 16-12-21	0	0	29.9	15.4	59	35	7.1	4.3	0.0	10.5	0.0	0.0
51	17-12-21 to 23-12-21	0	0	28.6	10.9	60	32	8.3	3.8	0.0	5.0	0.0	0.0
52	24-12-21 to 31-12-21	0	0	27.9	14.8	77	48	7.1	4.1	0.0	7.5	0.0	0.0



Table19b: Correlation values between weather parameters and BLB, ALB, Grey mildew diseases of cotton Junagarh [Correlation coefficient (r)]

Sr. No.	Diseases	Rainfall	Temperature °C		R. Humidity		Sunshine hours/BSH
			Max.	Mini	Morn.	Even.	
1	Bacterial leaf blight	-0.3559	0.7322**	-0.0505	-0.2527	-0.3763	0.3798
2	Alternaria leaf spots	0.2078	-0.2251	-0.5377*	-0.4257	-0.3498	-0.1582
3	Grey mildew	-	0.6559**	0.3085	-0.1496	-0.5317	0.3377
4.	Corynespora leaf spot	0.3653	-0.0280	0.6149*	0.4672	0.4367	0.8214**

SOUTH ZONE**Table – 20a: Disease progress in relation to weather factors at UAS, Dharwad (Karnataka)**

Met. Week	Rainy days	Rainfall in mm	Temperature °C		R. Humidity %		V1Abhaditha				V2 Jayadhar				V3 Ajeeth 155 Bt				V4 Dr.Brent Bt			
			Max.	Min.	Morn.	Ev.	AB	BLB	GM	Rust	AB	BLB	GM	Rust	AB	BLB	GM	Rust	AB	BLB	GM	Rust
31	2.0	15.0	27.0	20.7	91.7	87.1	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	3.0	11.8	29.2	20.8	88.6	83.0	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
33	1.0	8.0	26.8	20.1	90.4	90.3	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
34	0.0	0.0	29.0	20.2	88.7	81.3	5.5	0.0	0.0	0.0	3.9	0.0	3.3	0.0	4.7	0.0	0.0	0.0	4.8	0.0	0.0	0.0
35	1.0	6.4	28.2	20.6	88.0	79.1	8.5	0.0	0.0	0.0	4.5	0.0	6.5	0.0	6.3	0.0	0.0	0.0	5.0	0.0	0.0	0.0
36	2.0	13.0	27.5	20.5	90.9	79.6	12.0	0.0	0.0	0.0	5.3	0.0	10.5	0.0	8.5	0.0	0.0	0.0	6.8	0.0	0.0	0.0
37	4.0	19.0	27.1	21.0	92.4	85.6	16.0	0.0	0.0	0.0	6.5	0.0	15.5	0.0	10.0	0.0	0.0	0.0	8.5	0.0	0.0	0.0
38	1.0	3.8	29.1	20.3	88.6	70.9	19.3	0.0	0.0	0.0	9.3	0.0	16.0	0.0	12.5	0.0	0.0	0.0	9.0	0.0	0.0	0.0
39	1.0	2.8	28.0	20.3	88.4	78.3	22.8	0.0	0.0	0.0	12.0	0.0	18.8	0.0	15.8	0.0	4.5	0.0	11.0	0.0	3.5	0.0
40	5.0	52.8	30.9	21.1	87.0	80.1	25.0	0.0	0.0	0.0	16.0	0.0	19.0	0.0	18.8	0.0	6.8	0.0	14.0	0.0	4.3	0.0
41	2.0	26.4	29.2	20.9	91.4	75.3	29.5	2.3	8.0	0.0	17.5	0.0	22.5	0.0	21.5	0.0	8.0	0.0	19.3	0.0	5.5	0.0
42	0.0	0.0	30.6	19.6	83.0	60.6	30.8	4.4	10.3	0.0	19.0	0.0	23.8	0.0	23.5	0.0	10.8	0.0	21.8	0.0	6.9	0.0
43	2.0	9.0	29.8	18.5	76.7	62.3	31.5	6.9	11.5	0.0	20.8	0.0	25.8	0.0	24.3	4.5	12.6	0.0	23.3	4.0	7.0	0.0
44	1.0	5.2	29.4	19.7	83.3	63.7	29.5	8.7	13.6	10.7	18.3	0.0	29.3	8.7	26.3	7.0	15.0	5.6	24.3	6.8	7.5	6.8
45	1.0	9.6	28.9	17.4	80.7	72.7	29.3	6.5	14.2	12.6	18.0	0.0	21.5	12.7	28.8	7.8	16.0	12.5	25.0	8.0	8.3	10.5
46	2.0	49.2	28.2	20.2	88.6	75.7	22.0	5.5	4.6	15.2	16.0	0.0	22.0	14.6	18.0	5.8	5.7	14.3	12.3	7.5	4.7	12.6

AB=Alternaria leaf spot, BLB= Bacterial leaf blight, GM= Grey mildew



Path– 20b: Correlation values between weather parameters and cotton foliar diseases [Correlation coefficient (r)] at UAS, Dharwad

r'values weather parameters	V1 Abhadita				V2 Jayadhar			V3 Ajeet 155 Bt				V4 Dr. Brent Bt			
	AB	BB	GM	Rust	AB	GM	Rust	AB	BB	GM	Rust	AB	BB	GM	Rust
Max. Temp	0.823	0.888	0.627	0.347	0.819	0.826	0.334	0.843	0.688	0.659	0.342	0.833	0.771	0.438	0.341
Min. Temp	-0.847	- 0.725	- 0.806	- 0.763	- 0.834	-0.808	- 0.780	- 0.828	- 0.737	- 0.782	- 0.784	-0.837	- 0.864	-0.839	-0.788
RH Morning (%)	-0.871	- 0.842	- 0.908	- 0.768	- 0.874	-0.911	- 0.768	- 0.863	- 0.866	- 0.898	- 0.780	-0.748	- 0.788	-0.869	-0.784
RH Evening (%)	-0.937	- 0.922	- 0.770	- 0.615	- 0.931	-0.912	- 0.606	- 0.944	- 0.796	- 0.793	- 0.617	-0.832	- 0.848	-0.654	-0.618



Table 21a: Disease progress in relation to weather factors (weekly observations) at RARS, Lam Guntur (Andhra Pradesh)

Met. Week	Period	Rainfall (mm)	Rainy days	Temperature °C		R. Humidity%		Sunshine hours	Wind speed (km/H)	Evaporation
				Max.	Min.	Morn.	Even			
35	27Aug-2Sept	49.9	4	27.6	24.0	94.3	84.7	0.7	4.1	2.0
36	3-9 Sept	3.3	1	29.7	23.9	94.1	72.4	3.2	6.2	2.9
37	10-16	83.2	3	31.9	25.4	97.4	70.4	3.4	8.6	4.9
38	17-23	6.4	1	32.9	25.0	89.3	58.6	8.2	6.9	5.6
39	24-30Sept	40.2	3	29.8	24.0	94.1	83.0	3.1	6.3	3.4
40	Oct.1-7	122.4	4	30.5	25.3	98.6	75.7	6.2	3.5	4.2
41	8-14	0	0	32.0	24.6	98.3	71.6	6.2	3.8	4.3
42	15-21	1.8	0	31.3	24.7	93.6	73.9	4.4	3.8	3.7
43	22-28	0	0	31.3	23.2	84.7	64.0	6.9	3.6	4.6
44	29Oct-4 Nov	76.4	2	30.2	22.6	89.9	62.0	2.4	7.2	3.7
45	5-11	0.0	0	31.2	19.7	78.6	65.7	3.5	9.8	6.3
46	12-18	7.2	1	31.3	15.5	78.7	52.0	0.7	8.6	5.4
47	19-25	0.0	0	31.3	15.4	72.7	62.0	5.6	7.7	3.4
48	26- 2Dec	83.4	3	31.3	14.0	98.7	91.2	1.9	6.0	5.7
49	3-9	0	0	31.2	15.6	93.1	48.4	7.9	3.8	8.4
50	10-16	0	0	31.3	15.7	81.6	43.4	7.6	3.8	8.6
51	17-23	0	0	31.0	15.3	61.1	59.7	6.7	3.7	7.0
52	24-31Dec	0	0	30.3	15.3	61.4	61.1	6.2	3.6	6.4
01	1-7 Jan	0	0	29.5	15.3	66.0	57.1	7.6	4.9	5.9
02	8-14	31.2	2	28.2	17.6	99.7	79.1	5.1	4.5	3.1
03	15-21	5.4	1	27.0	17.5	98.9	92.3	5.6	3.2	1.3
04	21-28	0	0	30.3	19.6	98.9	74.3	7.0	4.7	5.4



Table 21b: 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	Jaadoo BG II	RCH 2 BG II	L 1060	NDLH 1938
35	27 Aug-2Sept.	Traces									
36	3-9Sept.	2.0	Traces	Traces	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	10-16	5.2	2.0	1.5	Traces	0.0	0.0	0.0	0.0	0.0	0.0
38	17-23	10.6	5.0	5.5	2.0	4.5	0.0	0.0	10.6	5.0	5.5
39	24-30Sept	9.3	10.0	5.3	8.5	10.8	4.3	0.0	9.3	10.0	5.3
40	Oct.1-7	9.8	5.8	6.3	7.5	12.5	6.5	0.0	9.8	5.8	6.3
41	8-14	8.0	5.8	12.0	14.5	6.0	4.3	0.0	8.0	5.8	12.0
42	15-21	10.8	5.5	17.0	14.3	18.3	11.0	2.5	10.8	5.5	17.0
43	22-28	10.5	11.5	16.3	15.8	22.3	16.8	4.3	10.5	11.5	16.3
44	29 Oct-4 Nov	20.5	11.3	25.3	12.0	21.7	24.0	22.5	20.5	11.3	25.3
45	5-11	25.0	17.5	28.0	24.5	21.0	7.5	38.8	25.0	17.5	28.0
46	12-18	22.3	27.3	28.3	25.5	4.5	0.0	40.3	22.3	27.3	28.3
47	19-25	30.3	24.5	44.3	26.0	1.3	0.0	29.3	30.3	24.5	44.3
48	26- 2 Dec	39.5	29.8	40.8	30.3	2.3	0.0	34.5	39.5	29.8	40.8
49	3-9	28.0	30.3	40.8	32.0			26.8	28.0	30.3	40.8
50	10-16	34.8	25.5	41.3	29.8			21.5	34.8	25.5	41.3
51	17-23	30.0	33.8	35.8	29.8			18.5	30.0	33.8	35.8
52	24-31Dec	21.5	35.0	29.5	29.5			15.8	21.5	35.0	29.5
01	1-7 Jan.'22	22.8	16.0	26.0	19.8			11.0	22.8	16.0	26.0
02	8-14	20.0	21.3	27.3	18.8			9.0	20.0	21.3	27.3
03	15-21	18.8	16.3	30.3	18.3			7.0	18.8	16.3	30.3
04	22-28							5.5			



Table 21c: Correlation values between weather parameters and *Corynespora* leaf spot of cotton [Correlation coefficient (r)] (Guntur-Andhra Pradesh)

Sr. No.	Entry/ PDI	Rainfall	Rainy days	Temperature °C		R. Humidity		Sunshine hours/ BSH	Wind Speed kmph	Evaporation
				Max.	Mini	Morn.	Even.			
1	L 1060(44.25)	-0.636	-0.704	-0.079	-0.939	-0.574	-0.552	0.201	-0.128	0.651
2	NDLH 1938 (32.0)	-0.663	-0.747	-0.042	-0.920	-0.629	-0.588	0.284	-0.221	0.697
2	RCH 2 Bt (30.25)	-0.638	-0.662	-0.077	-0.97	-0.719	-0.632	0.299	-0.159	0.755
3	Jaadoo BG II (39.5)	-0.511	-0.595	0.034	-0.897	-0.563	-0.595	0.190	-0.033	0.716

L 1060 ('r') values: * Significant at 5% 0.378; ** Significant at 1% 0.515

NDLH 1938 ('r') values: * Significant at 5% 0.378; ** Significant at 1% 0.515

RCH 2 BG II ('r') values: * Significant at 5% 0.378; ** Significant at 1% 0.515

Jaadoo BG II ('r') values: * Significant at 5% 0.378; ** Significant at 1% 0.515

Table 21d: Correlation values between weather parameters and grey mildew of cotton [Correlation coefficient (r)] (Guntur-Andhra Pradesh)

Sr. No.	Entry/ PDI	Rainfall	Rainy days	Temperature °C		R. Humidity		Sunshine hours/ BSH	Wind Speed kmph	Evaporation
				Max.	Mini	Morn.	Even.			
1	RCH 2 BG II (24.0)	-0.438	-0.681	0.035	-0.147	-0.455	-0.598	-0.052	-0.019	0.328
2	Jaadoo BG II (22.3)	-0.525	-0.783	0.186	-0.561	-0.663	-0.568	0.065	-0.188	0.393

RCH 2 BG II ('r') values: * Significant at 5% 0.497; ** Significant at 1% 0.658

Jaadoo BG II ('r') values: * Significant at 5% 0.549; ** Significant at 1% 0.715

Table 21e: Correlation values between weather parameters and rust of cotton [Correlation coefficient (r)]

Sr. No.	Entry/ (PDI)	Rainfall	Rainy days	Temp. °C		R. Humidity		Sunshine hours/ BSH	Wind Speed (km/h)	Evaporation
				Max.	Mini	Morn.	Even.			
1	L 1060 (27.0)	-0.283	-0.334	0.204	-0.557	-0.301	-0.528	-0.643	0.755	0.297
	NDLH 1938 (30.0)	-0.264	-0.312	0.231	-0.525	-0.274	-0.487	-0.675	0.787	0.247
2	Jaadoo BG II (40.25)	-0.22	-0.363	0.371	-0.403	-0.344	-0.551	-0.672	0.769	0.319
	RCH 2 BG II (42.0)	-0.161	-0.248	0.250	-0.237	-0.124	-0.304	-0.786	0.829	-0.036

L 1060 ('r') values: * Significant at 5% 0. 0.441, ** Significant at 1% 0.592

NDLH 1938 ('r') values: * Significant at 5% 0. 0.441, ** Significant at 1% 0.592

Jaadoo BG II ('r') values: * Significant at 5% 0. 0.412, ** Significant at 1% 0.558

RCH 2 BG II ('r') values: * Significant at 5% 0.441, ** Significant at 1% 0.592



Table 22a: Disease progress in relation to weather factors at UAS, Coimbatore (Tamil Nadu)

Met. Week	Period	Rainy days	Rainfall (mm)	Temperature (°C)		Relative Humidity (%)		Wind speed (km/h)	Sun Shine hours
				Max.	Min.	Morn.	Even		BSH
30	July 20-26	0	2.5	31.0	23.9	77	59	13.3	5.5
31	July 27-Aug 2	0	0	32.4	23.0	82	51	11.1	7.5
32	Aug 3-9	0	1	32.5	23.4	85	56	7.4	6.5
33	Aug 10-16	1	4.3	31.2	28.7	85	54	7.0	4.5
34	17-23	3	14.2	31.3	22.8	85	63	4.7	6.6
35	24-30	3	16.0	31.1	22.9	85	60	9.2	3.2
36	Sep 1-7	2	9.0	29.9	22.8	82	60	8.8	5.7
37	8-14	0	0.0	32.2	23.6	81	54	11.9	6.9
38	15-21	1	3.0	33.2	23.3	85	55	5.4	6.1
39	22-28	2	17.5	31.4	23.3	83	59	8.6	5.7
40	29-Oct 5	4	37.0	30.9	23.5	87	62	4.2	5.3
41	6-12	1	11.5	30.9	23.5	83	65	6.9	4.0
42	13-19	1	66.5	31.0	23.5	86	66	5.1	5.3
43	20-26	3	86.0	30.3	22.7	86	64	4.2	6.4
44	27-Nov 2	5	104.0	28.1	23.0	87	71	4.4	2.1
45	Nov 3-9	4	85.2	27.9	22.0	87	73	2.8	1.8
46	10-16	1	60.0	29.6	22.6	87	67	3.7	3.6
47	17-23	1	3.2	28.9	22.1	86	67	3.4	4.2
48	24-30	2	25.0	27.5	22.6	86	69	5.5	2.3
49	Dec 1-7	3	30.0	29.7	22.5	86	66	4.0	4.6
50	8-14	1	19.5	28.1	21.8	85	58	3.9	6.9
51	15-21	0	0	28.9	19.6	84	53	4.2	5.5
52	22-28	0	0	29.2	19.4	84	48	5.1	7.7
1	29-Jan 4, 2022	0	0	30.8	20.6	85	46	3.9	8.1



Table 22b: Disease progress in relation to weather factors at UAS, Coimbatore (Tamil Nadu)

SMW No	Foliar diseases															Soil borne disease				
	ALB					Tobacco Streak virus					Grey mildew					Collar rot / root rot				
	RCH659	LRA 5166	CO14	K12	K11	RCH659	LRA 5166	CO14	K12	K11	RCH659	LRA 5166	CO14	K12	K11	RCH659	LRA 5166	CO14	K12	K11
33	-	-	-	-	-		-	-	-	-	-	-	-	-	-		-	-	-	-
34	-	-	-	-	-		-	-	-	-	-	-	-	-	-		-	-	-	-
35	-	-	-	-	-		-	-	-	-	-	-	-	-	-	2.5	1.0	3.0	0.7	0.5
36	-	-	-	-	-		-	-	-	-	-	-	-	-	-	3.2	1.5	4.0	1.3	1.4
37	-	-	-	-	-		-	-	-	-	-	-	-	-	-	4.1	2.0	4.5	1.7	2.0
38	-	-	-	-	-		-	-	-	-	-	-	-	-	-	4.5	3.0	5.5	2.0	2.3
39	2.5	2.3	2.7	2.0	1.5		-	-	-	-	-	-	-	-	-	4.7	4.0	6.3	2.5	2.7
40	3.3	3.7	3.5	2.7	2.7	1.5	-	1.0	-	-	-	-	-	-	-	1.0	6.5	1.2	-	-
41	4.1	4.5	4.8	3.2	3.5	2.7	-	2.5	-	-	-	-	-	-	-	1.5	1.0	1.5	-	-
42	5.5	5.8	6.2	4.1	6.0	3.5	-	3.7	-	-	-	-	-	-	-	1.7	2.0	1.7	-	-
43	6.3	6.7	7.5	5.3	6.5	6.0	-	5.5	-	-	1.3	-	-	2.3	2.5	-	-	-	-	-
44	7.7	8.0	8.3	6.5	7.3	6.5	-	6.3	-	-	2.5	-	-	3.7	3.0	-	-	-	-	-
45	8.3	8.7	9.5	7.0	8.0	7.3	-	7.5	-	-	3.3	-	-	4.3	4.1	2.4	-	2.0	-	-
46	9.4	10.5	11.4	7.3	9.7	8.0	-	8.7	-	-	4.5	-	-	5.7	5.0	3.7	2.7	3.5	1.0	-
47	10.6	10.7	12.8	8.5	10.2	9.7	-	9.1	-	-	5.4	-	-	8.8	8.2	4.3	3.5	5.0	3.7	2.5
48	11.3	11.7	13.7	9.1	11.5	10.3	-	10.5	-	-	6.1	-	-	9.3	9.1	4.5	4.3	6.5	4.0	3.3
49	11.5	17.2	16.5	12.5	14.5	11.5	-	15.5	-	-	8.7	-	-	18.7	14.5	4.7	4.8	7.0	4.2	4.7
50	13.5	17.2	16.5	12.5	14.5	15.3	-	15.5	-	-	8.7	-	-	18.7	14.5	5.0	5.2	7.7	4.5	5.0
51	13.5	17.2	16.5	12.5	14.5	15.3	-	15.5	-	-	8.7	-	-	18.7	14.5	5.3	6.0	8.3	5.0	5.2
52	13.5	17.2	16.5	12.5	14.5	15.3	-	15.5	-	-	8.7	-	-	18.7	14.5	5.5	6.0	8.5	5.0	5.5
01	13.5	17.2	16.5	12.5	14.5	15.3	-	15.5	-	-	8.7	-	-	18.7	14.5	5.5	6.5	8.7	5.5	5.7



Table 22c: Correlation between weather variables and disease incidence in Cotton at UAS, Coimbatore (Tamil Nadu)

Environmental variables	Correlation Coefficient			
	<i>Alternaria</i> blight	Tobacco streak virus	Grey mildew	Collar rot / root rot
Maximum Temperature	- 0.4544	- 0.3833	0.2067	-0.0119
Minimum Temperature	- 0.8037	- 0.7995	- 0.6999	-0.5393
RH(Morning)	- 0.07505	- 0.3372	- 0.8144	-0.0200
RH(Evening)	- 0.5095	- 0.5868	- 0.7662	-0.0822
Wind speed	- 0.4715	- 0.2750	0.2197	-0.2510
Sunshine hours	0.3580	0.4200	0.6574	0.5107
Rainfall	- 0.4413	- 0.5319	-0.8291	-0.5782

Path 1c: Studies on the variability in *Alternaria* causing leaf spot in cotton**Table 23: 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-24: Progress of TSV incidence (%) at RARS, Lam, Guntur during *kharif* 2021

SMW	Month & Date	Incidence of Tobacco Streak Virus Disease (%)			
		RCH 2 BG II	Jaadoo BG II	L 1060	NDLH 1938
32	6-12Aug'21	2.9	3.5	1.3	0.7
33	13-19	1.3	2.0	0.7	0.2
34	20-26	0.8	2.2	0.4	0.5
35	27Aug-2Sept	1.0	0.8	0.5	0.4
36	3-9 Sept'21	2.0	2.6	0.8	0.5
37	10-16	15.6	17.3	19.6	8.1
38	17-23	12.9	19.5	6.6	5.0
39	24-30	8.8	13.6	5.4	2.0
40	Oct.1-7	6.6	8.7	0.3	0.5
41	8-14	10.0	8.5	0.5	1.7
42	15-21	11.2	10.6	0.5	2.2
43	22-28	11.3	13.5	0.8	2.2
44	29Oct- 4 Nov	9.5	11.7	0.0	1.4
45	5-11	9.5	8.0	0.0	1.3
46	12-18	9.5	8.0	0.0	1.3
47	19-25	14.2	12.8	1.1	2.5
48	26Nov- 2Dec	9.8	8.0	0.3	3.0
49	3-9	8.1	7.4	0.3	1.7
50	10-16	10.3	6.4	0.3	3.4
51	17-23	9.8	8.0	0.4	5.0
52	24-31	9.0	7.3	0.0	6.0
1	1-7 Jan'22	17.2	9.9	0.0	7.1
2	8-14	16.2	9.9	0.0	6.4
3	15-21	11.3	8.3	0.0	5.0



Table 25: 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 21	Kallipalayam	RCHIIBGII, RCH 659	Vegetative stage	3.3
	Kovilpalayam	RCHIIBGII, RCH 659	Vegetative stage	4.2
	Vellamadaï	RCHIIBGII, RCH 659	Vegetative stage	5.0
	Thottipalayam	RCHIIBGII, RCH 659	Vegetative stage	4.5
	Samainayakkanpalayam	RCHIIBGII, RCH 659	Vegetative stage	3.0
	TNAU Farm	RCHIIBGII, RCH 659, Var.Co14, Co17	Vegetative stage	6.5
November 2021	Kallipalayam	RCHIIBGII, RCH 659	Square formation	4.0
	Kovilpalayam	RCHIIBGII, RCH 659	Square formation	5.3
	Vellamadaï	RCHIIBGII, RCH 659	Square formation	5.7
	Thottipalayam	RCHIIBGII, RCH 659	Square formation	5.0
	Samainayakkanpalayam	RCHIIBGII, RCH 659	Square formation	4.0
	TNAU Farm	RCHIIBGII, RCH 659	Square formation	8.7
December 2021	Kallipalayam	RCHIIBGII, RCH 659	Boll formation	7.0
	Kovilpalayam	RCHIIBGII, RCH 659	Boll formation	7.5
	Vellamadaï	RCHIIBGII, RCH 659	Boll formation	7.8
	Thottipalayam	RCHIIBGII, RCH 659	Boll formation	8.3
	Samainayakkanpalayam	RCHIIBGII, RCH 659	Boll formation	10.7
	TNAU Farm	RCHIIBGII, RCH 659, Var. Co14, Co17	Boll formation	18.5
January 2022	Kallipalayam	RCHIIBGII, RCH 659	Boll maturity	7.5
	Kovilpalayam	RCHIIBGII, RCH 659	Boll maturity	8.3
	Vellamadaï	RCHIIBGII, RCH 659	Boll maturity	8.5
	Thottipalayam	RCHIIBGII, RCH 659	Boll maturity	9.3
	Samainayakkanpalayam	RCHIIBGII, RCH 659	Boll maturity	11.0
	TNAU Farm	RCHIIBGII, RCH 659 Var. Co14, Co17	Boll maturity	18.5



Path 1 (e) Studies on variability of *Corynespora* leaf spot

Table 26: 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 with outer side light gray with light to dark gray, zonation	5-11, transverse pseudoseptate, ovate, slightly curved with truncate base, tip rounded, long beak	Positive



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, Gray 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 27: Morphological studies of *Corynespora* cultures Junagarh

Days	Morphological character	Growth	Sporulation	Virulence
3	Septet brownish mycelium	Olivaceous, profuse aerial mycelium	No	-
5	Septate brownish mycelium	Olivaceous, profuse aerial mycelium	No	-
7	Septate brownish mycelium, conidia with three or four transverse pseudoseptate	Dark brown, profuse aerial mycelium	Moderate	-
9	Septate brownish black mycelium,	Brown to black pigmentation	Good	virulent

Table 28: Presence of *Corynespora* species in cotton leaf spot samples during *kharif* 2021 in Andhra Pradesh

S. No.	Date	Place (district)	Hybrid / variety	Presence of <i>Corynespora</i> spores
1	24.09.21	Rajupalem (Guntur)	Crystal 999	Positive
2	30.09.21	RARS, Lam	Jaadoo (Field No 6)	Positive
3	11.10.21	RARS, Lam	Lam varieties (Field No 18)	Positive
4	20.10.21	Chandavaram (Guntur)	Jaadoo	Positive
5	30.10.21	Endroyi (Guntur)	Akira	Positive
6	13.11.21	Bobbepalli (Prakasam)	Nava Mallika	Positive
7	13.11.21	Marturu	RCH 659	Positive
8	15.11.21	RARS, Lam	LHDP 5 (PG trial)	Positive
9	25.11.21	G. Konduru (Krishna)	Tulasi 7	Positive
10	25.11.21	Bheemavaram (Krishna)	Sadananda	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 29. 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
101	HD 564	0.0	DF	0.0	DF	0.0	DF	17.5	R	75.0	S	0.0	DF	10.5	R
102	PBD 160	0.0	DF	0.0	DF	0.0	DF	16.8	R	66.5	S	0.0	DF	12.9	R
103	RG 868	0.0	DF	9.3	R	0.0	DF	18.3	R	84.1	S	1.5	R	10.4	R
104	ZC (FDK 124)	0.0	DF	0.0	R	0.0	DF	17.8	R	85.4	S	0.0	DF	9.0	R
105	CISA 7	0.0	DF	0.0	R	0.0	DF	17.0	R	67.8	S	0.0	DF	8.6	R
106	FDK 325	0.0	DF	7.8	R	0.0	DF	18.5	R	88.3	S	0.0	DF	7.1	R
107	RG 888	0.0	DF	0.0	DF	0.0	DF	17.8	R	75.0	S	0.0	DF	9.1	R
108	PBD 156	0.0	DF	0.0	DF	0.0	DF	17.3	R	82.7	S	0.5	R	10.9	R
109	CISA 33-7	0.0	DF	0.0	DF	0.0	DF	17.5	R	75.5	S	0.3	R	11.3	R
110	LC	0.0	DF	0.0	DF	0.0	DF	17.8	R	85.4	S	1.0	R	12.2	R
111	FDK 315	0.0	DF	8.8	R	0.0	DF	18.8	R	86.1	S	0.0	DF	9.1	R
112	HD 562	0.0	DF	9.0	R	0.0	DF	19.3	R	87.5	S	0.0	DF	9.5	R
	LD 949(LC)			12.0	R			21.3	R						
	FDK 124(LC)			11.50	R			20.3	R						
	CISA 614									84.6	S				
	CISA 310									79.8	S				



Table 30: 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
121	KR 152	16.3	R	0.0	DF	45.8	S
122	CISAA 20-2	17.8	R	8.3	R	15.7	MS
123	KR 151	13.8	R	0.0	DF	59.5	S
124	CISAA 20-1	13.8	R	0.0	DF	22.3	MS
125	AAH 45	18.3	R	8.0	R	30.6	S
126	LC	17.5	R	7.8	R	89.6	S
127	KR 153	16.0	R	0.0	DF	38.8	S
128	AAH 44	17.0	R	8.8	R	51.2	S
129	ZC (KR 64-NZ)	15.0	R	6.8	R	32.2	S
	LD 949(LC)	19.5	R	10.5	R	-	-
	FDK 124(LC)	19.5	R	11.3	R	-	-
	CISA 614					41.1	S
	CICR-2					16.7	MS

NATIONAL TRIALS: Central Zone**Table 31. Br. 02 a/b CC – IET- *G. hirsutum* – Coloured Cotton (IRRIGATED / RAINFED)**

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)							
		Surat		Khandwa		Surat		Khandwa	
		Bacterial Leaf Blight		Alternaria Leaf blight		Corynespora leaf spot		Grey Mildew	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR
131	CNH 21198	29.2	MR	50.0	MR	0.0	DF	42.5	MR
132	ZC (Phule Yamuna)	5.5	R	52.5	MS	43.5	MR	35.0	MR
133	CNH 20449	12.5	R	60.0	MS	0.0	DF	40.0	MR
134	LHCC 23	0.0	DF	55.0	MS	0.0	DF	57.5	MS
135	Local Check	9.2	R	62.5	MS	7.8	R	55.0	MS
136	CCH 20452	0.0	DF	45.0	MR	0.0	DF	42.5	MR
137	DHCC 2151	0.0	DF	47.5	MR	0.0	DF	42.5	MR



Table 32. Br. 22 a/b IET-*G. arboreum*

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)									
		Alternaria blight				BLB		Grey Mildew		MLS	
		Khandwa		Akola		Akola		Khandwa		Akola	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
141	JLA 1204	52.5	MS	5.0	R	3.3	R	0.0	DF	5.0	R
142	PAIG 421	45.0	MR	3.3	R	6.7	R	0.0	DF	6.7	R
143	CNA19086	40.0	MR	6.7	R	8.3	R	0.0	DF	3.3	R
144	PA 908	82.5	S	8.3	R	3.3	R	27.5	MR	8.3	R
145	ZC (AKA 7)	52.5	MS	3.3	R	5.0	R	27.5	MR	3.3	R
146	PA 907	77.5	S	5.0	R	6.7	R	32.5	MR	6.7	R
147	CNA 1080	67.5	MS	6.7	R	3.3	R	0.0	DF	8.3	R
148	GAM 283	50.0	MR	5.0	R	8.3	R	0.0	DF	3.3	R
149	CNA 1081	47.5	MR	6.7	R	11.7	R	0.0	DF	3.3	R
150	QC (PA 255)	40.0	MR	3.3	R	3.3	R	0.0	DF	6.7	R
151	CNA 1077	40.0	MR	5.0	R	6.7	R	0.0	DF	8.3	R
152	GAM 276	47.5	MR	5.0	R	8.3	R	0.0	DF	6.7	R
153	PA 906	57.5	MS	3.3	R	3.3	R	0.0	DF	8.3	R
154	AKA 2016-11	62.5	MS	6.7	R	3.3	R	0.0	DF	3.3	R
155	LC	45.0	MR	5.0	R	10.0	R	0.0	DF	5.0	R
156	CNA1076	52.5	MS	5.0	R	8.3	R	0.0	DF	6.7	R
157	JLA 1440	45.0	MR	3.3	R	6.7	R	0.0	DF	3.3	R
158	PAIG 420	35.0	MR	6.7	R	3.3	R	0.0	DF	5.0	R
	AKA-8 (Ch			25.0	MR	28.3	MR	0.0	DF	26.7	MR



Table 33. Br. 32b IET of *G. herbaceum*

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)							
		Bacterial leaf blight				Alternaria Leaf blight		Corynespora leaf spot	
		Surat		Bharuch		Bharuch		Surat	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR
171	GShv 831/17	0.0	DF	0.0	DF	0.0	DF	0.0	DF
172	GVhv 1014	0.0	DF	0.0	DF	0.0	DF	0.0	DF
173	GShv 807/17	0.0	DF	0.0	DF	0.0	DF	0.0	DF
174	GVhv 1028	0.0	DF	0.0	DF	25.0	R	0.0	DF
175	ZC (G Cot 23)	0.0	DF	0.0	DF	0.0	DF	0.0	DF
176	GVhv 1172	0.0	DF	0.0	DF	0.0	DF	0.0	DF
177	GShv 810/17	0.0	DF	0.0	DF	0.0	DF	0.0	DF
178	LC	0.0	DF	0.0	DF	0.0	DF	0.0	DF
	LRA 5166 (SC)			0.0	DF	0.0	DF		
	1027 ALF			0.0	DF	0.0	DF		
	Digvijay			0.0	DF	0.0	DF		



ZONAL TRIAL: NORTH ZONE**Table 34. Br-04 a – Coordinated Variety trial of *G. hirsutum* (1001-1009)**

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)													
		Bacterial leaf blight				FFS				CLCuD					
		Faridkot		Bathinda		Bathinda		Faridkot		Faridkot		Bathinda		Hisar	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1001	LC	3.0	MR	0.0	R	14.8	R	3.0	MR	34.3	MS	35.4	MS	14.2	R
1002	PBH 79	1.8	R	14.0	R	22.5	R	2.5	MR	32.9	MS	36.5	MS	14.8	R
1003	F 2732	1.0	R	0.0	R	19.0	R	0.5	R	23.6	MR	29.2	MR	16.7	R
1004	ZC (F 2228)	2.5	MR	0.0	R	18.0	R	0.8	R	38.4	MS	28.1	MR	14.4	R
1005	CSH 90	1.3	R	0.0	R	10.8	R	1.0	R	27.8	MR	34.4	MS	9.2	HR
1006	H 1480	1.8	R	9.8	R	24.3	R	0.5	R	35.9	MS	39.6	MS	6.5	HR
1007	Quality Check (CSH 3129)	0.5	R	8.3	R	20.8	R	0.8	R	29.2	MR	28.1	MR	12.3	R
1008	F 2743	1.5	R	9.5	R	19.5	R	0.5	R	22.9	MR	27.1	MR	9.4	HR
1009	H 1569	0.8	R	9.5	R	22.5	R	0.5	R	27.2	MR	33.3	MS	11.6	R
	F846(SC)			12.0	R	25.5	MR					45.8	S		
	HS 6(SC)			11.5	R	18.8	R					45.8	S		



Table 35. 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		Bathinda		Faridkot	
		PDI	DR	PDI		PDI	DR	PDI	DR
1011	PBD 88	0.0	DF	8.0	R	17.0	R	0.0	DF
1012	FDK 124 (ZC)	0.0	DF	8.5	R	17.5	R	0.0	DF
1013	FDK 312	0.0	DF	8.8	R	18.0	R	0.0	DF
1014	PBD 92	0.0	DF	9.0	R	16.5	R	0.0	DF
1015	FDK 324	0.0	DF	8.5	R	15.3	R	0.0	DF
1016	Local Check	0.0	DF	9.0	R	15.5	R	0.0	DF
	LD 949 (Check)			10.0	R	19.3	R		
	FDK 124 (Check)			9.3	R	18.5	R		

Table 36. Br-25 a Coordinated Desi Hybrid trial (1021-1029)

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)							
		Bacterial leaf blight				FFS			
		Faridkot		Bathinda		Bathinda		Faridkot	
		PDI	DR	PDI		PDI	DR	PDI	DR
1021	KR 149	0.0	DF	6.3	R	9.5	R	0.0	DF
1022	Local Check	0.0	DF	6.8	R	9.0	R	0.0	DF
1023	CISAA 19-3	0.0	DF	0.0	R	8.8	R	0.0	DF
1024	CISAA 19-4	0.0	DF	4.8	R	9.8	R	0.0	DF
1025	Zonal Check (KR 64)	0.0	DF	6.3	R	10.5	R	0.0	DF
1026	KR 150	0.0	DF	0.0	R	8.8	R	0.0	DF
1027	KR 148	0.0	DF	0.0	R	8.8	R	0.0	DF
	LD 949 (Check)			7.8	R	10.5	R		
	FDK 124 (Check)			8.3	R	10.0	R		



ZONAL TRIAL: CENTRAL ZONE**Table 37. 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		Khandwa	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR
1111	CNH 19480	0.0	DF	72.5	S	5.8	R	77.5	S
1112	Phule Yamuna (Zonal Check)	8.2	R	80.0	S	13.0	R	55.0	MS
1113	CNH 18529	5.2	R	57.5	MS	4.5	R	56.3	MS
1114	DHCC 1901	0.0	DF	75.0	MS	0.0	DF	62.5	MS
1115	Local Check	0.0	DF	72.5	S	0.0	DF	85.0	S
1116	CNH 19325	0.0	DF	57.5	MS	0.0	DF	67.5	MS
1117	CNH 17395	0.0	DF	80.0	S	5.0	R	50.0	MS
1118	CNH 18528	0.0	DF	77.5	S	0.0	DF	52.5	MS
	LRA 5166 (SC)	65.5	MS						

Table 38. Br-04 a – CVT – Irrigated

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)															
		Bacterial leaf blight				Alternaria leaf spot				Corynespora leaf spot				Grey mildew			
		Junagarh		Surat		Khandwa		Junagarh		Junagarh		Surat		Khandwa		Junagarh	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1121	GJHV 568	1.5	R	7.3	R	75.0	MS	26.5	MR	30.5	MR	10.0	R	57.5	MS	0.0	DF
1122	TCH 1941	2.6	R	7.0	R	75.0	MS	14.0	R	20.0	R	10.5	R	40.0	MR	0.0	DF
1123	Quality Check (Suraj)	3.1	R	8.0	R	60.0	MS	12.5	R	13.5	R	8.3	R	57.5	MS	0.0	DF
1124	GJHV 566	1.0	R	8.5	R	80.0	S	8.0	R	25.0	R	9.2	R	60.0	MS	0.0	DF
1125	ZC (Phule Yamuna)	0.5	R	10.2	R	67.5	MS	13.0	R	41.0	MR	33.5	MR	77.5	S	0.0	DF
1126	GJHV 548	1.1	R	0.0	DF	75.0	MS	9.5	R	28.0	MR	8.5	R	55.0	MS	0.0	DF
1127	LC	2.5	R	0.0	DF	62.5	MS	8.0	R	10.5	R	0.0	DF	82.5	S	0.0	DF
1128	GISV 328	2.0	R	0.0	DF	57.5	MS	6.5	R	7.0	R	0.0	DF	67.5	MS	0.0	DF
	LRA 5166, SC			65.5	MS							8.0	R				



Table 39. Br-04 b – CVT – Rainfed

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)															
		Bacterial leaf blight						Alternaria leaf spot						MLS		GM	
		Bharuch		Nanded		Akola		Bharuch		Nanded		Akola		Akola		Nanded	
		PDI	DR	PDI	DR	PDI	DR	Grade	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1131	ZC (NH 615)	25.0	R	5.6	R	10.0	R	25.0	R	5.2	R	3.3	R	3.3	R	9.7	R
1132	CNH 119	0.0	DF	2.9	R	3.3	R	0.0	DF	5.0	R	5.0	R	3.3	R	11.4	R
1133	Local Check	0.0	DF	2.2	R	11.7	R	0.0	DF	3.8	R	6.7	R	1.7	R	9.0	R
1134	TVH 007	0.0	DF	8.0	R	10.0	R	25.0	R	6.8	R	1.7	R	3.3	R	8.2	R
1135	RAH 1081	25.0	R	7.3	R	1.7	R	0.0	DF	6.7	R	3.3	R	1.7	R	8.4	R
1136	AKH 2013-2	0.0	DF	1.0	R	10.0	R	0.0	DF	3.2	R	1.7	R	5.0	R	8.5	R
1137	Quality Check (Suraj)	0.0	DF	4.8	R	18.3	R	0.0	DF	4.3	R	1.7	R	1.7	R	8.4	R
1138	AKH 2013-3	0.0	DF	5.2	R	1.7	R	25.0	R	5.5	R	6.7	R	1.7	R	10.3	R
	LRA 5166 (SC)	0.0	DF	9.8	R	48.3	MR	0.0	DF	7.2	R	36.7	MR	26.7	MR	11.8	R



Table 40. Br-24 b CVT – *G. arboreum*

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)							
		Bacterial leaf blight		Alternaria leaf spot				MLS	
		Akola		Akola		Khandwa		Akola	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR
1141	PA 873	6.7	R	3.3	R	37.5	MR	3.3	R
1142	LC	3.3	R	5.0	R	35.0	MR	5.0	R
1143	CNA 1072	8.3	R	6.7	R	25.0	R	3.3	R
1144	PA 904	11.7	R	3.3	R	35.0	MR	6.7	R
1145	GAM 269	3.3	R	5.0	R	60.0	MS	8.3	R
1146	QC (PA 255)	6.7	R	3.3	R	52.5	MS	3.3	R
1147	PAIG 411	8.3	R	6.7	R	37.5	MR	8.3	R
1148	NDLA 3116-3	3.3	R	8.3	R	27.5	MR	11.7	R
1149	PA 869	5.0	R	3.3	R	52.5	MS	3.3	R
1150	JLA-1430	6.7	R	5.0	R	30.0	MR	5.0	R
1151	CNA 1075	3.3	R	6.7	R	60.0	MS	5.0	R
1152	NDLA 3104-4	5.0	R	5.0	R	50.0	MS	3.3	R
1153	GAM 266	3.3	R	3.3	R	35.0	MR	6.7	R
1154	PAIG 410	6.7	R	3.3	R	62.5	MS	11.7	R
1155	CNA 1071	11.7	R	10.0	R	57.5	MS	6.7	R
1156	ZC (AKA 7)	6.7	R	8.3	R	50.0	MS	8.3	R
1157	AKA 2013-8	8.3	R	6.7	R	32.5	MR	5.0	R
	AKA-8 (Ch)	33.3	MR	30.0	MR			28.3	MR



Table 41. 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	
		Surat		Khandwa		Surat	
		PDI	DR	PDI	DR	PDI	DR
1161	CNA 1092	0.0	DF	27.5	MR	0.0	DF
1162	DDCC 1902	0.0	DF	45.0	MR	0.0	DF
1163	CNA 18562	0.0	DF	40.0	MR	0.0	DF
1164	Local Check	0.0	DF	35.0	MR	0.0	DF
1165	CNA 18563	0.0	DF	37.5	MR	0.0	DF
1166	DDCC 1901	0.0	DF	47.5	MR	0.0	DF
1167	CNA 19475	0.0	DF	50.0	MR	0.0	DF
1168	DDCC 2001	0.0	DF	35.0	MR	0.0	DF
1169	CNA 20402	0.0	DF	35.0	MR	0.0	DF
1170	AKA 7 (Zonal Check)	0.0	DF	27.5	MR	0.0	DF
	LRA 5166 (SC)	65.5	MS			8.0	R

ZONAL TRIAL: SOUTH ZONE**Table 42. Br-03 a/b (CC) – PVT Colour Cotton – Irrigated (1211-1221) – Lam Centre**

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)			
		Corynespora leaf spot		Rust	
		PDI	DR	PDI	DR
1211	CCHC 19-2	9.8	R	20.5	R
1212	DHCC 2151	7.8	R	17.3	R
1213	DHCC 2001	16.5	R	20.8	R
1214	Suraj (Zonal Check)	10.0	R	25.8	MR
1215	DHCC 2002	14.5	R	23.3	R
1216	DHCC 1902	15.0	R	18.8	R
1217	CNH 18529	13.5	R	16.5	R
1218	DHCC 1901	13.8	R	16.5	R
1219	Local Check	22.8	R	29.5	MR
1220	CCHC 19-1	13.8	R	29.0	MR
1221	LHCC 23	17.4	R	27.0	MR
C	L 1060	44.3	MR	27.0	MR
C	Jaadoo BG II	39.5	MR	40.3	MR
C	RCH 2 BG II	33.8	MR	42.0	MR



Table 43. Br-04a – CVT – Irrigated

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)					
		Corynespora leaf spot		Grey mildew		Rust	
		Lam		Junagarh		Lam	
		PDI	DR	PDI	DR	PDI	DR
1231	TSH 383	13.0	R	1.0	R	20.8	R
1232	TSH 387	10.0	R	7.5	R	14.3	R
1233	RAH 1083	11.3	R	1.0	R	17.3	R
1234	TCH 1941	9.0	R	1.0	R	12.3	R
1235	ZC (Suraj)	9.8	R	1.0	R	21.0	R
1236	SHSV 14	15.3	R	1.0	R	18.8	R
1237	CCH 19-2	16.5	R	1.5	R	21.5	R
1238	RAH 1082	13.0	R	1.0	R	26.3	MR
1239	LC	13.8	R	1.3	R	25.3	MR
1240	CPD 1902	13.5	R	1.0	R	24.0	R
1241	RAH 1046	10.8	R	1.0	R	20.0	R
1242	RHC 1409	9.8	R			22.5	R
1243	RAH 1081	16.3	R			28.0	MR
C	L 1060	44.3	MR			27.0	MR
C	Jaadoo BG II	39.5	R			40.3	MR
C	RCH 2 BG II	33.8	R			42.0	MR



Table 44. 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	%inci.	DR	PDI	DR	PDI	DR
1251	CCB 29	0.0	DF	17.5	R	35.5	MR	27.0	S	0.0	DF	16.6	R
1252	CCB 26	0.0	DF	14.3	R	41.3	MR	15.5	MS	0.0	DF	14.4	R
1253	CCB 51	0.0	DF	13.1	R	55.5	MS	16.3	MS	0.0	DF	15.6	R
1254	DB 1901	0.0	DF	11.8	R	12.5	R	11.5	MR	0.0	DF	15.4	R
1255	ZC (Suvin)	0.0	DF	17.9	R	58.7	MS	26.3	S	0.0	DF	16.0	R
1256	SBSD 5-6	0.0	DF	12.6	R	38.3	MR	18.5	MS	0.0	DF	15.8	R
1257	CCB 2	0.0	DF	14.3	R	57.7	MS	15.3	MS	0.0	DF	15.3	R
1258	CCB 1	0.0	DF	14.3	R	60.4	MS	17.3	MS	0.0	DF	15.3	R
1259	CCB 6	0.0	DF	12.5	R	9.5	R	9.7	R	0.0	DF	13.9	R
	Jaydhar (C)	0.0	DF	65.0	S					52.8	S	47.5	MR
	Abhadit (C)	47.3	MR	54.5	S					41.0	MR	49.0	MR
	LRA5166 (SC)					70.5	MS	29.5	S				

Table 45. Br-04b – CVT – Rainfed - Dharwad Centre

Code	Entry	Average Percent Disease Index (PDI %) & Disease reaction (DR)							
		Bacterial leaf blight		Alternaria leaf spot		Grey mildew		Rust	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR
1261	NDLH 2071-2	0.0	DF	16.0	R	0.0	DF	16.9	R
1262	RAH 1081	0.0	DF	16.4	R	0.0	DF	17.8	R
1263	ZC (Sahana)	0.0	DF	16.5	R	0.0	DF	16.5	R
1264	CCH 19-2	0.0	DF	13.8	R	0.0	DF	14.8	R
1265	NDLH 2056-4	0.0	DF	16.6	R	0.0	DF	17.7	R
1266	LC	0.0	DF	16.6	R	0.0	DF	16.5	R
1267	CNH 119	0.0	DF	16.1	R	0.0	DF	17.0	R
1268	QC (Suraj)	0.0	DF	17.8	R	0.0	DF	16.4	R
1269	AKH 2013-3	0.0	DF	19.3	R	0.0	DF	17.0	R
	Jaydhar (C)	0.0	DF	65.0	S	52.8	S	47.5	MR
	Abhadita (C)	47.3	MR	54.5	S	41.0	MR	49.0	MR



Table 46. Br. 24b CVT – *G. arboreum*

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
1271	DWDa 2051	0.0	DF	13.9	R	19.5	R	15.3	R
1272	MDL 2674	0.0	DF	12.5	R	19.6	R	15.3	R
1273	CNA 1072	0.0	DF	13.8	R	19.3	R	16.3	R
1274	PA 887	0.0	DF	13.8	R	20.1	R	15.4	R
1275	ZC (DLSa 17)	0.0	DF	15.1	R	19.0	R	16.2	R
1276	NDLA 3104-4	0.0	DF	16.8	R	20.7	R	15.6	R
1277	PA 888	0.0	DF	16.4	R	21.4	R	15.3	R
1278	CNA 1075	0.0	DF	15.5	R	15.0	R	10.4	R
1279	CNA 2034	0.0	DF	16.0	R	20.4	R	15.4	R
1280	PA 898	0.0	DF	17.2	R	19.0	R	15.3	R
1281	CNA 1071	0.0	DF	16.0	R	18.3	R	15.0	R
1282	PAIG 411	0.0	DF	15.3	R	18.7	R	16.2	R
1283	MDL ABB1	0.0	DF	12.8	R	16.5	R	15.4	R
1284	LC	0.0	DF	13.6	R	20.1	R	15.3	R
	Jaydhar (C)	0.0	DF	65.0	S	52.8	S	47.5	MR
	Abhadita (C)	47.3	MR	54.5	S	41.0	MR	49.0	MR



Path 2 (b) Confirmation and maintenance of disease-resistant lines

NORTH ZONE

Table 47: Confirmation and maintenance of disease resistant lines (*G. hirsutum*) against Cotton leaf curl disease (CLCuD) at Faridkot (Field Trial)

Entry name	Year of start	CLCuD PDI and Disease reaction					
		First year (2019)		Second year (2020)		Third year (2021)	
		PDI	Reaction	PDI	Reaction	PDI	Reaction
RHC 1307	2019	9.5	HR	3.3	HR	23.7	MR
CSH 3012		7.7	HR	7.7	HR	25.8	MR
RS 2909		1.3	HR	2.7	HR	18.5	R
F 2687		5.0	HR	4.8	HR	19.1	R
GSHV 208		12.5	R	9.4	HR	24.7	MR
RAH 1076		4.3	HR	2.6	HR	19.9	R
F 2228		37.2	MS	41.3	S	41.2	S
F 846		32.7	MS	42.0	S	41.2	S
RST 9		39.3	MS	40.7	S	40.3	S

Table 48: Confirmation and maintenance of disease resistant lines (*G. hirsutum*) against Cotton leaf curl disease (CLCuD) at Bathinda (Field Trial)

S.No	Entry	CLCuD PDI and Disease reaction			
		First year (2020-21)		Second year (2020-21)	
		PDI	DR	PDI	DR
1	F 2732	16.7	R	35.4	MS
2	PBH 197	14.6	R	45.8	S
3	CSH 90	12.5	R	41.7	S
4	QC (CSH 3129)	16.7	R	35.4	MS
5	RS 2958	12.5	R	45.8	S
6	F 2743	8.3	HR	41.7	S
7	H 1569	16.7	R	37.5	MS
8	CSH 89	18.8	R	20.8	MR
9	LC	8.3	HR	47.9	S
10	PBH 79	16.7	R	52.1	HS
11	H 1480	12.5	R	47.9	S
12	RS 2943	2.1	HR	39.6	MS
13	ZC (F 2228)	14.6	R	37.5	MS
14	F 846 (SC)	33.3	MS	58.3	HS



CENTRAL ZONE**Table 49a: Confirmation and maintenance of disease resistant lines (*G. hirsutum*) against bacterial leaf blight at Junagarh (Gujrat) and CRS Surat**

Sr. No	Entries	Bacterial Leaf Blight (BLB) PDI and Disease reaction													
		Screening at CRS, Junagarh										Screening at CRS, Surat			
		First year (2017)		Second year (2018)		Third year (2019)		Fourth year (2020)				First year (2021)			
		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	GJHV-523	8.0	R	1.0	R	13.0	R	9.5	R	-	-	39.5	MR	50.2	MR
2	BS2-17	6.3	R	1.0	R	14.8	R	7.5	R	-	-	41.5	MR	56.8	MS
3	RAH-0603	5.3	R	3.8	R	10.8	R	5.5	R	-	-	3.7	R	10.5	R
4	TSH-325	5.0	R	4.5	R	8.78	R	8.3	R	-	-	21.5	R	30.2	MR
5	H-1488	7.5	R	1.0	R	18.5	R	10.0	R	-	-	35.8	MR	48.7	MR
6	RAH-0604	6.5	R	0.5	R	19.5	R	9.8	R	-	-	35.2	MR	45.2	MR
7	LRA-5166 SC)	39.8	MR	42.5	MR	38.5	MR	76.3	S	-	-	65.5	MS	65.5	MS

Table 49b: Confirmation and maintenance of disease resistant lines (*G. hirsutum*) against Alternaria leaf blight at Junagarh and Dharwad

Sr. No	Entries	Alternaria leaf blight PDI and Disease reaction (DR)													
		Screening at CRS, Junagarh										Screening at UAS Dharwad			
		First year (2017)		Second year (2018)		Third year (2019)		Fourth year (2020)				First year (2021)			
		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	GJHV-523	13.5	R	8.8	R	19.0	R	9.8	R	-	-	13.3	R	19.5	R
2	BS2-17	4.3	R	20.8	R	22.3	R	17.3	R	-	-	15.4	R	21.7	R
3	RAH-0603	3.5	R	14.5	R	6.0	R	8.5	R	-	-	16.8	R	22.3	R
4	TSH-325	5.2	R	18.3	R	18.8	R	15.0	R	-	-	15.0	R	19.1	R
5	H-1488	22.3	R	13.8	R	21.0	R	12.3	R	-	-	15.0	R	21.1	R
6	RAH-0604	4.5	R	12.0	R	17.5	R	11.3	R	-	-	14.2	R	20.5	R
7	LRA-5166 (SC)	45.5	MR	41.5	MR	38.5	MR	78.6	S	-	-				
	GBhv-206											13.6	R	19.8	R
	Jaydhar(Check)											65.0	MS	65.0	MS



Table 49c: Confirmation and maintenance of disease resistant lines (*G. hirsutum*) against Grey mildew at Junagarh (Gujrat) and UAS Dharwad

Sr. No	Entries	Grey mildew PDI and Disease reaction (DR)													
		Screening at CRS, Junagarh										Screening at UAS Dharwad			
		First year (2017)		Second year (2018)		Third year (2019)		Fourth year (2020)							
		Field trail		Field trail		Field trail		Field trail		Artificial inoculation		Field trail		Artificial inoculation	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1.	GJHV-523	GM was not observed	GM was not observed	GM was not observed				0.3	R	Not conducted		6.9	R	9.9	R
2.	BS2-17							3.3	R			5.6	R	8.7	R
3.	RAH-0603							3.3	R			5.0	R	9.5	R
4.	TSH-325							0.8	R			5.7	R	8.4	R
5.	H-1488							2.8	R			7.5	R	8.5	R
6.	RAH-0604							2.8	R			4.6	R	6.4	R
7.	G. cot 10 (SC)							75.2	S						
	GBhv-206											6.5	R	7.3	R
	Jaydhar(Check)											52.8	MS	52.8	MS

Table 50a: Confirmation of disease resistance (*G. hirsutum*) against bacterial leaf blight at Junagarh (Gujrat) and CRS Surat

Sr. No	Entries	Bacterial Leaf Blight (BLB) PDI and Disease reaction													
		Screening at CRS, Junagarh										Screening at CRS, Surat			
		First year (2018)		Second year (2019)		Third year (2020)		Fourth year (2021)				First year (2021)			
		Field trail		Field trail		Field trail		Field trail		Artificial inoculation		Field trail		Artificial inoculation	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1	RAH1075	5.6	R	19.8	R	12.75	R	81.5	S	36.2	MR	24.8	R	36.2	MR
2	L1384	8.0	R	9.5	R	5.50	R	0.5	R	33.2	MR	25.5	MR	33.2	MR
3	GJHV554	6.3	R	3.3	R	2.75	R	1.5	R	3.8	R	3.8	R	10.2	R
4	RS2909	8.2	R	5.8	R	5.00	R	0.5	R	35.2	MR	25.8	MR	35.2	MR
5	RAH1076	6.9	R	7.5	R	10.75	R	0.5	R	51.2	MS	38.8	MR	51.2	MS
6	TSH357	5.0	R	18.3	R	6.00	R	9.75	R	27.2	MR	19.8	R	27.2	MR
7	LRA-5166 (SC)	38.6	MR	39.5	MR	79.1	S	76.3	S	-	-	65.5		65.5	MS



Table 50b: Confirmation of disease resistance (*G. hirsutum*) against Alternaria leaf spot at Junagarh (Gujrat) and UAS Dharwad

Sr. No	Entries	Alternaria Leaf Blight (ALB) PDI and Disease reaction													
		Screening at Junagarh										Screening at Dharwad			
		First year (2018)		Second year (2019)		Third year (2020)		Fourth year (2021)				First year (2021)			
		Field trail		Field trail		Field trail		Field trail		Artificial inoculation		Field trail		Artificial inoculation	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1	RAH1075	16.3	MR	11.3	MR	24.0	R	9.5	R	18.7	R	13.7	R	18.7	R
2	L1384	10.5	MR	14.8	MR	14.5	R	18.0	R	21.9	R	14.2	R	21.9	R
3	GJHV554	9.5	MR	20.5	MR	12.5	R	8.5	R	18.5	R	13.2	R	18.5	R
4	RS2909	7.3	MR	12.3	MR	18.8	R	8.0	R	21.8	R	14.5	R	21.8	R
5	RAH1076	12.8	MR	37.0	MS	10.3	R	6.0	R	17.1	R	15.7	R	17.1	R
6	TSH357	8.3	MR	16.0	MR	9.0	R	6.5	R	22.9	R	16.1	R	22.9	R
7	LRA-5166 (SC)	42.5	S	52.1	S	78.1	S	60.1	MS	-	-				
8	GBhv-206 (SC)											13.6	R	19.8	R

Table 50c: Confirmation of disease resistance (*G. hirsutum*) against Corynespora leaf spot at Junagarh (Gujrat) and CRS Surat

Sr. No	Entries	Corynespora leaf spot PDI and Disease reaction													
		Screening at CRS, Junagarh										Screening at CRS, Surat			
		First year (2018)		Second year (2019)		Third year (2020)		Fourth year (2021)				First year (2021)			
		Field trail		Field trail		Field trail		Field trail		Artificial inoculation		Field trail		Artificial inoculation	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1.	RAH1075	Cols was not observed		Cols was not observed		Cols was not observed		5.5	R	Not conducted		23.5	R	0.0	DF
2.	L1384							18.0	R			0.0	DF	0.0	DF
3.	GJHV554							34.5	MR			26.5	MR	0.0	DF
4.	RS2909							17.5	R			0.0	DF	0.0	DF
5.	RAH1076							34.0	MR			0.0	DF	0.0	DF
6.	TSH357							46.5	MR			0.0	DF	0.0	DF
7.	LRA-5166 (SC)							77.0	S			8.0	R	1.0	R



Table 51: Confirmation and maintenance (*G. hirsutum*) of disease resistant lines against grey mildew at UAS Dharwad and against Bacterial Leaf blight at CRS Surat (Entries selected at JAU Junagarh (Gujrat) for resistance against BLB, ALS and CoLS.

Sr. No	Entries	Grey Mildew at Dharwad				Corynespora leaf spot at CRS Surat			
		Field reaction		Artificial reaction		Field reaction		Artificial reaction	
		PDI	DR	PDI	DR	PDI	DR	PDI	DR
1	L 1384	3.7	R	6.2	R	-	-	-	-
2	RAH 0604	-	-	-	-	0.00	-	0.00	DF
3	RAH 1076	5.9	R	9.3	R	-	-	-	-
4	H 1488	-	-	-	-	0.00	-	0.00	DF
5	RS 2909	5.5	R	6.4	R	-	-	-	-
6	GJHV 523	-	-	-	-	0.00	-	0.00	DF
7	BS2-17	-	-	-	-	27.16	-	0.00	MR
8	GJHV 554	4.6	R	7.7	R	-	-	-	-
9	TSH 357	8.3	R	11.4	R	16.83	-	0.00	R
10	RAH 1075	5.6	R	9.7	R	-	-	-	-
11	RAH 0603	-	-	-	-	19.16	-	0.00	R
12	TSH 325	-	-	-	-	19.16	-	0.00	R
	GBhv-206	06.5	R	07.3	R				
	LRA 5166, SC	-	-	-	-	8.00		1	R
	Jaydhar (Check) Her	52.8	MS	52.8	MS				

Table 52a: Confirmation of disease resistance (*G. hirsutum*) against Bacterial leaf Blight at Junagarh (Gujrat)

Sr. No	Entries	Bacterial Leaf Blight (BLB) PDI and Disease reaction					
		First year (2019)		Second year (2020)		Third year (2021)	
		Field trail		Field trail		Field trail	
		PDI	DR	PDI	DR	PDI	DR
1	CCH 19-2	8.0	MR	7.8	R	0.5	R
2	GJHV 557	1.5	R	12.0	R	0.5	R
3	GISV 323	0.5	R	4.5	R	0.5	R
4	LC	1.0	R	6.3	R	5.0	R
5	RHC 1409	5.3	MR	3.4	R	7.5	R
6	BGDS 1047	1.5	R	0.8	R	0.5	R
7	LRA-5166 (SC)	39.5	S	79.1	S	60.1	MS



Table 52b: Confirmation of disease resistance (*G. hirsutum*) against Alternaria leaf Blight at Junagarh (Gujrat)

Sr. No	Entries	Alternaria Leaf Blight (ALB) PDI and Disease reaction					
		First year (2019)		Second year (2020)		Third year (2021)	
		Field trail		Field trail		Field trail	
		PDI	DR	PDI	DR	PDI	DR
1	CCH 19-2	30.7	MR	24.0	R	14.5	R
2	GJHV 557	22.5	R	14.5	R	22.0	R
3	GISV 323	19.8	R	12.5	R	7.50	R
4	LC	21.8	R	18.8	R	14.5	R
5	RHC 1409	18.0	MR	10.3	R	5.00	R
6	BGDS 1047	21.0	R	9.0	R	11.5	R
7	LRA-5166 (SC)	45.5	S	78.1	S	60.1	MS

Table 52c: Confirmation of disease resistance (*G. hirsutum*) against Corynespora leaf spot at Junagarh (Gujrat)

Sr. No	Entries	Corynespora Leaf spot PDI and Disease reaction					
		First year (2019)		Second year (2020)		Third year (2021)	
		Field trail		Field trail		Field trail	
		PDI	DR	PDI	DR	PDI	DR
1	CCH 19-2	-	-	-	-	69.5	R
2	GJHV 557	-	-	-	-	15.5	R
3	GISV 323	-	-	-	-	4.5	R
4	LC	-	-	-	-	27.0	R
5	RHC 1409	-	-	-	-	9.5	R
6	BGDS 1047	-	-	-	-	13.5	R
7	LRA-5166 (SC)	-	-	-	-	77.1	S



Table 53a: Confirmation of disease resistance (*G. hirsutum*) against Bacterial leaf Blight at Junagarh (Gujrat)

Sr. No	Entries	Bacterial Leaf Blight (BLB) PDI and Disease reaction			
		First year (2020)		Second year (2021)	
		Field trail		Field trail	
		PDI	DR	PDI	DR
1	GJHV 548	12.8	R	7.5	R
2	RB 602	2.5	R	1.0	R
3	TSH 354	2.8	R	0.5	R
4	CPD 2003	8.5	R	3.0	R
5	GISV 328	2.0	R	1.5	R
6	RAH 1081	3.0	R	0.5	R
7	LRA-5166 (SC)	39.5	MR	79.1	S

Table 53b: Confirmation of disease resistance (*G. hirsutum*) against Alternaria leaf blight at Junagarh (Gujrat)

Sr. No	Entries	Alternaria Leaf Blight (ALB) PDI and Disease reaction			
		First year (2020)		Second year (2021)	
		Field trail		Field trail	
		PDI	DR	PDI	DR
1	GJHV 548	9.5	R	14.5	R
2	RB 602	8.0	R	22.0	R
3	TSH 354	11.0	R	7.5	R
4	CPD 2003	7.8	R	14.5	R
5	GISV 328	7.5	R	5.0	R
6	RAH 1081	20.5	R	11.5	R
7	LRA-5166 (SC)	45.5	MR	56.0	MS



Table 53c: Confirmation of disease resistance (*G. hirsutum*) against *Corynespora* leaf spot at Junagarh (Gujrat)

Sr. No	Entries	Corynespora Leaf spot (CoLS) PDI and Disease reaction			
		First year (2020)		Second year (2021)	
		Field trail		Field trail	
		PDI	DR	PDI	DR
1	GJHV 548	23.3	R	4.50	R
2	RB 602	11.0	R	4.50	R
3	TSH 354	3.5	R	3.00	R
4	CPD 2003	2.0	R	2.25	R
5	GISV 328	8	R	2.75	R
6	RAH 1081	15.8	R	0.50	R
7	LRA-5166 (SC)	45.5	MR	77	MS

Table 54a: Confirmation and maintenance of disease resistant lines (*G. hirsutum*) against Bacterial leaf Blight at MCRS, NAU, Surat

Sr. No	Entries	Bacterial Leaf Blight (BLB) PDI and Disease reaction											
		First year (2019)				Second year (2020)				Third year (2021)			
		Field trail		Artificial		Field trail		Artificial		Field trail		Artificial	
		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	-		-	
2	GSHH 15035	0.0	DF	0.0	DF	0.0	DF	20.0	R	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
4	GISV 319	0.0	DF	0.0	DF	0.0	DF	16.0	R	22.5	R	33.2	MR
5	GISV 323	0.0	DF	0.0	DF	0.0	DF	17.8	R	0.0	DF	0.0	DF
6	GSHV 329/15	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF
7	GSHV 829/16	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF
8	GSHV 797/16	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF
9	GSHV 780/16	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF
	LRA 5166 (SC)	36.5	MR	-		55.5	MS	-		65.0	MS	3.0	R



Table 54b: Confirmation of disease resistance (*G. hirsutum*) against Alternaria leaf Blight at MCRS Surat (Gujrat)

Sr. No	Entries	PDI and Disease reaction											
		Alternaria Leaf Blight (ALB)								Corynespora Leaf Spot (CoLS)			
		First year (2019)				Second year (2020)				Third year (2021)			
		Field trail		Artificial		Field trail		Artificial		Field trail		Artificial	
		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	-		-	
2	GSHH 15035	0.0	DF	0.0	DF	0.0	DF	0.0	DF	6.2	R	0.0	DF
3	GISV 312	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
5	GISV 323	0.0	DF	0.0	DF	0.0	DF	0.0	DF	8.2	R	0.0	DF
6	GShv 329/15	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF
7	GShv 829/16	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF	0.0	DF
	GShv 797/16	0.0	DF	0.0		0.0	DF	0.0	DF	0.0	DF	0.0	DF
	GShv 780/16	0.0	DF	0.0		0.0	DF	0.0	DF	0.0	DF	0.0	DF
	LRA 5166 (SC)	0.0	DF	0.0		8.0	R	-	-	8.0	R	1.0	R



SOUTH ZONE**Table 55a: Confirmation and maintenance of disease resistant lines against Grey Mildew at UAS Dharwad (Karnataka)**

Entry	Species	Year of start	Grey Mildew PDI and Disease reaction											
			First year (2013-14)		Second year (2015-16)		Third year (2018-19)				Fourth year (2021-22)			
			Field trial		Field trial		Field trial		Artificial inoculation trial		Natural condition		Artificial inoculation	
			PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
DB-14	<i>G. barbadense</i>	2013-14	27.0	R	20.1	R	24.1	R	37.5	MR	5.2	R	6.5	R
SVA-1118	<i>G. arboreum</i>	2013-14	4.3	R	6.9	R	4.7	R	7.6	R	3.5	R	4.6	R
GSB-41	<i>G. barbadense</i>	2013-14	10.1	R	17.3	R	15.6	R	18.6	R	12.5	R	14.5	R
DB-40	<i>G. barbadense</i>	2013-14	7.6	R	10.1	R	9.3	R	14.3	R	6.7	R	7.7	R
DB-16	<i>G. barbadense</i>	2013-14	11.3	R	12.6	R	10.1	R	17.6	R	5.2	R	7.2	R
Suvin	<i>G. hirsutum</i>	2013-14	29.4	R	21.4	R	23.7	R	29.4	MR	9.7	R	12.7	R
SCS-1206	<i>G. hirsutum</i>	2013-14	25.0	R	14.9	R	14.6	R	21.1	R	8.4	R	10.4	R
RHB-1005	<i>HXB</i>	2013-14	26.1	MR	31.4	R	29.2	MR	28.9	MR	9.2	R	11.2	R
DB-1302	<i>G. barbadense</i>	2013-14	16.3	R	18.4	R	19.4	R	22.0	R	7.4	R	9.4	R
GSHB-989	<i>HXB</i>	2013-14	15.1	R	16.4	R	18.9	R	21.4	R	11.9	R	14.9	R
CPD-2052	<i>G. hirsutum</i>	2021-22									5.3	R	7.3	R
DSC1951	<i>G. hirsutum</i>	2021-22									3.6	R	5.6	R
DSC-2051	<i>G. hirsutum</i>	2021-22									8.6	R	11.6	R
DHB-1901	<i>HXB</i>	2021-22									5.7	R	9.6	R
TCH-375	<i>G. hirsutum</i>	2021-22									3.2	R	6.2	R
RAH-1046	<i>G. hirsutum</i>	2021-22									7.7	R	10.2	R
AKH-2013-2	<i>G. arboreum</i>	2021-22									9.4	R	11.2	R
TSH-356	<i>G. hirsutum</i>	2021-22									7.3	R	10.0	R
RHC-1409	<i>G. hirsutum</i>	2021-22									17.4	R	8.6	R
DB-1901	<i>Barbadense</i>	2021-22									10.9	R	11.8	R
NDLA-3118-3	<i>G. hirsutum</i>	2021-22									10.7	R	11.2	R
CNA-1042	<i>G. arboreum</i>	2021-22									10.2	R	12.4	R
PA-778	<i>G. arboreum</i>	2021-22									8.6	R	9.4	R
GBHV-206	<i>G. hirsutum</i>	2021-22									6.5	R	7.3	R
Jaydhar (Check)	<i>G. herbaceum</i>	2021-22									52.8		52.8	



Table 55b: Confirmation and maintenance of disease resistant lines against Alternaria leaf spot at UAS Dharwad (Karnataka)

S. No	Entry code & name	Species	Year of start	Alternaria leaf spot PDI and Disease reaction											
				First year (2013-14)		Second year (2015-16)		Third year (2018-19)				Fourth year (2021-22)			
				Field trial		Field trial		Field trial		Artificial inoculation		Field trial		Artificial inoculation	
				PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR	PDI	DR
1.	DB-14	<i>G. barbadense</i>	2013-14	37.0	MR	30.1	MR	34.1	MR	47.5	MR	13.3	R	11.2	R
2.	SVA-1118	<i>G. arboreum</i>	2013-14	9.3	R	11.9	R	9.7	R	12.6	R	0.0	DF	0.0	DF
3.	GSB-41	<i>G. barbadense</i>	2013-14	15.1	R	22.3	R	22.6	R	24.6	R	*		*	
4.	DB-40	<i>G. barbadense</i>	2013-14	12.6	R	17.1	R	16.3	R	21.3	R	16.5	R	14.5	R
5.	DB-16	<i>G. barbadense</i>	2013-14	21.3	R	22.6	R	20.1	R	27.6	R	*		*	
6.	Suvin	<i>G. hirsutum</i>	2013-14	39.4	MR	41.4	MR	43.7	MR	49.4	MR	*		*	
7.	SCS-1206	<i>G. hirsutum</i>	2013-14	25.0	R	30.9	MR	24.6	R	31.1	MR	17.0	R	15.3	R
8.	RHB-1005	<i>HXB</i>	2013-14	41.1	MR	46.4	MR	39.2	MR	48.9	MR	*		*	
9.	DB-1302	<i>G. barbadense</i>	2013-14	22.3	R	24.4	R	31.4	MR	25.0	R	*		*	
10.	GSHB-989	<i>HXB</i>	2013-14	30.1	MR	36.4	MR	30.9	MR	41.4	MR	*		*	
11.	CPD-2052	<i>G. hirsutum</i>	2021-22									15.6	R	17.9	R
12.	DSC-1951	<i>G. hirsutum</i>	2021-22									17.5	R	19.6	R
13.	DSC-2051	<i>G. hirsutum</i>	2021-22									17.5	R	19.6	R
14.	DHB-1901	<i>HXB</i>	2021-22									15.2	R	17.0	R
15.	TCH-375	<i>G. hirsutum</i>	2021-22									14.2	R	16.1	R
16.	RAH-1046	<i>G. hirsutum</i>	2021-22									16.7	R	19.4	R
17.	AKH-2013-2	<i>G. arboreum</i>	2021-22									13.5	R	19.3	R
18.	TSH-356	<i>G. hirsutum</i>	2021-22									14.0	R	21.5	R
19.	RHC-1409	<i>G. hirsutum</i>	2021-22									13.5	R	22.6	R
20.	DB-1901	<i>Barbadense</i>	2021-22									14.3	R	24.3	R
21.	NDLA-3118-3	<i>G. hirsutum</i>	2021-22									14.9	R	22.1	R
22.	CNA-1042	<i>G. arboreum</i>	2021-22									15.2	R	19.8	R
23.	PA-778	<i>G. arboreum</i>	2021-22									14.4	R	21.2	R
24.	GBHV-206	<i>G. hirsutum</i>	2021-22									13.6	R	19.8	R
25.	Jaydhar(Check)	<i>G. herbaceum</i>	2021-22									65.0	MS	65.0	MS

* Not EVALUATED during 2021-22



Table 56a: Confirmation and maintenance of disease resistant lines against Alternaria leaf spot at Guntur (Lam)

Entry Code & Name		Species	Year of start	Alternaria leaf spot PDI and Disease reaction					
				First Year (2019)		Second Year (2020)		Third Year (2021)	
				Field trial		Field trial			
				PDI	DR	PDI	DR	PDI	DR
217	BGDS 1047	<i>G. hirsutum</i>	2019	-	DF	Traces	R	Traces	R
	NDLH 1938	<i>G. hirsutum</i>	2019	-	DF	Traces	R	Traces	R
9572	CCB 51	<i>G. barbadense</i>	2019	-	DF	Traces	R	-	-
9576	DB 1801	<i>G. barbadense</i>	2019	-	DF	Traces	R	Traces	R
9585	CCB 143B	<i>G. barbadense</i>	2019	-	DF	Traces	R	Traces	R
9556	RHC HD 1420	<i>G. hirsutum</i>	2019	-	DF	Traces	R	Traces	R
C	L 1060	<i>G. hirsutum</i>	2020	-	DF	Traces	R	5.3	R
C	Jaadoo BG II	<i>G. hirsutum</i>	2019	30.0	MR	Traces	R	6.3	R
C	RCH 2 BG II	<i>G. hirsutum</i>	2019	27.5	MR	Traces	R	7.0	R



Table 56b: Confirmation and maintenance of disease resistant lines against *Corynespora* leaf spot at Guntur (Lam)

Entry Code & Name		Species	Year of start	Corynespora leaf spot PDI and Disease reaction					
				First Year (2019)		Second Year (2020)		Third Year (2021)	
				Field trial		Field trial			
				PDI	DR	PDI	DR	PDI	DR
321	SBSD 5-6	<i>G. barbadense</i>	2019	-	DF	3.0	R	6.3	R
9572	CCB 51	<i>G. barbadense</i>	2019	-	DF	1.0	R	6.5	R
9576	DB 1801	<i>G. barbadense</i>	2019	-	DF	1.0	R	16.3	R
9585	CCB 143B	<i>G. barbadense</i>	2019	-	DF	1.0	R	7.5	R
304	TSH 354	<i>G. hirsutum</i>	2020	-	-	18.3	R	17.3	R
306	ZC (Suraj)	<i>G. hirsutum</i>	2020	-	-	24.5	R	8.0	R
319	RAH 1083	<i>G. hirsutum</i>	2020	-	-	26.8	MR	8.0	R
394	CNH 19480	<i>G. hirsutum</i>	2020	-	-	17.0	R	8.5	R
402	CNH 20-31	<i>G. hirsutum</i>	2020	-	-	20.0	R	7.0	R
409	RAHC 1032	<i>G. hirsutum</i>	2020	-	-	18.0	R	10.8	R
412	RB 1918	<i>G. hirsutum</i>	2020	-	-	19.5	R	12.5	R
2502	ZC (Suraj)	<i>G. hirsutum</i>	2020	-	-	22.3	R	11.5	R
2507	RAH 1046	<i>G. hirsutum</i>	2020	-	-	17.0	R	8.0	R
2511	DHCC 1801	<i>G. hirsutum</i>	2020	-	-	18.3	R	9.8	R
2516	CNH 17395	<i>G. hirsutum</i>	2020	-	-	17.8	R	9.3	R
2518	DHCC 1902	<i>G. hirsutum</i>	2020	-	-	17.8	R	6.5	R
2534	RAH 1075	<i>G. hirsutum</i>	2020	-	-	17.5	R	11.3	R
2553	RHC-HD 1312	<i>G. hirsutum</i>	2020	-	-	27.8	MR	16.3	R
2556	RHC-HD 1438	<i>G. hirsutum</i>	2020	-	-	30.0	MR	11.8	R
C	L 1060	<i>G. hirsutum</i>	2020	-	-	33.0	MR	44.3	MR
C	Jaadoo BG II	<i>G. hirsutum</i>	2020	-	-	21.5	R	39.5	MR
C	RCH 2 BG II	<i>G. hirsutum</i>	2020	-	-	16.0	R	33.8	MR



Table 56c: Confirmation and maintenance of disease resistant lines against Grey Mildew at Guntur (Lam)

Entry Code & Name		Species	Year of start	Grey Mildew PDI and Disease reaction					
				First Year (2019)		Second Year (2020)		Third Year (2021)	
				Field trial		Field trial			
				PDI	DR	PDI	DR	PDI	DR
321	SBSD 5-6	<i>G. barbadense</i>	2019	-	DF	0.0	DF	0.0	DF
9572	CCB 51	<i>G. barbadense</i>	2019	-	DF	0.0	DF	0.0	DF
9585	CCB 143B	<i>G. barbadense</i>	2019	-	DF	Traces	R	Traces	R
9501	RAH 1075	<i>G. hirsutum</i>	2019	-	R	Traces	R	Traces	R
	NDLH 1938	<i>G. hirsutum</i>	2019	-	R	Traces	R	4.0	R
9576	DB 1801	<i>G. barbadense</i>	2019	-	R	2.0	R	Traces	R
9704	CNH 17395	<i>G. hirsutum</i>	2019	-	R	Traces	R	Traces	R
9706	16301 DB	<i>G. hirsutum</i>	2019	-	R	Traces	R	Traces	R
C	L 1060	<i>G. hirsutum</i>				6.8	R	3.8	R
C	Jaadoo BG II	<i>G. hirsutum</i>				25.6	MR	22.3	R
C	RCH 2 BG II	<i>G. hirsutum</i>				2.8	R	24.0	R



Table 56d: Confirmation and maintenance of disease resistant lines against cotton rust at Guntur (Lam)

Entry Code & Name		Species	Year of start	Cotton rust PDI and Disease reaction					
				First Year (2019)		Second Year (2020)		Third Year (2021)	
				Field trial		Field trial			
				PDI	DR	PDI	DR	PDI	DR
321	SBSD 5-6		2019	-	DF	4.0	R	14.0	R
9576	DB 1801		2019	-	DF	9.5	R	27.8	MR
9585	CCB 143B		2019	-	DF	5.0	R	12.3	R
9704	CNH 17395		2019	-	DF	20.5	R	15.5	R
304	TSH 354		2020	-	-	21.5	R	29.0	MR
306	ZC (Suraj)		2020	-	-	16.5	R	12.5	R
319	RAH 1083		2020	-	-	20.8	R	11.3	R
394	CNH 19480		2020	-	-	14.0	R	10.8	R
402	CNH 20-31		2020	-	-	11.0	R	10.5	R
409	RAHC 1032		2020	-	-	22.0	R	19.0	R
412	RB 1918		2020	-	-	29.0	MR	26.8	MR
2502	ZC (Suraj)		2020	-	-	18.8	R	22.3	R
2507	RAH 1046		2020	-	-	23.0	R	24.8	R
2511	DHCC 1801		2020	-	-	22.0	R	31.3	MR
2516	CNH 17395		2020	-	-	21.8	R	24.8	R
2518	DHCC 1902		2020	-	-	15.8	R	6.5	R
2534	RAH 1075		2020	-	-	22.8	R	20.0	R
2553	RHC-HD 1312		2020	-	-	24.0	R	23.0	R
2556	RHC-HD 1438		2020	-	-	11.8	R	21.0	R
C	L 1060		2020	-	-	32.5	MR	27.0	MR
C	Jaadoo BG II		2020	-	-	34.8	MR	40.3	MR
C	RCH 2 BG II		2020	-	-	26.8	MR	42.0	MR



Table 57: Confirmation and maintenance of disease resistant lines against *Alternaria* blight at TNAU Coimbatore

S. No.	Entry code& name		Species	Year of start	Alternaria leaf spot PDI and Disease reaction					
					First Year		Second Year		Third Year	
					Field trial		Field trial		Field trial	
					PDI	DR	PDI	DR	PDI	DR
1.	203	DSC 1801	<i>G.hirsutum</i>	2019	0.0	R	8.5	R	15.4	R
2.	211	GBHV187	<i>G.hirsutum</i>	2019	5.0	R	10.6	R	25.1	MR
3.	212	Local check	<i>G.hirsutum</i>	2019	5.0	R	8.7	R	25.4	MR
4.	217	RHC-HD 1446	<i>G.hirsutum</i>	2019	5.0	R	8.9	R	12.3	R
5.	285	GTHV18/17	<i>G.arboreum</i>	2019	5.0	R	9.1	R	10.7	R
6.	286	Local check	<i>G.hirsutum</i>	2019	5.0	R	10.6	R	27.5	MR
7.	287	CCH 15-1	<i>G.hirsutum</i>	2019	5.0	R	8.5	R	12.3	R
8.	288	GJHV584	<i>G.hirsutum</i>	2019	5.0	R	8.7	R	13.5	R
9.	289	RAHC 1902	<i>G.hirsutum</i>	2019	5.0	R	8.1	R	14.3	R
10.	291	TCH1875	<i>G.hirsutum</i>	2019	5.0	R	8.0	R	8.7	R
11.	322	Local check	<i>G.arboreum</i>	2019	0.0	R	10.4	R	20.3	R
12.	9574	CCB 28	<i>G. barbedense</i>	2019	0.0	R	11.8	R	23.7	R
13.	9575	CCB 29	<i>G. barbedense</i>	2019	0.0	R	8.7	R	15.3	R
14.	335	DA 852	<i>G.arboreum</i>	2019	0.0	R	10.2	R	20.7	R
15.	Check	RCHIIBGII	<i>G.hirsutum</i>		25.5	S	12.1	R	30.5	MR



Table 58. Confirmation and maintenance of disease resistant lines Coimbatore

S.No	Entry code			Year of start	Disease grade	PDI	Disease reaction
1	302	RB602	<i>G.hirsutum</i>	2021	4	35.7	MR
r	307	TCH1941	<i>G.hirsutum</i>	2021	2	15.3	R
3	308	CPD2002	<i>G.hirsutum</i>	2021	3	20.5	R
4	313	ADB727	<i>G.hirsutum</i>	2021	1	9.3	R
5	314	TSH387	<i>G.hirsutum</i>	2021	1	8.5	R
6	315	GISV 332	<i>G.hirsutum</i>	2021	1	7.3	R
7	319	RAH 1083	<i>G.hirsutum</i>	2021	3	25.5	MR
8	320	RAH 101	<i>G.hirsutum</i>	2021	2	17.7	R
9	402	CNH 20-31	<i>G.hirsutum</i>	2021	4	33.3	MR
10	408	RB1901	<i>G.hirsutum</i>	2021	3	26.3	MR
11	409	RAHC 1032	<i>G.hirsutum</i>	2021	2	15.5	R
12	410	Check (Suraj)	<i>G.hirsutum</i>	2021	3	27.3	MR

Path. 2 (c) Monitoring of resistance against CLCuD in cotton**Table 59. Monitoring of resistance against CLCuD in North Zone**

Name of variety/ hybrid	Sriganganagar			Hisar			Bathinda		
	CLCuD		Whitefly	CLCuD		Whitefly	CLCuD		Whitefly
	PDI	DR	Adult/3 leaves	PDI	DR	Adult/3 leaves	PDI	DR	Adult/3 leaves
Susceptible variety									
HS-6	44.4	S	10.4	38.0	MS	35.0	63.2	HS	4.3
F-846	33.2	MS	9.2	40.0	MS	29.3	66.7	HS	4.5
RST-9	40.5	S	15.3	37.5	MS	40.0	54.4	HS	6.6
Moderately tolerant varieties									
H 1098 (i)	27.2	MR	10.3	33.3	MS	31.5	61.9	HS	2.4
F 2228	23.3	MR	9.6	33.3	MS	29.0	45.6	S	3.6
CSH 3075	20.5	MR	10.9	33.3	MS	24.4	55.7	HS	2.9
Moderately susceptible BG II hybrid									
NSPL-531	29.4	MR	11.7	33.3	MS	25.9	63.0	HS	5.0
Moderately tolerant BGII hybrid									
RCH 773	18.4	R	13.8	16.7	R	23.0	31.7	MS	1.5



Path.3: Management of Diseases of cotton**Path.3 (f): Management of sooty mold (*Capnodium* spp.) in cotton****Path. 60: Management of sooty mold (*Capnodium* spp.) in cotton (Poly House Experiment: Prophylactic spray thrice)) at Sirsa**

Treatments	% Sooty mold per plant (Polyhouse study: Sirsa)				Reduction over control (%) (Mean)	Whitefly population / 3 leaves			Reduction over control (%) (Mean)
	Before I spray	30 DAS I spray	30 DAS II spray	30 DAS III spray		30DAS I spray	30 DAS II spray	30 DAS III spray	
T1-COC 50 WP @ 1.25 g/litre	53.9 (48.0)	50.8 (45.5)	41.5 (40.0)	48.5 (44.1)	5.0	5.9 (14.0)	6.3 (14.5)	2.1 (9.5)	0.7
T2-COC 50 WP @ 2.50 g/litre	51.0 (50.1)	45.0 (42.0)	43.7 (41.3)	26.5 (26.0)	22.3	4.5 (12.1)	4.9 (12.8)	3.1 (11.5)	13.2
T3-Propiconazole 25 EC @ 1 ml / litre	29.5 (32.9)	27.9 (31.8)	24.1 (28.5)	14.5 (18.4)	55.1	5.8 (13.8)	6.1 (14.2)	1.2 (7.3)	9.0
T4-Mancozeb 50 WP @2.0 g /litre	40.7 (39.7)	39.7 (39.0)	40.2 (34.2)	30.1 (28.1)	25.8	5.2 (13.1)	5.3 (13.3)	0.8 (5.9)	21.5
T5-Neem oil 1500ppm @5ml / litre	29.2 (32.7)	26.7 (30.9)	29.0 (32.5)	19.1 (25.3)	49.6	4.3 (11.9)	4.2 (11.8)	0.9 (6.3)	34.7
T6-Flonicamid 0.4g/L	33.8 (35.6)	31.0 (33.8)	28.8 (32.4)	20.8 (27.1)	45.6	8.0 (16.4)	7.7 (16.1)	0.0 (0.3)	46.5
T7-Control	27.0 (31.2)	45.6 (42.5)	43.3 (41.1)	59.4 (50.6)	0.0	5.1 (13.0)	5.2 (13.1)	4.2 (13.4)	0.0
C.D.	10.57	9.29	N/A	N/A		2.45	1.99	7.87	
SE(m)	3.39	2.98	7.62	8.85		0.79	0.64	2.53	
SE(d)	4.79	4.22	10.77	12.52		1.11	0.90	3.57	
C.V.	15.23	13.62	36.92	48.88		10.11	8.06	23.42	



Table 61: Management of sooty mold (*Capnodium* spp.) in cotton (Field Experiment (Spray thrice)) Faridkot

Treatments	PDI (Before Spray)	PDI (7 DAS)	PDI (15 DAS)	Reduction at 15 days after 3 rd spray
T ₁ - Copper oxy chloride (COC) 50 WP @ 1.25 g/litre of water	18.3 (25.4)	13.0 (21.1)	8.4 (16.9)	32.7
T ₂ - Copper oxy chloride (COC) 50 WP @ 2.5 g/litre of water	16.9 (24.3)	11.3 (19.7)	6.3 (14.5)	42.2
T ₃ - Propiconazole 25 EC @ 1 ml / liter of water	17.5(24.7)	12.6 (20.8)	6.4 (14.7)	41.4
T ₄ - Mancozeb 50 WP @2.0 g /liter of water	16.1(23.7)	11.0 (19.4)	6.7 (15.0)	40.4
T ₅ - Neem oil 1500 ppm@ 5 ml/liter of water	14.4 (22.3)	9.4 (17.8)	5.1 (13.1)	47.9
T ₆ - Flonicamid	13.3 (21.4)	8.9 (17.4)	3.3 (10.5)	58.1
T ₇ - Control	18.6 (25.6)	17.44(24.7)	18.0 (25.1)	0.0
CD 0.05%	N/A	2.9	2.6	-

Table 62: Effect of different treatments on the sooty mold in Cotton (*Bt* Hybrid US 51) Hisar

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	
T ₁ : COC* 50 WP @ 1.25 g/litre	25.5 (30.3)	20.7 (27.0)	18.2 (25.2)	50.9	35.6	26.4	15.0	46.2	26
T ₂ : COC 50 WP @ 2.50 g/litre	21.3 (27.5)	16.2 (23.7)	8.8 (17.2)	76.3	30.7	25.1	15.9	42.8	26
T ₃ : Propiconazole 25 EC @ 1 ml/litre	16.0 (23.5)	10.7 (19.0)	5.9 (14.0)	84.1	28.5	25.1	16.4	41.3	23
T ₄ : Mancozeb 50 WP @ 2.0 g/litre	26.3 (30.8)	23.9 (29.2)	21.0 (27.2)	43.2	24.4	21.8	16.3	41.4	23
T ₅ : Neem oil 1500 ppm @ 5ml/litre	21.0 (27.3)	20.7 (27.0)	17.2 (24.5)	53.6	27.1	20.8	10.8	61.2	25
T ₆ : Flonicamid @ 0.4g/litre	17.7 (24.8)	11.0 (19.4)	7.7 (16.1)	79.3	28.8	19.0	9.5	66.0	28
T ₇ : Control	32.0 (34.4)	35.0 (36.3)	37.0 (36.4)	0.0	41.7	31.2	27.9	0.0	22
CD 0.05%	2.94	2.45	2.20		7.62	4.47	2.87		
C.V. %	5.75	5.25	5.34		13.67	10.28	10.00		



Table 63: Management of sooty mold (*Capnodium* spp.) in cotton: Aphid infestation (Field Experiment- Spray thrice) Junagarh

Tr. No.	Treatments	Sooty mold PDI (%) mean			Number of aphid/3 leaves/plant				Seed cotton yield (Q/ha)
		at 1 st spray after 15 th day	2 nd spray after 15 th day	Reduction over control 2 nd spray after 15 days	Before spray	15 DAS 1 spray	15 DAS 2 spray	Reduction over control 2 nd spray after 15 days	
T ₁	Copper oxychloride 50 WP @ 1.25 g/l	20.1(26.7)	59.3(50.3)	12.0	11.7(20.0)	45.4 (42.4)	86.0(112.0)	-20.1	15.01
T ₂	Copper oxychloride 50 WP @ 2.50 g/l	18.7 (25.6)	50.9(45.5)	24.5	12.8(21.0)	46.9(43.2)	69.5(123.5)	2.9	16.92
T ₃	Propiconazole 25 EC	9.5(17.9)	50.3(45.2)	25.4	9.6(18.0)	39.3(38.8)	93.5(104.8)	-30.6	16.66
T ₄	Mancozeb 75 WP	8.9(17.3)	48.3(44.0)	28.3	14.0(22.0)	43.6 (41.3)	77.8(118.1)	-8.7	16.99
T ₅	Neem oil 1500 ppm	14.3(22.2)	44.6(42.0)	33.8	11.0(19.3)	50.6(45.3)	84.2(113.4)	-17.6	15.58
T ₆	Flonicamid 50 WG (Insecticide)	2.6(9.3)	4.1 (11.7)	93.9	11.0(19.3)	2.2 (8.5)	4.4(12.1)	93.9	20.07
T ₇	Control	16.3(23.8)	67.4(55.2)	0.0	12.8(21.0)	62.32(52.1)	71.6 (122.2)	0.0	15.12
S. Em.±		1.2417	3.90		1.142	2.485	7.80		85.69
C.D.at 5%		3.820	12.02		NS	7.6577	24.20		2.641
C.V.%		10.52	15.88		9.84	11.09	13.53		8.93

Table 64: Management of sooty mold (*Capnodium* spp.) in cotton: Aphid infestation (Field Experiment- Spray thrice). Coimbatore

Treatment No.	Treatment details	Sooty mould (%)	Per cent Inhibition over control (%)	Seed Cotton Yield (q/ha)
T ₁	Copper oxychloride (COC) 50 WP @ 1.25 g/litre of water	8.2 (16.6)	61.0	16.3
T ₂	Copper oxychloride (COC) 50 WP @ 2.25 g/litre of water	5.9 (13.9)	72.0	18.2
T ₃	Propiconazole 25EC @ 1ml / litre of water	6.8 (15.0)	68.0	17.5
T ₄	Mancozeb 50 WP @ 2.0g / litre of water	9.9 (18.3)	53.0	15.0
T ₅	Neem oil 1500 ppm @ 5ml/ litre of water	10.1 (18.5)	52.0	15.5
T ₆	Flonicamid @ 0.6ml/ litre of water	11.2 (19.5)	47.0	14.3
T ₇	Control	21.0 (27.3)	-	12.7
CD (P= 0.05)		1.35		1.15



Path 3 (h): Evaluation of efficacy of bioagents against cotton diseases (From 2019-20)**Table 65: List of treatments for Evaluation of efficacy of bioagents against cotton diseases**

Treatment	Details
T ₁	ST+ SA of <i>Bacillus aryabhattai</i> ST: 10 ⁸ cfu/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 <i>Bacillus tequilensis</i> SA: 10 ⁸ cfu/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 ⁸ cfu/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 <i>Bacillus subtilis</i> SA: 10 ⁸ cfu/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 <i>Pf</i> CICR ;SA: 10 ⁸ cfu/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 66. Evaluation of efficacy of bioagents against bacterial and fungal foliar diseases

Treatment	<i>Alternaria Leaf spot PDI (%)</i>				<i>Bacterial Leaf Blight PDI (%)</i>					<i>Grey mildew PDI(%)</i>			
	<i>Nanded</i>	<i>Surat</i>	<i>Akola</i>	<i>Mean</i>	<i>Nanded</i>	<i>Surat</i>	<i>Akola</i>	<i>Nagpur</i>	<i>Mean</i>	<i>Nanded</i>	<i>Akola</i>	<i>Nagpur</i>	<i>Mean</i>
T ₁	4.4 (12.1)	13.3(21.3)*	3.6(13.3)	7.1	5.3(13.3)	26.2(30.6)*	3.9(15.0)	5.6	10.3	8.3(16.6)	3.2(10.0)	2.6	4.7
T ₂	6.3 (14.5)	11.5(19.8)	3.9(15.0)	7.2	5.3(13.2)	23.3(28.8)	4.1(16.7)	5.3	9.5	8.1(16.5)	3.4(11.7)	0.0	3.8
T ₃	4.6(12.3)	10.5(18.8)	3.4(11.7)	6.2	4.3(11.9)	20.3(26.6)	3.6(13.3)	3.3	7.9	7.1(15.4)	2.9(8.3)	0.0	3.3
T ₄	5.2(13.1)	14.2(22.0)	3.6(13.3)	7.7	4.7(12.5)	29.7(32.9)	3.8(15.0)	6.6	11.2	7.5(15.9)	3.4(11.7)	3.2	4.7
T ₅	4.7(12.4)	15.8(2.4)	3.6(13.3)	8.0	3.8(11.2)	14.5(22.1)	3.9(15.0)	6.4	7.2	6.6(14.8)	3.2(10.0)	2.6	4.1
T ₆	4.0(11.5)	16.3(23.8)	3.8(15.0)	8.0	3.3(10.4)	30.7(33.5)	4.1(16.7)	4.1	10.6	6.0(14.1)	3.6(13.3)	3.5	4.4
T ₇	2.2 (8.6)	8.2(16.5)	4.1(16.7)	4.8	2.5(9.0)	33.2(34.5)	4.1(16.7)	4.7	11.1	4.9(12.7)	3.6(13.3)	0.0	2.8
T ₈	8.0 (16.4)	19.3(26.0)	4.3(18.3)	10.5	7.8(16.1)	42.3(40.5)	4.5(20.0)	11.5	16.5	13.5(21.5)	4.3(18.3)	4.3	7.4
S. Em.± (T)	0.60	1.34	0.23		0.50	1.82	0.21			0.87	0.19		
C.D.at 5% (T)	1.83	4.07	0.69		1.51	5.53	0.64			2.63	0.59		
C.D. (Y x T)		-			-	-				-			
C.V. %	8.28	10.84	10.33		7.96	10.12	9.18			9.41	9.73		



Table 67: Effect bioagents against cotton diseases and seed cotton yield at various locations: Nagpur, Nanded, Akola and Surat

Treatment	Disease PDI (%) at ICAR-CICR Nagpur			SCY (Q/ha)				
	Wilt	CoLS	MLS	Akola	Nanded (RCH2 BG II)	Nagpur (Suraj cv.)	Surat (RCH 2 BG II)	Pooled Mean
T ₁	1.7	5.8	5.7	12.2	9.8	29.2	19.3	17.6
T ₂	1.7	5.1	5.3	12.7	8.4	29.7	21.1	18.0
T ₃	0.0	3.2	2.7	14.1	11.4	31.1	21.6	19.6
T ₄	1.7	5.1	3.5	12.3	8.5	29.3	19.9	17.5
T ₅	1.7	6.2	4.1	12.4	9.6	28.3	26.1	19.1
T ₆	0.0	5.9	0.0	13.8	10.3	27.4	18.4	17.5
T ₇	3.3	3.2	0.0	12.4	9.8	25.2	22.8	17.6
T ₈	6.7	9.4	13.8	11.0	6.8	23.3	16.6	14.4
S. Em.± (T)				0.49	0.49			
C.D.at 5% (T)				1.46	1.51			
C.D. (Y x T)				8.48	9.14			
C.V. %								

Path.3(i). Integrated Management of CLCuD through its vector management (2020-21)**Table 68: Treatments detail for the Integrated Management of CLCuD through its vector management (2020-21)**

	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	Neem 300 ppm	Diafenthiuron /Flonicamid	Spiromesifen	Repeat fourth spray treatment of respective module if required
T2	IPM module-1	Neem 300 ppm	Neem 300 ppm	Diafenthiuron /Flonicamid	CICRRS-Ij	
T3	IPM module-2	Neem 300 ppm	Neem 300 ppm	Diafenthiuron / Flonicamid	CICRRS-Bb	
T4	IPM module- 3	Neem 300 ppm	Neem 300 ppm	Diafenthiuron/ Flonicamid	CICRRS Ma	
T5	Biomodule-1	Neem 300 ppm	Neem 300 ppm	CICRRS-Ij	CICRRS-Ij	
T6	Biomodule-2	Neem 300 ppm	Neem 300 ppm	CICRRS-Bb	CICRRS-Bb	
T7	Biomodule-3	Neem 300 ppm	Neem 300 ppm	CICRRS-Ma	CICRRS-Ma	
T8	Biomodule-4	Neem 300 ppm	Neem 300 ppm	<i>L. lacanii commercial formulation</i>	<i>L. lacanii commercial formulation</i>	
T9	Control	No spray	No spray	No spray	No spray	



Table 69a: Integrated Management of CLCuD through its vector management (Sirsa)

Treatment No.	IPM/Biomodule	Nymph % reduction over control								Overall mean mortality of 7 DAS
		1 st spray		2 nd spray		3 rd spray		4 th spray		
		5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	
T1	IPM existing module	45.6 (42.3)	42.8 (40.8)	28.0 (31.6)	38.5 (38.2)	55.8 (48.4)	63.2 (52.7)	55.8 (48.4)	70.1 (57.3)	53.7
T2.	IPM module-1	46.9 (43.0)	32.4 (53.9)	28.1 (31.9)	35.7 (36.5)	50.9 (45.5)	63.0 (52.5)	47.7 (43.6)	68.4 (56.1)	49.9
T3.	IPM module-2	54.5 (47.7)	53.2 (47.0)	30.0 (33.1)	34.2 (35.6)	49.2 (44.5)	55.9 (48.4)	38.7 (38.3)	61.2 (51.5)	51.1
T4.	IPM module- 3	47.8 (41.4)	40.6 (45.0)	19.4 (24.1)	28.3 (30.8)	42.5 (40.7)	44.8 (41.9)	45.3 (41.8)	55.9 (48.5)	42.4
T5.	Biomodule-1	50.5 (44.7)	49.4 (48.0)	16.4 (23.5)	40.9 (39.6)	53.4 (46.9)	62.0 (52.5)	54.8 (47.8)	68.4 (56.6)	55.2
T6.	Biomodule-2	53.1 (46.8)	48.5 (44.0)	14.8 (21.3)	33.7 (34.8)	41.0 (39.5)	53.9 (47.3)	58.7 (50.3)	60.0 (51.3)	49.0
T7	Biomodule-3	44.5 (41.3)	46.4 (42.6)	39.8 (38.4)	42.2 (40.4)	29.9 (32.6)	43.8 (41.1)	48.5 (43.9)	52.5 (46.4)	46.2
T 8	Biomodule-4	34.5 (36.2)	34.1 (30.4)	12.5 (20.3)	44.8 (41.9)	24.2 (29.20)	44.1 (41.5)	44.9 (41.0)	51.8 (46.6)	43.7
T 9	Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	C.D.	24.704	19.58	15.266	14.034	8.232	11.862	14.321	12.333	
	SE(m)	8.17	6.475	5.049	4.641	2.722	3.923	4.736	4.079	
	SE(d)	11.554	9.157	7.14	6.564	3.85	5.548	6.698	5.768	
	C.V.	37.075	28.69	35.097	24.277	12.963	16.181	20.789	15.35	



Table 69b: Integrated Management of CLCuD through its vector management (Sirsa)

Treatment No.	IPM/ Biomodule	Whitefly adults% reduction over control								Overall mean mortality	CLCuD PDI%			SCY Q/ha
		1 st spray		2 nd spray		3 rd spray		4 th spray		At 7 DAI	2 nd spray	2 nd spray	4 th spray	
		5DAS	7DAS	5DAS	7DAS	5DAS	7DAS	5DAS	7DAS		60 DAS	90 DAS	115 DAS	
T1	IPM existing module	39.0 (38.5)	26.2 (30.6)	30.2 (33.3)	15.4 (21.9)	51.2 (45.7)	61.2 (51.6)	41.5 (40.0)	31.1 (32.6)	33.5	17.9	18.2	21.2	28.3 (32.1)
T2.	IPM module-1	37.6 (37.2)	12.8 (34.4)	27.8 (31.0)	25.3 (30.0)	51.0 (45.6)	58.9 (50.1)	52.3 (46.3)	43.1 (40.8)	35.0	19.8	20.5	24.8	25.7 (30.5)
T3.	IPM module-2	36.8 (37.0)	10.0 (38.6)	30.0 (39.2)	14.6 (30.7)	48.9 (44.3)	59.9 (50.7)	42.1 (40.3)	42.4 (40.4)	31.7	17.0	19.2	24.0	25.2 (30.0)
T4.	IPM module- 3	44.7 (41.8)	12.0 (21.5)	26.6 (29.7)	11.2 (23.5)	45.8 (42.6)	57.5 (49.3)	58.5 (50.0)	29.0 (31.6)	27.4	16.4	19.4	25.0	24.7 (29.8)
T5.	Biomodule-1	43.5 (40.6)	21.6 (26.7)	37.0 (36.4)	23.5 (28.6)	43.4 (41.2)	46.1 (42.7)	61.6 (51.8)	38.3 (38.0)	32.4	15.9	18.9	24.6	27.3 (31.4)
T6.	Biomodule-2	49.7 (44.8)	23.6 (24.2)	42.3 (40.0)	41.4 (40.0)	33.6 (35.3)	48.0 (43.8)	44.8 (41.9)	39.8 (37.9)	38.2	12.2	17.2	23.1	29.3 (32.6)
T7	Biomodule-3	45.9 (42.6)	24.9 (32.0)	33.0 (33.2)	29.6 (32.3)	45.5 (42.4)	46.1 (42.6)	57.0 (49.1)	42.0 (40.3)	35.7	13.0	18.0	24.8	27.3 (31.4)
T 8	Biomodule-4	48.5 (44.0)	5.4 (23.0)	20.0 (39.1)	10.6 (33.8)	36.7 (36.8)	44.9 (41.8)	47.0 (43.3)	43.1 (40.5)	26.0	16.0	20.2	25.3	24.0 (29.3)
T 9	Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.1	25.1	36.3	22.9 (28.4)
	C.D.	15.99	19.57	N/A	13.61	6.93	8.70	10.93	18.52					N/A
	SE(m)	5.29	6.47	6.21	4.50	2.29	2.88	3.62	6.12					1.623
	SE(d)	7.48	9.15	8.78	6.37	3.24	4.07	5.11	8.66					2.295
	C.V.	25.22	43.69	32.78	29.15	10.70	12.03	15.54	31.62					9.183



Table 70a: Integrated Management of CLCuD through its vector management (Hisar)

Treatment	IPM/Biomodule	WF nymph /3 leaves (Mean)					WF adults /3 leaves (Mean)				
No.	Spray	1 st spray	2 nd spray	3 rd spray	Mean	Reduction (%)	1 st spray	2 nd spray	3 rd spray	Mean	Reduction (%)
T ₁	IPM existing module	21.5	30.1	18.2	23.2	51.5	16.7	6.5	8.3	10.5	61.9
T ₂	IPM module-1	23.7	31.7	17.6	24.4	49.1	17.2	7.7	8.5	11.1	59.5
T ₃	IPM module-2	24.8	33.2	18.3	25.4	46.9	16.6	8.2	8.8	11.2	59.3
T ₄	IPM module- 3	26.2	32.2	19.8	26.1	45.6	19.6	7.5	8.6	11.9	56.7
T ₅	Biomodule-1	24.9	32.8	20.7	26.1	45.4	21.1	8.4	10.9	13.5	51.0
T ₆	Biomodule-2	21.4	32.5	19.7	24.5	48.8	19.3	7.3	12.2	12.9	52.9
T ₇	Biomodule-3	23.8	34.9	21.0	26.6	44.5	20.3	8.4	10.1	12.9	53.0
T ₈	Biomodule-4	27.4	33.7	21.8	27.6	42.3	17.9	7.7	12.8	12.8	53.4
T ₉	Control	34.9	56.8	50.5	47.4	1.0	30.6	15.0	36.7	27.5	0.2

Table 70b: Integrated Management of CLCuD through its vector management (Hisar)

Treatment	IPM/Biomodule	CLCuD PDI (%)				Pl ht (cm)	No. Sym	Yield (q/ha)
		1 st spray	2 nd spray	3 rd spray	Mean			
T ₁	IPM existing module	0.3	0.4	0.2	0.5	216	21	24
T ₂	IPM module-1	0.3	0.0	0.7	0.7	214	21	23
T ₃	IPM module-2	0.3	0.3	0.5	0.3	211	21	22
T ₄	IPM module- 3	0.0	0.0	0.0	0.0	194	20	21
T ₅	Biomodule-1	0.4	0.0	0.8	0.7	197	20	21
T ₆	Biomodule-2	0.3	0.0	0.7	0.8	199	21	19
T ₇	Biomodule-3	0.3	0.0	0.8	0.7	198	20	20
T ₈	Biomodule-4	0.4	0.0	0.5	1.2	212	22	20
T ₉	Control	0.7	0.6	0.6	1.8	205	17	19



Table 71a: Integrated Management of CLCuD through its vector management (Sriganganagar)

IPM/Bio-module	Whitefly/3 leaves														
	First Spray					Second Spray					Third Spray				
	B.S*	5 DAS*	7 DAS	Mean	% reduction over control	B.S.	5 DAS	7 DAS	Mean	% reduction over control	B.S.	5 DAS	7 DAS	Mean	% reduction over control
T1	15.3	5.7	6.5	6.1	53.3	10.5	5.7	4.7	5.2	54.4	9.4	2.9	2.9	2.9	70.0
T2	10.0	5.6	6.4	6.0	53.8	11.1	5.4	4.7	5.0	56.1	8.7	2.6	2.6	2.6	73.1
T3	13.4	5.5	6.5	6.0	53.6	10.9	5.6	4.8	5.2	54.7	9.8	2.7	2.7	2.7	72.4
T4	12.7	5.8	6.8	6.3	51.6	10.8	5.8	4.9	5.3	53.5	8.5	2.9	2.8	2.8	70.7
T5	14.3	5.5	6.6	6.1	53.4	11.3	5.7	4.7	5.2	54.3	8.4	4.1	4.1	4.1	57.3
T6	11.5	5.7	6.7	6.2	52.0	11.4	5.6	4.8	5.2	54.7	9.1	3.5	3.7	3.6	62.7
T7	11.1	5.4	6.5	5.9	54.4	10.3	5.7	4.9	5.3	53.5	9.4	3.7	3.9	3.8	60.6
T8	14.0	5.5	6.5	6.0	53.6	10.9	5.5	4.7	5.1	55.5	8.3	4.3	4.5	4.4	54.4
T9	9.5	12.4	13.6	13.0	0.0	14.1	12.8	10.1	11.5	0.0	10.8	10.1	9.2	9.7	0.0
CV %	12.24	12.35	10.59	8.12	8.82	11.15	13.30	12.62	9.25	9.86	11.46	12.09	11.19	7.27	5.09
S.Em (±)	1.24	0.64	0.64	0.45	3.41	1.02	0.70	0.55	0.45	3.90	0.86	0.40	0.37	0.24	2.41
CD at 5%	3.73	1.92	1.91	1.36	10.21	3.07	2.10	1.66	1.34	11.71	1.57	1.21	1.11	0.72	7.72

Note: BS= Before spray and DAS= Days after spray

Table 71b: Integrated Management of CLCuD through its Vector Management (Sriganganagar)

IPM/Bio-module	Whitefly nymph/3 leaves														
	First Spray					Second Spray					Third Spray				
	B.S.	5 DAS	7 DAS	Mean	% reduction over control	B.S.	5 DAS	7 DAS	Mean	% reduction over control	B.S.	5 DAS	7 DAS	Mean	% reduction over control
T1	4.8	2.6	2.5	2.6	44.2	5.1	2.7	2.6	2.6	47.2	5.3	1.5	1.9	1.7	66.0
T2	4.2	2.5	2.4	2.5	46.4	4.5	2.5	2.4	2.5	50.4	4.7	1.3	1.7	1.5	69.4
T3	4.5	2.5	2.5	2.5	45.6	5.2	2.6	2.5	2.5	49.2	5.4	1.4	1.8	1.6	68.0
T4	4.7	2.7	2.5	2.6	43.5	5.1	2.7	2.7	2.7	46.1	5.2	1.5	1.9	1.7	66.0
T5	4.9	2.5	2.4	2.4	47.1	5.3	2.5	2.4	2.4	51.2	5.3	2.3	2.5	2.4	52.0
T6	5.2	2.7	2.5	2.6	44.1	4.9	2.7	2.6	2.7	46.4	5.1	2.1	2.3	2.2	56.0
T7	4.6	2.5	2.4	2.5	46.4	4.8	2.5	2.5	2.5	49.8	5.1	2.1	2.4	2.3	54.6
T8	5.1	2.5	2.3	2.4	47.8	5.2	2.6	2.5	2.6	48.5	5.1	2.3	2.7	2.5	49.9
T9	4.3	4.5	4.7	4.6	0.0	4.6	4.9	5.1	5.0	0.0	4.7	4.9	5.1	5.0	0.0
CV %	15.6	12.9	12.3	11.7	7.2	11.6	12.2	12.6	9.2	7.6	12.3	11.9	11.4	9.1	7.8
S.Em (±)	0.6	0.3	0.3	0.3	2.4	0.5	0.3	0.3	0.2	2.5	0.5	0.2	0.2	0.2	3.4
CD at 5%	1.8	0.9	0.8	0.8	7.3	1.4	0.9	0.9	0.6	7.5	1.5	0.6	0.7	0.5	10.2

B.S.- Before Spray; DAS – Days After Spray



Table 71c: Integrated Management of CLCuD through its Vector Management (Sriganganagar)

IPM/Bio-module	CLCuD (PDI)				Yield (Q/ha)	Plant height (cm)	Monopods	Sympods	No. of bolls
	60DAS	75DAS	90DAS	115DAS					
IPM existing module	6.8 (15.0)*	12.7(20.8)	15.6 23.3)	17.5 24.7)	34.6	162.2	2.8	20.2	42.0
IPM module-1	4.8 (12.6)	12.2 20.4)	16.6 24.0)	20.2 26.7)	33.1	164.6	3.2	19.6	43.6
IPM module-2	4.4(11.9)	13.1 21.2)	18.3 25.3)	23.1 28.7)	33.5	160.0	3.4	20.8	47.4
IPM module- 3	6.4 (14.1)	13.9(21.9)	19.6 26.3)	21.2 27.4)	32.0	165.5	3.1	21.2	45.0
Biomodule-1	6.6 (14.7)	11.9 20.2)	19.8 26.4)	20.6(27.0)	31.2	165.8	2.9	20.7	48.0
Biomodule-2	8.7(16.9)	15.2(23.0)	22.0 (29.3)	22.6 (28.3)	34.9	162.0	3.4	19.4	44.8
Biomodule-3	6.8 (15.2)	14.6 (22.5)	21.7 (27.8)	21.9 (27.9)	33.8	167.4	3.4	21.8	47.2
Biomodule-4	5.7 (13.8)	12.9 (21.01)	17.5 (24.7)	20.7 (27.1)	31.4	167.2	3.5	19.3	41.8
Control	7.8(16.2)	12.1 (20.4)	18.3 (25.3)	21.4 (27.5)	32.1	162.1	2.9	21.0	46.6
CD at 5%	4.1	3.1	3.6	3.0	2.7				
CV	16.5	8.1	8.2	6.4	4.8				

Table 72a: Integrated Management of CLCuD through its Vector Management (Bathinda)

IPM/Bio-module	No. of whitefly adults/ 3 leaves														
	1st spray					2nd spray					3rd spray				
	BS	5 DAS	7 DAS	Mean	Reduction over control (%)	BS	5 DAS	7 DAS	Mean	Reduction over control (%)	BS	5 DAS	7 DAS	Mean	Reduction over control (%)
IPM existing module	12.0	8.7	6.7	9.1	22.6	7.3	4.7	3.7	5.2	45.3	12.0	9.0	6.3	9.1	7.9
IPM module-1	11.3	8.0	5.7	8.3	29.2	9.0	6.0	4.0	6.3	33.7	10.0	7.7	6.0	7.9	20.2
IPM module-2	10.0	7.3	6.0	7.8	34.0	9.0	5.7	3.0	5.9	38.4	6.3	4.0	2.7	4.3	56.2
IPM module- 3	11.3	7.3	4.7	7.8	34.0	8.3	7.0	4.7	6.7	30.2	12.0	7.0	4.3	7.8	21.3
Biomodule-1	11.3	8.3	7.0	8.9	24.5	6.3	4.0	3.0	4.4	53.5	10.0	7.7	5.0	7.6	23.6
Biomodule-2	12.3	8.7	6.3	9.1	22.6	7.0	4.0	2.7	4.6	52.3	11.3	7.7	6.0	8.3	15.7
Biomodule-3	11.7	9.0	7.0	9.2	21.7	8.0	5.0	4.0	5.7	40.7	6.3	4.0	2.0	4.1	58.4
Biomodule-4	11.3	9.7	8.0	9.7	17.9	9.0	6.0	3.7	6.2	34.9	9.3	6.0	3.3	6.2	37.1
Control	12.0	11.7	11.7	11.8	0.0	10.7	9.0	9.0	9.6	0.0	10.3	10.0	9.3	9.9	0.0



Table 72b: Integrated Management of CLCuD through its Vector Management (Bathinda)

IPM/Bio-module	No. of whitefly nymphs/ 3 leaves														
	1st spray					2nd spray					3rd spray				
	BS	5 DAS	7 DAS	Mean	Reduction over control (%)	BS	5 DAS	7 DAS	Mean	Reduction over control (%)	BS	5 DAS	7 DAS	Mean	Reduction over control (%)
IPM existing module	4.3	3	1.7	3.0	44.9	3.0	1.7	1.3	2.0	64	3.0	1.7	1.3	2.0	64.7
IPM module-1	3.3	2	1.3	2.2	59.2	4.3	2.7	2.0	3.0	46	4.7	3.0	2.3	3.3	41.2
IPM module-2	3.7	3	2.3	3.0	44.9	4.0	2.7	2.0	2.9	48	3.0	2.3	1.3	2.2	60.8
IPM module- 3	4.7	3.3	2.7	3.6	34.7	3.3	1.7	2.0	2.3	58	4.3	2.0	1.3	2.6	54.9
Biomodule-1	4.3	3.3	2.7	3.4	36.7	3.3	2	1.7	2.3	58	4.3	3.3	2.7	3.4	39.2
Biomodule-2	3.7	2.7	2	2.8	49.0	4.3	3.7	2.3	3.4	38	3.0	2.3	2.3	2.6	54.9
Biomodule-3	4.0	2.3	1.7	2.7	51.0	3.7	2.3	2.0	2.7	52	4.7	2.0	1.3	2.7	52.9
Biomodule-4	2.7	2.3	2.0	2.3	57.1	4.0	3.7	3.0	3.6	36	3.0	2.0	2.3	2.4	56.9
Control	6.0	6.0	4.3	5.4	0.0	6.0	5.3	5.3	5.6	0.0	6.0	6.0	5.0	5.7	0.0

Table 72c: Integrated Management of CLCuD through its Vector Management (Bathinda)

IPM/Bio-module	PDI (CLCuD)				No. of Monopods	No. of Sympods (Fruiting branches)	Plant Height (Shoot length)(cm)	No. of open bolls per plant	Seed Cotton Yield(Q/ha)
	60DAS	75DAS	90DAS	115 DAS					
IPM existing module	3.9 (11.3)	16.7(24.0)*	22.2(28.1)	25.6 (30.3)	1.7	31.3	156.4	47.1	18.5
IPM module-1	7.8 (16.2)	16.7(23.7)	25.6(30.4)	27.8 (31.8)	1.5	27.7	144.7	37.9	16.1
IPM module-2	3.9 (11.3)	12.8(20.9)	27.2(31.4)	28.3 (32.1)	1.3	27.1	144.3	37.4	15.7
IPM module- 3	9.4 (17.9)	11.7(19.4)	23.9(29.2)	27.2 (31.4)	1.6	27.9	146.9	39.8	17.1
Biomodule-1	8.9 (17.3)	12.8(20.6)	32.2(34.6)	34.4 (35.9)	1.0	26.7	134.9	36.6	15.2
Biomodule-2	7.8 (16.2)	13.3(21.0)	30.6(33.5)	32.2 (34.6)	1.2	26.9	136.5	37.3	15.3
Biomodule-3	6.1 (14.3)	13.3(21.3)	29.4(32.9)	31.7 (34.2)	1.3	27.0	140.3	37.3	15.5
Biomodule-4	7.8 (16.2)	15.0(22.6)	33.3(35.2)	36.7 (37.2)	0.9	26.7	126.4	34.7	15.0
Control	9.4 (17.9)	14.4(22.1)	35.0(36.3)	38.9 (38.6)	0.9	23.8	122.1	32.8	14.8
CD(0.05)	1.18	NS	0.56	1.75	NS	NS	NS	NS	NS
CV	4.43	17.47	1.01	2.99	35.83	16.07	9.82	16.58	22.07



Table 73a: Integrated Management of CLCuD through its Vector Management (Faridkot)

No. of whitefly adults/3 leaves																				
IP M	First spray					Second spray					Third spray					Fourth spray				
	BS	5 DAS	7 DAS		Reductio n over control (%)	BS	5 DAS	7 DAS		Reductio n over control (%)	BS	5 DAS	7 DAS		Reductio n over control (%)	BS	5DAS	7 DAS		Reductio n over control (%)
				Mea n					Mea n					Mea n					Reductio n Mean	
T1	10.4	7.9 (2.9)	9.5 (3.2)	8.7	30.5	9.1	4.6 (2.3)	7.3 (2.8)	6.0	30	4.7	2.4 (1.7)	3 (1.9)	2.7	60	3.9	1.4 (1.4)	2.1 (1.6)	1.6	66
T2	10.1	8.4 (3.0)	9.4 (3.2)	8.9	28.8	8.9	4.8 (2.3)	6.7 (2.7)	5.8	32	5.2	2.2 (1.6)	2.9 (1.9)	2.6	62	3.7	2.6 (1.7)	3.2 (1.9)	2.9	38
T3	9.8	8(2.9)	9.6 (3.2)	8.8	29.9	8.9	5.2 (2.4)	6.6 (2.7)	5.9	30	5.4	2.4 (1.7)	2.6 (1.8)	2.5	63	3.0	2.7 (1.8)	3.3 (1.9)	3.0	36
T4	9.9	8.3 (3.0)	11 (3.3)	9.4	25.2	9.1	5.2 (2.4)	5.9 (2.5)	5.6	34	6.3	2.4 (1.7)	2.9 (1.8)	2.6	62	3.5	2.5 (1.7)	3.6 (2.0)	3.1	34
T5	10.8	8.1 (2.9)	9.7 (3.2)	8.9	29.1	8.1	5.0 (2.3)	6.2 (2.6)	5.6	34	6.5	4.1 (2.1)	4.8 (2.3)	4.5	35	4.2	2.8 (1.8)	3.3 (1.9)	3	35
T6	10.2	7.4 (2.8)	10 (3.3)	8.8	30.1	7.3	5.5 (2.4)	6.7 (2.7)	6.1	28	5.8	4.2 (2.2)	4.9 (2.3)	4.6	33	3.7	2.9 (1.8)	3.3 (1.9)	3.1	34
T7	9.7	7 (2.7)	9.9 (3.2)	8.5	32.5	7.5	5.3 (2.4)	6.8 (2.7)	6.1	29	5.4	4.1 (2.1)	4.5 (2.2)	4.3	37	3.3	2.9 (1.8)	3 (1.9)	3	37
T8	10.1	8 (2.9)	10 (3.2)	9.0	28.3	7.8	4.8 (2.3)	7 (2.7)	5.9	30	6.1	4 (2.1)	4.4 (2.2)	4.2	39	4.1	2.8 (1.8)	3 (1.9)	2.9	37
T9	11.2	12(3.6)	13 (3.7)	13.0		8.2	8.1 (2.9)	8.8 (3.0)	8.5		6.5	6.6 (2.7)	7 (2.7)	6.8		4.4	4.5 (2.2)	4.9 (2.3)	4.7	
C.D.		N/S 0.25	0.23			N/S	0.38	0.21			N/S	0.28	0.25			N/S	0.29	0.12		



Table 73b: Integrated Management of CLCuD through its Vector Management (Faridkot)

Treatments	No. of Nymph/3 leaves																			
	First spray					Second spray					Third spray					Fourth spray				
	BS	SDAS	7 DAS			BS	SDAS	7 DAS			BS	SDAS	7 DAS			BS	SDAS	7 DAS		
				Mean	Reduction over control (%)				Mean	Reduction over control (%)				Mean	Reduction over control (%)				Mean	Reduction over control (%)
1	14.1	13.9 (3.8)	15.9 (4.0)	14.9	9.5	13.5	14.4 (3.9)	16.8 (4.2)	16.0	11.7	6.3	9.7 (3.2)	11.4 (3.5)	10.6	22.7	6.5	10.5 (3.3)	13.4 (3.7)	12.0	24.3
2	13.3	13.5 (3.7)	16.2 (4.1)	14.8	9.9	12.2	16.4 (4.1)	16.4 (4.1)	16.4	9.3	6.6	9.4 (3.2)	11.5 (3.5)	10.5	23.4	8.0	13.4 (3.7)	14.7 (3.9)	14.1	11.0
3	14.5	15.0 (3.9)	15.1 (3.9)	15.0	8.8	12.3	16.1 (4.1)	17.0 (4.2)	16.6	8.5	8.2	9.2 (3.1)	11.5 (3.5)	10.4	24.3	7.4	12.9 (3.7)	14.9 (3.9)	13.9	11.7
4	13.1	14.5 (3.9)	15.0 (3.9)	14.7	10.5	11.3	16.0 (4.1)	17.0 (4.2)	16.5	8.7	8.1	9.0 (3.0)	12.2 (3.6)	10.6	22.4	7.3	13.8 (3.8)	13.9 (3.8)	13.9	12.1
5	14.2	14.5 (3.9)	15.5 (4.0)	15.0	8.9	12.1	16.5 (4.1)	16.2 (4.1)	16.3	9.7	9.6	10.9 (3.4)	12.9 (3.7)	11.9	12.9	6.4	13.4 (3.7)	13.7 (3.8)	13.6	13.9
6	14.6	14.4 (3.9)	15.5 (4.0)	15.0	9.1	12.4	16.4 (4.1)	15.8 (4.0)	16.1	11.2	9.5	11.3 (3.4)	12.9 (3.7)	12.1	11.5	7.2	14.6 (3.9)	13.7 (3.8)	14.2	10.2
7	13.8	14.9 (3.9)	15.1 (3.9)	15.0	9.0	11.3	16.4 (4.1)	16.8 (4.2)	16.6	8.2	8.8	10.8 (3.4)	13.4 (3.7)	12.1	11.6	7.4	13.5 (3.7)	14.4 (3.9)	14.0	11.6
8	14.5	14.3 (3.9)	15.7 (4.0)	15.0	8.9	12.6	16.6 (4.1)	16.3 (4.1)	16.5	9.0	8.9	11.5 (3.5)	12.5 (3.6)	12.0	12.2	6.8	13.5 (3.7)	14.6 (3.9)	14.0	11.1
9	14.9	16.0 (4.1)	17.2 (4.2)	16.5	0.0	15.9	18.7 (4.4)	17.5 (4.2)	18.1	0.0	12.	13.1 (3.7)	14.3 (3.8)	13.7	0.0	13.8	15.0 (3.9)	16.5 (4.1)	15.8	0.0



Table 73c: Integrated Management of CLCuD through its Vector Management (Faridkot)

Treatment	CLCuD PDI Faridkot					Yield character			
	IPM/Bio-module	60 Days	75 Days	90 Days	115 days	Plant height (Cm)	No. of fruiting branch/plant	Seed cotton Yield (Kg/Ha)	Density (%)
T1	IPM existing module	6.3	5.8	7.9	27.5	184	26	3307	100
T2	IPM module-1	5.0	6.7	7.1	27.9	190	27	3322	100
T3	IPM module-2	5.8	8.3	10	28.8	193	28	3300	100
T4	IPM module- 3	4.6	6.3	8.3	26.7	202	27	3358	100
T5	Biomodule-1	5.8	7.1	9.2	28.8	182	25	3139	100
T6	Biomodule-2	3.8	4.6	7.5	30.8	176	23	2985	100
T7	Biomodule-3	4.2	5.4	7.9	32.5	177	23	2963	100
T8	Biomodule-4	5.8	7.5	9.6	29.6	179	22	3051	100
T9	Control	5.0	6.3	10.8	36.3	175	22	2766	100
CD at 5%						15.6	3	108	100
CV						4.8	6.8	4.9	100

Table 74a: Integrated Management of CLCuD through its Vector Management (Reduction in whitefly adults)

Treatment No.	Whitefly adults% reduction over control (7 DAS)																	Mean Reduction at last spray
	Bathinda (Mean Reduction over control)			Faridkot (Mean Reduction over control)				Sriganganagar (Mean Reduction over control)			Hisar (Mean Reduction over control)			Sirsa (Mortality at 7DAI)				
	1 st spray	2 nd spray	3 rd spray	1 st spray	2 nd spray	3 rd spray	4 th spray	1 st spray	2 nd spray	3 rd spray	1 st spray	2 nd spray	3 rd spray	1 st spray	2 nd spray	3 rd spray	4 th spray	
T1	22.6	45.4	7.9	30.5	30.0	60.0	66.0	53.3	54.4	70.0	45.4	57.0	77.4	26.2	15.4	61.2	31.1	50.5
T2	29.3	33.7	20.2	28.8	32.0	62.0	38.0	53.8	56.1	73.1	43.8	48.8	76.7	12.8	25.3	58.9	43.1	50.2
T3	34.0	38.4	56.2	29.9	30.0	63.0	36.0	53.6	54.7	72.4	45.9	45.5	76.0	10.0	14.6	59.9	42.4	56.6
T4	34.0	30.2	21.4	25.2	34.0	62.0	34.0	51.6	53.5	70.7	35.8	49.9	76.6	12.0	11.2	57.5	29.0	46.3
T5	24.5	53.5	23.6	29.1	34.0	35.0	35.0	53.4	54.3	57.3	31.2	44.0	70.2	21.6	23.5	46.1	38.3	44.9
T6	22.6	52.3	15.7	30.1	28.0	33.0	34.0	52.0	54.7	62.7	36.8	51.6	66.8	23.6	41.4	48.0	39.8	43.8
T7	21.7	40.7	58.4	32.5	29.0	37.0	37.0	54.4	53.5	60.6	33.7	43.8	72.6	24.9	29.6	46.1	42.0	54.1
T 8	17.9	34.9	37.1	28.3	30.0	39.0	37.0	53.6	55.5	54.4	41.5	48.5	65.1	5.4	10.6	44.9	43.1	47.3
T 9	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 74b: Integrated Management of CLCuD through its Vector Management (Reduction in whitefly nymphs)

Treatment	Nymph % reduction over control (7 DAI)																	Mean Reduction at last spray
	Bathinda			Faridkot (Mean Reduction over control)				Sirsa (Mortality 7DAI)				Hisar (mean Reduction over control)			Sriganganagar (Mortality & DAI)			
	1 st spray	2 nd spray	3 rd spray	1 st spray	2 nd spray	3 rd spray	4 th spray	1 st spray	2 nd spray	3 rd spray	4 th spray	1 st spray	2 nd spray	3 rd spray	1 st spray	2 nd spray	3 rd spray	
T1	44.9	64.0	64.7	9.5	11.7	22.7	24.3	42.8	38.5	63.2	70.1	38.4	47.1	64.0	51.8	54.3	66.6	57.9
T2.	59.2	46.0	41.2	9.9	9.3	23.4	11.0	32.4	35.7	63.0	68.4	32.0	44.1	65.0	47.8	52.2	66.3	50.4
T3.	44.9	48.0	60.8	8.8	8.5	24.3	11.7	53.2	34.2	55.9	61.2	28.9	41.5	63.7	50.1	57.2	69.3	53.3
T4.	34.7	58.0	54.9	10.5	8.7	22.4	12.1	40.6	28.3	44.8	55.9	25.0	43.3	60.7	51.1	52.5	66.8	50.1
T5.	36.7	58.0	39.2	8.9	9.7	12.9	13.9	49.4	40.9	62.0	68.4	28.7	42.2	59.1	54.9	58.9	56.2	47.4
T6.	49.0	38.0	54.9	9.1	11.2	11.5	10.2	48.5	33.7	53.9	60.0	38.7	42.8	61.0	56.6	51.8	57.6	48.7
T7	51.0	52.0	52.9	9.0	8.2	11.6	11.6	46.4	42.2	43.8	52.5	31.8	38.5	58.4	52.3	53.6	56.9	46.5
T 8	57.1	36.0	56.9	8.9	9.0	12.2	11.1	34.1	44.8	44.1	51.8	21.6	40.6	56.9	58.5	56.1	51.4	45.6
T 9	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
															7.2	7.6	7.8	
															2.4	2.5	3.4	
															7.3	7.5	10.2	

Table 74c: Integrated Management of CLCuD through its Vector Management (Reduction in CLCuD PDI)

No.	IPM/Bio-module	CLCuD PDI Reduction over control (%)											
		Bathinda		Faridkot		Sriganganagar		Sirsa		Hisar		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	36.5	34.3	26.9	24.2	14.8	18.2	27.5	41.6	31.5	34.5	27.4	30.6
T2	IPM module-1	27.0	28.6	34.3	23.1	9.3	5.6	18.3	31.7	24.7	27.4	22.7	23.3
T3	IPM module-2	22.2	27.2	7.4	20.7	0.0	-7.9	23.5	33.9	22.4	34.5	15.1	21.7
T4	IPM module-3	31.7	30.0	23.1	26.4	-7.1	0.9	22.7	31.1	24.8	30.0	19.0	23.7
T5	Biomodule-1	7.9	11.4	14.8	20.7	-8.2	3.7	24.7	32.2	12.9	18.2	10.4	17.2
T6	Biomodule-2	12.7	17.2	30.6	15.2	-20.2	-5.6	31.5	36.4	27.5	36.4	16.4	19.9
T7	Biomodule-3	15.9	18.6	26.9	10.5	-18.6	-2.3	28.3	31.7	19.1	29.9	14.3	17.7
T8	Biomodule-4	4.8	5.7	11.1	18.5	4.4	3.3	19.5	30.3	16.3	15.4	11.2	14.6
T9	Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.4	30.6



Table 74d: Integrated Management of CLCuD through its Vector Management (Seed cotton yield)

Treatments	IPM/Bio-module	SCY(Q/ha)					
		Faridkot	Bathinda	Sriganganagar	Hisar	Sirsa	Overall mean
T1	IPM existing module	33.1	18.5	34.6	24	28.3 (32.1)	27.7
T2	IPM module-1	33.2	16.1	33.1	23	25.7 (30.5)	26.2
T3	IPM module-2	33.0	15.7	33.5	22	25.2 (30.0)	25.8
T4	IPM module- 3	33.6	17.1	32.0	21	24.7 (29.8)	25.7
T5	Biomodule-1	31.4	15.2	31.2	21	27.3 (31.4)	25.2
T6	Biomodule-2	29.9	15.3	34.9	19	29.3 (32.6)	25.7
T7	Biomodule-3	29.6	15.5	33.8	20	27.3 (31.4)	25.3
T8	Biomodule-4	30.5	15.0	31.4	20	24.0 (29.3)	24.2
T9	Control	27.7	14.8	32.1	19	22.9 (28.4)	23.3
CD P=0.5			NS	2.7		NS	
CV (%)			22.07	4.8		16.53	



Path 3(j): Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations**Table 75: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides (Bathinda and Hisar)**

Treatments	Bathinda (Fungal Foliar Leaf Spot)				Hisar (Boll rot %)						
	DI After 100 DAS**	PDI (15 DAS)	Reduction over control	Yield (Q./ha)	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	
Kresoxim-methyl 44.3%SC 1ml/litre	86.7	5.5(13.5)	63.3	19.1	12.0 (20.2)	15.6	14.0 (21.9)	17.7	18.0 (25.1)	29.7	21
Propiconazole 25%EC 1ml/litre	80.0	10.2(18.6)	32.2	16.2	12.5 (20.7)	11.8	14.4 (22.3)	15.3	18.0 (25.1)	29.7	21
Propineb 70 % WP 2.5 g/litre	76.7	7.5(15.9)	50.0	16.7	10.0 (18.4)	29.2	11.5 (19.8)	32.4	13.0 (21.1)	49.2	23
Fluxapyroxad 167 g/litre + Pyraclostrobin 333 g/litre SC 0.6 g/litre	86.7	11.3(19.7)	24.4	15.6	7.0 (15.3)	50.6	8.1 (16.5)	52.6	9.0 (17.4)	64.8	25
Metiram 55% + Pyraclostrobin 5% WG v2 g/litre	80.0	9.0(17.4)	40.0	16.3	7.0 (15.3)	50.6	8.0 (16.4)	52.9	10.1 (18.5)	60.7	25
Azoxystrobin 18.2 %w/w + Difenoconazole 11.4 % w/w SC 1ml/litre	76.7	6.0(14.1)	60.0	17.1	8.1 (16.5)	42.6	10.0 (18.4)	41.2	13.0 (21.1)	49.3	23
Copper sulphate 47.15% +Mancozeb 30% WDG 5g/litre of water	80.0	8.3(16.8)	44.4	16.5	10.4 (18.8)	26.8	13.3 (21.3)	22.0	15.0 (22.7)	41.4	22
Captan 70% + Hexaconazole 5%WP 1.5g/litre of water	86.7	7.0(15.3)	53.3	16.8	11.1 (19.5)	21.4	14.0 (22.0)	17.7	16.5 (23.9)	35.6	21
Copper oxychloride 50%WP + Streptocycline 2.5 g + 0.1g/ litre	90.0	10.3(18.7)	31.1	15.9	10.2 (18.6)	28.0	11.0 (19.3)	35.3	12.0 (20.2)	53.3	24
Flonicamid 80 gm/acre	73.3	11.5(19.8)	23.3	15.5	13.0 (21.1)	8.3	15.4 (23.1)	9.2	18.1 (25.2)	29.2	21
Fluvalinate (For Bugs)	93.3	14.5(22.4)	3.3	14.6	13.2 (21.3)	7.1	15.2 (22.9)	10.8	20.0 (26.5)	22.0	20
Control	96.7	15.0(22.8)		14.4	14.2 (22.1)	-	17.0 (24.3)	-	25.6 (30.4)	-	20
CD at 5%CV		0.36(1.18)		NS	1.91		2.14		1.87		
SE (m)					0.65		0.72		0.63		
C.V.					5.89		6.07		4.74		



Table 76: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides (Surat)

Sr. No.	Treatment (Surat)	Bacterial leaf blight (PDI)	Control (%)	Boll rot (PDI)	Control (%)	Seed cotton yield (Q/ha)
T ₁	Kresoxim methyl 44.3% SC @ 1 ml/litre of water	31.3 (34.0)*	24.8	19.3 (26.0)*	31.4	21.49
T ₂	Propiconazole 25% EC @ 1 ml/litre of water	34.7 (36.0)	16.8	22.7 (28.3)	19.5	19.27
T ₃	Propineb 70% WP @ 2.5 g/litre of water	32.8 (34.9)	21.2	20.8 (27.0)	26.0	20.47
T ₄	Fluxapyroxad 167 g/litre + Pyraclostrobin 333 g/litre SC @ 0.6 g/litre of water	21.2 (27.3)	49.2	14.7 (22.5)	47.9	25.98
T ₅	Metiram 55% + Pyraclostrobin 5% WG @ 2 g/litre of water	25.3 (30.1)	39.2	16.3 (23.8)	42.0	24.23
T ₆	Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1 ml/ litre of water	28.8 (32.3)	30.8	18.0 (25.0)	36.1	22.93
T ₇	Copper sulphate 47.15% + Mancozeb 30% WDG @ 5 g/ litre of water	37.7 (37.8)	9.6	24.2 (29.4)	14.2	17.45
T ₈	Captan 70 % + Hexaconazole 5 % WP @ 1.5 g/ litre of water	35.0 (36.2)	16.0	23.7 (29.1)	16.0	18.06
T ₉	Copper oxychloride 50 % WP @ 2.5 g + Streptocycline @ 0.1 g/ litre of water	19.8 (26.4)	52.4	13.3 (21.2)	52.7	26.42
T ₁₀	Flonicamid (60 & 90 days)/ Difenthiuron/ Dinotefuron (110 – 120 days)	38.2 (38.1)	8.4	24.7 (29.7)	12.4	17.10
T ₁₁	Flvualinate (for bugs)	39.7 (38.9)	4.8	26.2 (30.7)	7.1	16.77
T ₁₂	Control (Water spray)	41.7 (40.1)	0.0	28.2 (32.0)	0.0	16.39
S. Em.± (T)		1.78	-	1.24	-	1.38
C.D.at 5% (T)		5.20	-	3.63	-	4.048
C.D. (Y x T)		-	-	-	-	-
C.V. %		8.95	-	7.93	-	0.116



Table 77: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides (Surat) -Nanded

Sr. No.	Treatments	Boll rot % Incidence	Alternaria leaf spot		Grey mildew		No. of bugs/plant	Seed cotton Yield (Q/ha)
			PDI	% Control	PDI	% Control		
T1	Kresoxim-methyl 44.3% SC @ 1 ml/litre of water	No incidence of Boll rot noticed	4.1 (11.6)*	49.5	4.5 (12.3)	66.5	0.9 (1.4)**	11.5
T2	Propiconazole 25% EC @ 1 ml/litre of water		4.8 (12.6)	40.7	7.4 (15.8)	45.1	0.8 (1.3)	10.2
T3	Propineb70% WP @ 2.5 g/litre of water		4.3 (12.0)	45.9	6.6 (14.8)	51.2	0.9 (1.4)	10.7
T4	Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/l SC @ 0.6 g/litre of water		2.1 (8.3)	73.8	2.7 (9.5)	79.8	0.9 (1.4)	13.2
T5	Metiram 55% + Pyraclostrobin 5% WG @ 2 g / litre of water		3.5 (10.8)	55.9	6.3 (14.5)	53.2	0.8 (1.3)	10.9
T6	Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1 ml/ litre of water		3.6 (10.9)	55.0	6.4 (14.6)	52.3	0.9 (1.4)	10.7
T7	Copper sulphate 47.15% +Mancozeb 30% WDG) @ 5 g/ litre of water		5.5 (13.6)	31.3	8.9 (17.2)	34.4	0.9 (1.4)	9.6
T8	Captan 70% +Hexaconazole 5% WP @ 1.5 g/ litre of water		5.6 (13.7)	30.2	8.6 (17.0)	36.0	1.0 (1.4)	10.0
T9	Copper oxychloride 50 % WP @ 2.5g + Streptocycline @ 0.1 g /litre of water		5.6 (13.7)	29.8	9.0 (17.4)	33.1	0.9 (1.4)	8.7
T10	Fonicamid (60 & 90 DAS)/ Difenthiuron (110-120 DAS)		7.3 (15.6)	9.1	11.4 (19.7)	15.9	0.2 (1.1)	7.3
T11	Fluvalinate (for bugs)		7.3 (15.7)	8.5	11.4 (19.7)	15.6	0.3 (1.1)	7.2
T12	Control (Water spray)		8.0 (16.4)	0.0	13.5 (21.5)	0.0	1.0 (1.4)	7.0
	SEm±		0.61		0.72		0.04	0.46
	CD @ 5%		1.78		2.10		0.11	1.36
	CV %		8.14		7.68		4.85	8.21

* Angular transformed values; **Square root transformed values



Table 78: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides (CICR-Nagpur)

Treatments (ICAR-CICR Nagpur)		Avg. % Incidence of boll rot (10 bolls/plot)		Corynespora leaf spot (PDI)		Grey mildew (PDI)		Yield (Q/ha)
		I st Spray	II spray	I st Spray	II nd spray	I st Spray	II nd spray	
T1	Kresoxim-methyl 44.3% SC @1 ml/litre of water	16.7 (23.4)	23.3 (28.8)	4.0	21.0	11.1	6.0	15.9
T2	Propiconazole 25% EC @1 ml/litre of water	20.0 (26.1)	20.0 (26.1)	1.7	15.0	13.9	8.3	15.3
T3	Propineb70%WP @ 2.5 g/litre of water	23.3 (28.3)	36.7 (36.9)	4.0	17.0	8.3	11.1	15.8
T4	Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/l SC @ 0.6g/litre of water.	20.0 (26.1)	20.0 (26.1)	1.0	13.0	13.4	8.3	16.6
T5	Metiram 55% + Pyraclostrobin 5% WG @2 g / litre of water	20.0 (26.1)	23.3 (28.1)	0.0	16.0	11.1	11.1	17.2
T6	Azoxystrobin 18.2% w/w + Difenconazole 11.4% w/w SC @1 ml/ litre of water	13.3 (21.1)	23.3 (28.1)	1.0	17.2	13.9	13.4	14.7
T7	Copper sulphate 47.15%+Mancozeb 30% WDG) @5 g/ litre of water	6.7 (8.9)	13.3 (21.1)	1.7	23.0	16.7	24.0	15.2
T8	Captan 70%+Hexaconazole 5% WP@1.5 g/ litre of water	13.3 (17.7)	16.7 (19.2)	4.4	14.0	11.1	26.3	15.1
T9	Copper oxychloride 50 %WP @2.5g +Streptocycline @0.1 g /litre of water	3.3 (6.1)	6.7 (8.9)	4.4	15.0	13.4	39.7	16.5
T10	Flonicamid (60 & 90 DAS)/ Difenthiuron/ Dinotefuron (110-120DAS) (need based application)	26.7 (30.8)	30.0 (33.0)	3.3	13.0	17.0	50.0	17.9
T11	Fluvalinate (for bugs) (need based application)	33.3 (34.9)	36.7 (36.8)	2.2	33.9	20.3	48.64	15.2
T12	Control (Water spray)	36.7 (36.8)	40.0 (38.8)	13.0	46.0	20.5	52.00	12.0
	C.D.	17.288	N/A					
	SE(m)	5.857	6.355					
	C.V.	42.539	39.809					

Note: Figures in Parenthesis are angular transformed values



Table 79: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides (Guntur)

	Treatments	Corynespora leaf spot (PDI) (Lam, Guntur)						
		I spray (PDI)			II Spray		III spray	
		Before spray	After spray	% control	After spray	% control	After spray	% control
T1	Kresoxim methyl 44.3% SC @1ml/l	4.9(12.8)	7.0(15.3)	54.3	11.2(19.5)	53.8	15.3(23.0)	58.1
T2	Propiconazole 25%EC @ 1ml/l	4.0(11.5)	6.7(14.9)	56.5	10.3(18.7)	57.3	13.8 (21.8)	63.6
T3	Propineb 70%WP @ 2.5g/l	4.7(12.5)	5.3(13.3)	65.8	9.8(18.2)	59.7	11.9(20.1)	67.4
T4	Fluxapyroxad 167g/l + Pyroclostrobin 333g/l SC @ 0.6ml/l	2.9 (9.8)	7.2(15.5)	53.2	11.3(19.6)	53.1	11.8(20.1)	67.7
T5	Metiram 55% + Pyroclostrobin 5%WG @2g/l	4.1(11.6)	7.5(15.9)	51.1	10.8(19.2)	55.2	12.9 (21.0)	64.9
T6	Azoxystrobin 18.2% w/w + Difenconazole 11.5% w/w SC @ 1ml/l	3.6(10.9)	5.8(13.9)	62.5	10.3(18.7)	57.3	13.6 (21.6)	62.9
T7	Copper sulphate 47.15%+Mancozeb 30% WDG) @ 5 g/ litre of water	4.0(11.5)	6.3(14.5)	59.2	11.9(20.1)	50.7	15.5(23.2)	57.6
T8	Captan 70%+Hexaconazole 5% WP @1.5g/L	4.2(11.8)	6.6(14.8)	57.1	11.3(19.6)	53.5	10.5 (18.9)	71.3
T9	Copper oxychloride 50 %WP @2.5g + Streptocycline @0.1 g / L	3.3(10.4)	7.4(15.8)	51.6	11.3(19.6)	53.5	15.3 (23.0)	58.1
T10	Flonicamid (60 & 90 DAS)/ Difenthiuron/ Dinotefuron (110-120DAS) (need based application)	4.4(12.1)	8.3(16.7)	45.7	19.4(26.1)	27.9	27.2(31.4)	39.4
T11	Fluvalinate (for bugs) (need based application)	3.50(10.8)	8.4(16.9)	45.8	18.8(25.7)	33.1	24.4 (29.6)	46.9
T12	Control (Water spray)	3.6(10.9)	15.3 (23.0)		24.2(24.4)		36.6 (37.2)	-
	CD (p=0.05)	NS	2.26		1.73		3.71	
	CV (%)	19.6	17.5		7.6		12.6	



Table 80: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides (Guntur)

	Treatments	Grey mildew (PDI)				Rust (PDI)				Boll rot	Yield (Q/ha)
		I spray		II Spray		I spray		II Spray			
		After spray	% control	After spray	% control	After spray	% control	After spray	% control		
T1	Kresoxim methyl 44.3% SC @1ml/l	8.3 (16.7)	53.1	2.2 (9.7)	83.9	8.5 (17.0)	41.2	18.7 (25.6)	39.4	0.8	10.9
T2	Propiconazole 25%EC @ 1ml/l	6.3 (14.1)	64.8	2.0 (8.1)	85.2	8.2 (16.6)	43.7	17.3 (24.6)	44.0	1.7	11.0
T3	Propineb 70%WP @ 2.5g/l	4.2 (11.8)	76.5	1.1 (7.1)	92.0	7.1 (15.4)	51.2	16.8 (24.2)	45.6	4.0	11.5
T4	Fluxapyroxad 167g/l + Pyroclostrobin 333g/l SC @ 0.6l	6.9 (15.2)	61.0	2.6 (10.6)	80.9	7.6 (16.4)	47.7	8.8 (17.3)	71.4	1.6	10.0
T5	Metiram 55% + Pyroclostrobin 5%WG @2g/l	4.8 (12.7)	72.8	2.5 (9.1)	81.5	7.3 (15.6)	50.0	18.3 (25.3)	40.7	2.2	10.0
T6	Azoxystrobin 18.2% w/w + Difenconazole 11.5% w/w SC @ 1ml/l	1.8 (8.8)	89.7	1.4 (6.8)	89.5	6.3 (14.5)	56.3	15.3 (23.0)	50.7	1.9	10.1
T7	Copper sulphate 47.15%+Mancozeb 30% WDG) @ 5 g/ litre of water	10.7 (19.1)	39.9	0.8 (5.0)	94.4	9.4 (17.9)	35.0	19.8 (26.4)	35.9	2.4	9.4
T8	Captan 70%+Hexaconazole 5% WP @1.5g/L	6.2 (14.4)	62.2	1.5 (7.0)	88.9	7.7 (16.0)	47.1	15.6 (23.2)	49.6	1.6	10.5
T9	Copper oxychloride 50 %WP @2.5g + Streptocycline @0.1 g / L	8.7 (17.1)	51.2	5.2 (13.1)	61.7	9.0 (17.5)	37.9	19.6 (26.3)	36.7	2.3	10.2
T10	Flonicamid (60 & 90 DAS)/ Difenthiuron/ Dinotefuron (110-120DAS) (need based application)	13.3 (21.4)	24.9	7.7 (16.1)	43.2	12.8 (20.9)	12.1	26.8 (31.2)	13.5	3.4	9.9
T11	Fluvalinate (for bugs) (need based application)	14.1 (22.0)	20.7	9.7 (18.1)	32.1	11.8 (20.0)	19.0	25.0 (30.0)	19.2	3.5	9.7
T12	Control (Water spray)	17.75		13.5 (21.56)		14.5 (22.4)		30.9 (33.8)		4.4	8.0
	CD (p=0.05)	2.75		1.31		2.13		3.61			1.7
	CV (%)	18.9		18.6		13.7		11.0			9.6



Table 81: Management of boll rot and foliar diseases of Cotton through CIB&RC recommended new chemical pesticides and their Combinations during 2021-22 - Dharwad

Sl.	Treatments	Alternaria blight		Rust		Boll rot		Yield/ha (Qtls)
		PDI	% Control	PDI	% Control	PDI	% Control	
T ₁	Kresoxim-methyl 44.3% SC @1 ml/litre of water	28.2(-32.1)	24.0	32.2(-34.6)	16.3	17.8 (24.9)	23.8	15.5
T ₂	Propiconazole 25% EC @1 ml/litre of water	26.2(-30.7)	29.4	31.1(-33.9)	19.3	18.3 (-25.3)	21.8	14.1
T ₃	Propineb70%WP @ 2.5 g/litre of water	27.8(-31.8)	25.2	29.1(-32.6)	24.4	17.2(-24.5)	26.5	16.6
T ₄	Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/l SC @ 0.6g/litre of water.	20.4(-26.8)	45.1	24.1(-29.4)	32.8	13.3(-21.4)	43.0	18.6
T ₅	Metiram 55% + Pyraclostrobin 5% WG @2 g / litre of water	22.9(-28.6)	38.3	25.7(-30.4)	28.4	14.0(-22.0)	40.0	19.7
T ₆	Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @1 ml/ litre of water	23(-28.6)	38.0	26.8(-31.2)	25.1	15.5(-23.2)	33.7	17.4
T ₇	Copper sulphate 47.15%+Mancozeb 30% WDG@5 g// litre of water	32.1(-34.5)	13.5	32.8(-34.9)	8.5	19.1(-25.9)	18.0	14.9
T ₈	Captan 70%+Hexaconazole 5% WP@1.5 g/ litre of water	33.8(-35.6)	8.8	32.3(-34.6)	16.2	18.8(-25.7)	19.7	13.8
T ₉	Copper oxychloride 50 %WP @2.5g +Streptocycline @0.1 g /litre of water	30.7(-33.6)	17.3	33(-35.0)	14.3	19.0(-25.8)	18.6	14.8
T ₁₀	Flonicamid (60 & 90 DAS)/ Difenthiuron/ Dinotefuron (110-120DAS) (need based application)	35(-36.3)	5.6	36.9(-37.4)	4.1	21.7(-27.7)	7.2	11.1
T ₁₁	Fluvalinate (for bugs) (need based application)	34.9(-36.2)	5.79	36.3(-37.0)	5.8	21.2(-27.4)	9.3	10.8
T ₁₂	Control (Water spray)	37.1(-37.5)	--	38.5(-38.3)	--	23.4(-28.9)	--	9
	CD at 5%	2.6		3.38		3.13		3.05
	S. Em.±	0.88		1.15		1.07		1.04
	cv	4.71		5.86		7.33		12.12



Path.4: Crop loss estimation

Path.4(e). Crop loss estimation due to CLCuD and distribution pattern of CLCuD in north zone.

Expt.1.To work out relationship between disease index and yield reduction due to CLCuD.

NORTH ZONE

Table 82: 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	
1	6.3			6.3	2.2	-	-	2.2	9.7	-	-	9.7	10.9	-	-	10.9	7.3
2	24.6	14.7	2.3	13.9	15.9	9.3	5.9	10.4	33.1	8.2	3.7	15.0	10.5	10.5	8.4	9.8	12.3
3	11.9	28.6	17.2	19.2	16.0	22.3	26.6	21.6	22.7	17.5	22.4	20.9	21.8	14.9	27.9	21.5	20.8
4	22.6	34.9	42.7	33.4	2.3	30.1	37.8	23.4	19.4	31.0	41.2	30.5	35.2	30.2	48.3	37.9	31.3
5		36.7	71.1	53.9		34.8	-	34.8		36.3	-	36.3	-	36.0	-	36.0	40.3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mixed		17.4	33.3	25.4	-	13	23.4	18.2	-	15.7	22.4	19.1	-	15.8	28.2	22.0	21.2

Table 83: 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	-
1	5.6	-	-	5.6	2.2	-	0	1.1	0.3	-		0.3		-	0	0.0	1.6
2	8.2	-	0.9	4.6	2.2	-	1.8	2.0	3.6	-	11.4	7.5	3	-	3.8	3.4	4.4
3	9.1	-	9.6	9.4	2.5	-	6.8	4.7	5.5	-	15.1	10.3	6.2	-	4.9	5.6	7.5
4	9.1	-	16	12.6	11.1	-	16.6	13.9	13	-	16.5	14.8	7.3	-	9.9	8.6	12.4
5		-	24.4	24.4	-	-	-	-	-	-	-	-	-	-	-	-	24.4
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mixed	-	-	10.2	10.2	-	-	6.5	6.5	-	-	10.8	10.8	-	-	4.4	4.4	8.0



Table 84: 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
1	6.6	-	-	6.6	4.2	-	-	4.2	9.2	-	-	9.2	10.9	-	-	10.9	7.7
2	25.1	14.4	3.5	14.3	16.0	13.3	6.4	11.9	27.7	12.2	13.4	17.8	13.1	7.2	11.5	10.6	13.7
3	14.2	25.8	22.8	20.9	16.1	25.0	29.0	23.4	37.5	21.0	34.8	31.1	24.4	18.3	29.4	24.0	24.9
4	25.1	34.1	50.3	36.5	11.1	33.6	46.2	30.3	10.2	33.2	51.1	31.5	36	31.5	53.7	40.4	34.7
5	-	44.7	74.6	59.7	-	38.1	-	38.1	-	38.8	-	38.8	-	38.0	-	38.0	43.6
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mixed		21.2	37.8	29.5		16.7	27.2	22.0		20	33.1	26.6		18.1	31.5	24.8	25.7

Based on mixed grades it was 29.5, 22.0, 26.6 and 24.8%, respectively in US-51, RCH 773 BG II, NCS 9013 BGII and Bioseed 6688 BG II at Faridkot, Hisar and Sriganganagar.

Expt.2. 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 85: 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	17.7	Sriganganagar	16.7	Sirsa	14.5
2	Fazilka	29.5	Hanumangarh	5.6	Fatehabad	15.0
3	Muktsar	20.5			Hisar	15.0
4	Bathinda	9.1			Jind	17.8
5					Bhiwani	9.1
6					Jhajjar	8.0
7					Mahendergarh	8.5
8					Palwal	11.1
Average		19.2		11.4		12.4



Concluded Experiment:**Path.3 (f): Management of sooty mold (*Capnodium* spp.) in cotton****Table 86: Management of sooty mold (*Capnodium* spp.) in cotton (Polyhouse Experiment- Spray thrice): Sirsa**

Treatments	Reduction of sooty mold over control (%)				Whitefly population / 3 leaves (%Reduction 15 days after third spray)			
	2019-20	2020-21	2021-22	Pooled	2019-20	2020-21	2021-22	Pooled
T1-COC 50 WP @ 1.25 g/litre	11.4	18.6	5.0	11.7	74.2	30.4	0.7	39.3
T2-COC 50 WP @ 2.50 g/litre	-5.1	23.7	22.3	13.6	80.6	49.9	13.2	43.7
T3-Propiconazole 25 EC @ 1 ml / litre	47.2	97.4	55.1	66.6	61.3	40.1	9.0	36.8
T4-Mancozeb 50 WP @2.0 g /litre	54.1	98.6	25.8	59.5	100.0	69.2	21.5	63.6
T5-Neem oil 1500ppm @5ml / litre	34.3	93.8	49.6	59.2	100.0	55.6	34.7	63.4
T6-Flonicamid 0.4g/L	61.9	100	45.6	69.2	100.0	80.3	46.5	75.6
T7-Control	0	0	0	0.0	0	0	0	0.0



Table 87. Management of sooty mold (*Capnodium* spp.) Aphid infestation in cotton (Field Experiment- Spray thrice): Junagarh

Tr. No.	Treatments	1 st spray after 15 th day				2 nd spray after 15 th day			
		Sooty mould PDI (%) mean							
		2019-20	2020-21	2021-22	Pooled	2019-20	2020-21	2021-22	Pooled
T ₁	Copper oxychloride 50 WP @ 1.25 g/l	#15.9(23.5)	20.6(27.0)	20.1(26.7)	18.8(25.7)	#53.8(47.2)	62.7(52.3)	59.3(50.3)	58.6(49.9)
T ₂	Copper oxychloride 50 WP @ 2.50 g/l	12.3 (20.5)	19.2(26.0)	18.7(25.6)	16.6(24.0)	51.5(45.8)	55.8(48.3)	50.9(45.5)	52.7(46.6)
T ₃	Propiconazole 25 EC	8.9 (17.4)	9.8 (18.2)	9.5(17.9)	9.4(17.8)	41.3(40.0)	53.8(47.2)	50.3(45.2)	48.5(44.1)
T ₄	Mancozeb 75 WP	9.4(17.8)	9.2 (17.7)	8.9(17.3)	9.2(17.6)	52.0(46.2)	51.7(46.0)	48.3(44.0)	50.7(45.4)
T ₅	Neem oil 1500 ppm	11.0 (19.3)	14.7(22.6)	14.3(22.2)	13.3(21.4)	56.4(48.9)	55.5(48.2)	44.6(42.0)	52.4(46.4)
T ₆	Flonicamid 50 WG (Insecticide)	1.9 (7.8)	2.8 (9.7)	2.6(9.3)	2.4(8.9)	3.0(10.0)	5.6(13.7)	4.1(11.7)	4.2(11.8)
T ₇	Control	9.2(17.7)	16.76(24.17)	16.3(23.8)	13.2(21.9)	63.5(52.8)	67.4(55.2)	67.4(55.2)	66.1(54.4)
S. Em.±		0.91	1.24	1.24	0.66	2.43	3.93	3.90	1.99
C.D.at 5%		2.81	3.83	3.82	1.89	7.51	12.12	12.02	5.73
C.V.%		8.9	10.37	10.52	10.08	10.17	15.35	15.88	14.05
	Y								
S.Em.±			0.43			1.31			
C.D.at 5%			1.24			NS			
	Y x T								
S.Em.±			1.14			3.46			
C.D.at 5%			NS			NS			



Table 88. Management of sooty mold (*Capnodium* spp.) Aphid infestation in cotton (Field Experiment- Spray thrice): Junagarh

Tr. No.	Fungicides/ Insecticides	Number of aphid/3 leaves/plant (First Spray)											
		Before spray				7 DAS				15 DAS			
		2019	2020	2021	Pooled	2019	2020	2021	Pooled	2019	2020	2021	Pooled
1.	Copper oxychloride 50 WP @ 1.25 g/l	15.2 [#] (23.0)	16.5 (24.0)	11.7 (20.0)	14.4 (22.3)	24.0 (29.3)	32.4 (34.7)	38.2 (38.2)	31.3 (34.1)	40.2 (39.3)	49.4 (44.7)	45.4 (42.4)	45.0 (42.1)
2.	Copper oxychloride 50 WP @ 2.50 g/l	18.3 (25.3)	16.5 (24.0)	12.8 (21.0)	15.8 (23.4)	28.6 (32.3)	31.3 (34.0)	39.0 (38.7)	32.9 (35.0)	46.5 (43.0)	50.6 (45.3)	46.9 (43.2)	48.0 (43.8)
3.	Propiconazole 25 EC	17.0 (24.3)	14.0 (22.0)	9.6 (18.0)	13.4 (21.4)	28.1 (32.0)	25.0 (30.0)	32.9 (35.0)	28.6 (32.3)	46.5 (43.0)	41.9 (40.3)	39.3 (38.8)	42.5 (40.7)
4.	Mancozeb 75 WP	16.1 (23.7)	15.7 (23.3)	14.0 (22.0)	15.3 (23.0)	28.1 (32.0)	32.9 (35.0)	45.1 (42.2)	35.2 (36.4)	48.3 (44.0)	47.7 (43.7)	43.6 (41.3)	46.5 (43.0)
5.	Neem oil 1500 ppm	16.1 (23.7)	15.7 (23.3)	11.0 (19.3)	14.2 (22.1)	25.0 (30.0)	36.2 (37.0)	42.2 (40.5)	34.3 (35.8)	42.5 (40.7)	55.8 (48.3)	50.6 (45.3)	49.6 (44.8)
6.	Flonicamid 50 WG (Insecticide)	17.4 (24.7)	15.7 (23.3)	11.9 (19.3)	14.6 (22.4)	6.1 (14.3)	6.1 (14.3)	9.4 (17.8)	7.1 (15.5)	2.5 (9.0)	4.3 (12.0)	2.2 (8.5)	2.9 (9.8)
7.	Control	17.9 (25.0)	13.6 (21.7)	12.8 (21.0)	14.7 (22.6)	26.0 (30.7)	44.8 (42.0)	50.9 (45.5)	40.3 (39.4)	43.6 (41.3)	63.8 (53.0)	62.3 (52.1)	56.7 (48.8)
	S.Em.±	1.48	0.93	1.14	0.69	1.75	2.68	2.42	1.34	2.17	2.46	2.49	1.37
	C. D. at 5%	NS	NS	NS	NS	5.39	8.27	7.46	3.84	6.68	7.59	7.66	3.94
	CV%	10.62	7.01	9.84	9.32	10.58	14.33	11.39	12.3	10.09	10.40	11.09	10.55
	Y												
	S.Em.±				0.46				0.87				0.89
	C. D. at 5%				1.31				2.51				2.57
	Y X T												
	S.Em.±				1.21				2.31				2.37
	C. D. at 5%				NS				NS				NS



Table 89. Management of sooty mold (*Capnodium* spp.) Aphid infestation in cotton (Field Experiment- Spray thrice): Junagarh

Tr. No.	Fungicides	Number of aphid/3 leaves/plant (Second Spray)							
		7 DAS				15 DAS			
		2019	2020	2021	Pooled	2019	2020	2021	Pooled
1.	Copper oxychloride 50 WP @ 1.25 g/l	86.0 [#] (68.0)	80.4(63.8)	85.7(67.8)	84.1(66.5)	77.4(118.4)	87.9(110.3)	86.0(112.0)	84.0(113.6)
2.	Copper oxychloride 50 WP @ 2.50 g/l	83.9(66.3)	76.8(61.2)	82.4(65.2)	81.1(64.3)	65.9(125.7)	72.1(121.9)	69.5(123.5)	69.2(123.7)
3.	Propiconazole 25 EC	90.1(71.7)	88.5(70.2)	92.6(73.2)	90.5(72.0)	87.3(110.9)	94.8(103.1)	93.5(104.8)	92.2(106.3)
4.	Mancozeb 75 WP	90.8(72.3)	97.0(80.0)	98.9(84.0)	96.2(78.8)	77.9(118.0)	80.1(116.5)	77.8(118.1)	78.6(117.5)
5.	Neem oil 1500 ppm	85.2(67.3)	97.54(81.0)	99.2(85.0)	95.5(77.8)	73.5(121.0)	86.3(111.7)	84.2(113.4)	81.6(115.4)
6.	Flonicamid 50 WG (Insecticide)	3.0(10.0)	1.4(6.7)	3.4(10.7)	2.5 (9.1)	4.9 (12.7)	3.3 (10.5)	4.4 (12.1)	4.2(11.8)
7.	Control	82.1(65.0)	97.9(81.7)	99.4(85.7)	95.3(77.5)	67.7(124.6)	74.2(120.5)	71.6(122.2)	71.2(122.5)
	S.Em.±	3.73	5.53	5.52	2.88	7.63	7.88	7.80	4.50
	C. D. at 5%	11.49	17.03	17.03	8.28	23.52	24.29	24.20	12.92
	CV%	10.75	15.08	14.18	13.6	12.66	13.76	13.53	13.31
	Y								
	S.Em.±				1.89				2.95
	C. D. at 5%				5.42				NS
	Y X T								
	S.Em.±				5.00			7.76	7.79
	C. D. at 5%				NS			NS	NS



Table 90. Management of sooty mold (*Capnodium* spp.) Aphid infestation in cotton (Field Experiment- Spray thrice): Junagarh

Tr. No.	Treatments	Seed cotton yield (Kg/ha) mean			
		2019-20	2020-21	2020-21	Pooled
T ₁	Copper oxychloride 50 WP @ 1.25 g/l	2791	2169	1501	2154
T ₂	Copper oxychloride 50 WP @ 2.50 g/l	2881	2220	1692	2264
T ₃	Propiconazole 25 EC	2726	2337	1666	2243
T ₄	Mancozeb 75 WP	2585	2429	1699	2238
T ₅	Neem oil 1500 ppm	2765	2393	1558	2239
T ₆	Flonicamid 50 WG (Insecticide)	3189	2763	2007	2653
T ₇	Control	2585	2065	1512	2054
S. Em.±		99.85	114.11	85.69	58.05
C.D.at 5%		307.68	351.63	264.06	166.65
C.V.%		6.20	8.45	8.93	7.69
Y					
S.Em.±					38.01
C.D.at 5%					109.10
Y x T					
S.Em.±					100.55
C.D.at 5%					NS



Table 91: Statement showing Economics of various treatments in management of sooty mould of cotton (2021-22)

S/N	Treatment / Module	Seed yield (kg/ha) Pooled	Yield increase over control (kg/ha)	Additional income (Rs) (From column No.4)	Cost of treatment (Pesticides, labor charge etc (Rs/ha)	Net realization	ICBR
1	2	3	4	5	6	7 (5-6)	8 (5/6)
T ₁	Copper oxychloride 50 WP @ 1.25 g/l	2154	100	9000	3766	5235	2.39
T ₂	Copper oxychloride 50 WP @ 2.50 g/l	2264	210	18900	5440	13460	3.47
T ₃	Propiconazole 25 EC	2243	189	17010	4990	12020	3.41
T ₄	Mancozeb 75 WP	2238	184	16560	3829	12731	4.32
T ₅	Neem oil 1500 ppm	2239	185	16650	6888	9762	2.42
T ₆	Flonicamid 50 WG (Insecticide)	2653	599	53910	10448	43462	5.16
T ₇	Control	2054	0	0	0	0	0

(1) Labor charge for one spray/ha: Rs 500

(2) Price of seed cotton: Rs 100/kg

(3) Picking charge: Rs 11/ kg seed cotton.

Cost of Fungicides (2021-22)

Sr.	Name of Fungicides	Cost as per Packing available(Rs)
1	Copper oxychloride (COC) 50 WP	Rs.375/500
2	Propiconazole 25 EC	Rs. 625/250ml
3	Mancozeb 75 WP	Rs. 641/ 1 Kg
4	Neem oil 1500 ppm	Rs.825/ 1 lit.
5	Flonicamid 50 WG (Insecticide)	Rs. 1400/140 g



Path. 3 (h): Evaluation of efficacy of bioagents against cotton diseases**Table 92: List of treatments for Evaluation of efficacy of bioagents against cotton diseases**

Treatment	Details
T ₁	ST+ SA of <i>Bacillus aryabhattai</i> ST: 10 ⁸ cfu/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 <i>Bacillus tequilensis</i> SA: 10 ⁸ cfu/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 ⁸ cfu/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 <i>Bacillus subtilis</i> SA: 10 ⁸ cfu/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 <i>Pf</i> CICC ;SA: 10 ⁸ cfu/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 93: Evaluation of efficacy of bioagents against cotton diseases, Nanded

Treatment	Percent Disease Index (%)															
	Alternaria leaf spot (ALS)				Bacterial leaf blight (BLB)				Grey mildew (GM)							
	2019	2020	2021	Pooled	2019	2020	2021	Pooled	2019	2020	2021	Pooled	2019	2020	2021	Pooled
T ₁	5.0(12.9)	4.9(12.8)	4.4(12.1)	4.8	6.6(14.8)	6.6(14.9)	5.3(13.3)	6.2	7.4(15.7)	9.6(18.1)	8.2(16.6)	8.4	13.2	12.3	9.8	11.8
T ₂	7.5(15.9)	6.8(15.1)	6.2(14.5)	6.8	6.4(14.6)	6.5(14.8)	5.3(13.2)	6.1	6.0(14.2)	9.4(17.8)	8.1(16.5)	7.8	11.7	10.6	8.4	10.2
T ₃	5.0(12.9)	5.1(12.9)	4.6(12.3)	4.9	5.3(13.2)	5.6(13.7)	4.3(12.0)	5.1	6.0(14.1)	8.5(16.9)	7.1(15.4)	7.2	14.8	14.0	11.4	13.4
T ₄	5.6(13.7)	5.7(13.8)	5.2(13.1)	5.5	6.2(14.3)	6.1(14.3)	4.7(12.5)	5.7	7.4(15.8)	8.9(17.4)	7.5(15.9)	7.9	11.8	10.7	8.5	10.3
T ₅	5.3(13.3)	5.1(13.1)	4.7(12.4)	5.0	4.9(12.8)	5.1(13.1)	3.8(11.2)	4.6	5.3(13.3)	7.9(16.3)	6.6(14.8)	6.6	12.9	11.9	9.6	11.5
T ₆	4.6(12.4)	4.5(12.2)	4.0(11.5)	4.4	4.7(12.5)	4.7(12.4)	3.3(10.4)	4.2	3.6(10.9)	7.4(15.7)	5.9(14.1)	5.6	13.5	12.9	10.3	12.2
T ₇	4.1(11.6)	2.8(9.57)	2.2(8.6)	3.0	3.5(10.8)	3.6(10.9)	2.5(9.0)	3.2	2.6(9.2)	6.3(14.5)	4.9(12.7)	4.6	13.1	12.2	9.8	11.7
T ₈	9.4(17.9)	8.6(16.9)	8.0(16.4)	8.7	7.5(15.9)	9.2(17.6)	7.8(16.1)	8.2	8.7(7.7)	15.3(22.9)	13.5(21.5)	12.5	10.6	8.9	6.8	8.8
SE±	0.28	0.62	0.60		0.47	0.66	0.50		0.53	0.84	0.87		0.38	0.5	0.5	
CD @ 0.05%	0.85	1.87	1.83		1.42	2.01	1.51		1.65	2.54	2.63		1.17	1.6	1.5	
C.D. (Y x T)	3.53	8.01			5.99	8.23			6.74	8.30			5.29	8.0	9.1	
CV %		4.94 (12.8)	8.28			6.63 (14.9)	7.96			9.64 (18.1)	9.41					



Table 94: Evaluation of efficacy of bioagents against cotton diseases, CICR, Nagpur

Treatments	Wilt/Root rot (%)					MLS (PDI)			CoLS (PDI)			
	2019-20	2020-21	2021-22	Mean	2019-20	2020-21	2021-22	Mean	2019-20	2020-21	2021-22	Mean
T1	3.3	6.7	1.7	3.9	5.3	8.3	5.7	6.4	5.2	8.3	5.8	6.4
T2	0.0	1.7	1.7	1.1	4.4	6.7	5.3	5.5	4.8	8.3	5.1	6.1
T3	0.0	0.0	0.0	0.0	1.7	6.7	2.7	3.7	2.7	7.2	3.2	4.4
T4	1.7	6.7	1.7	3.4	2.7	11.7	3.5	6.0	4.4	7.8	5.1	5.8
T5	1.7	6.7	1.7	3.4	2.7	11.7	4.1	6.2	4.9	8.9	6.2	6.7
T6	0.0	1.7	0.0	0.6	0.0	6.7	0.0	2.2	5.5	8.8	5.9	6.7
T7	3.3	8.3	3.3	5.0	0.0	8.3	0.0	2.8	2.7	6.7	3.2	4.2
T8 (Control)	6.7	13.3	6.7	8.9	12.4	16.7	13.8	14.3	8.7	21.7	9.4	13.3

Table 95: Evaluation of efficacy of bioagents against cotton diseases, CICR, Nagpur

Treatments	Bacterial leaf blight (PDI)				Grey mildew (PDI)				SCY (Q/ha)			
	2019-20	2020-21	2021-22	Mean	2019-20	2020-21	2021-22	Mean	2019-20	2020-21	2021-22	Mean
T1	4.2	6.7	5.6	5.5	2.7	3.3	2.6	2.6	44.7	8.9	29.2	27.6
T2	4.1	6.7	5.3	5.4	0.0	2.7	0.0	0.0	45.1	8.9	29.7	27.9
T3	2	5.3	3.28	3.5	0.0	1.7	0.0	0.0	46.2	9.8	31.1	29.0
T4	2.5	6.7	6.6	5.3	0.0	3.3	3.2	3.2	39.1	8.2	29.3	25.5
T5	3.3	6.7	6.4	5.5	0.0	8.8	2.6	2.6	41.9	8.0	28.3	26.1
T6	3.3	11.7	4.1	6.4	0.0	6.7	3.5	3.5	46.0	8.5	27.4	27.3
T7	4.3	8.3	4.7	5.8	0.0	1.7	0.0	0.0	43.6	8.7	25.2	25.8
T8 (Control)	9.6	13.3	11.5	11.5	2.7	16.7	4.3	4.3	37.5	7.6	23.31	22.8



Table 96: Evaluation of efficacy of bioagents against cotton diseases, Surat

Treatment	% PDI											
	Alternaria leaf spot (ALS)				Bacterial leaf blight (BLB)				SCY(Q)			
	2019-20	2020-21	2021-22	Pooled	2019-20	2020-21	2021-22	Pooled	2019-20	2020-21	2021-22	Pooled
T ₁	8.3 (16.5)	14.5 (22.2)	13.3 (21.3)*	12.0	17.2 (24.3)	26.7 (30.9)	26.2 (30.6)*	23.4	21.1	19.0	19.3	19.8
T ₂	7.5 (15.6)	12.3 (20.5)	11.5 (19.8)	10.4	15.7 (23.2)	22.5 (28.2)	23.3 (28.8)	20.5	23.0	21.0	21.1	21.7
T ₃	4.2 (11.3)	10.5 (18.8)	10.5 (18.8)	8.4	9.7 (17.9)	20.8 (27.0)	20.3 (26.6)	15.0	26.8	21.2	21.6	23.2
T ₄	11.5 (19.6)	15.7 (23.3)	14.2 (22.0)	13.8	19.7 (26.2)	28.2 (31.9)	29.7 (32.9)	25.9	19.5	19.6	19.9	19.7
T ₅	6.0 (14.0)	18.3 (25.3)	15.8 (23.4)	13.4	13.5 (21.3)	14.3 (22.1)	14.5 (22.1)	14.1	24.2	25.8	26.1	25.4
T ₆	12.2 (20.3)	16.5 (23.9)	16.3 (23.8)	15.0	20.8 (27.0)	29.5 (32.8)	30.7 (33.5)	27.0	18.1	18.1	18.4	18.2
T ₇	10.2 (18.5)	8.7 (17.1)	8.2 (16.5)	9.0	18.8 (25.4)	32.5 (34.5)	33.2 (34.5)	26.0	20.4	22.5	22.8	21.9
T ₈	17.5 (24.6)	20.3 (26.7)	19.3 (26.0)	19.0	42.3 (40.5)	40.5 (39.5)	42.3 (40.5)	41.7	17.2	16.3	16.6	16.7
SE±	1.90	1.06	1.34		1.50	1.77	1.82		1.332	1.6		
CD @ 0.05%	5.75	3.21	4.07		4.53	5.38	5.53		4.039	4.9		
C.D. (Y x T)		-	-			-	-			-		
CV %	18.70	8.24	10.84		10.06	9.95	10.12		0.108			



Agron. V: Technology for organic cotton production**Table 97: Intensity of diseases under organic cotton production: Junagarh**

S. N.	Treatment's detail	PDI ALB	PDI BLB
T ₁	Absolute control (No organic & Inorganic)	*34.6 (36.9)	#3.7(3.7)
T ₂	Control (STCR)	35.1 (37.1)	3.3(3.3)
T ₃	RD of Nutrient through organic based on P - equivalent basis. (No P recommended)	31.8 (35.9)	3.0(3.0)
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.)	31.8(35.9)	3.1(3.2)
T ₅	Neem cake 250 kg/ha. (0.945 kg/plot)	34.6(36.9)	3.3(3.3)
T ₆	Raising of Sunhemp between rows incorporated before flowering.	32.9(36.3)	3.2(3.2)
T ₇	Intercropping with black gram crop residue has to be incorporated after harvesting insitu condition.	36.8(37.7)	3.0(3.0)
T ₈	T ₄ +T ₅	37.3(37.9)	3.0(3.0)
T ₉	T ₄ +T ₆	31.8(35.8)	3.3(3.3)
T ₁₀	T ₄ +T ₅ +T ₆	32.9(36.3)	3.3(3.3)
T ₁₁	T ₄ + T ₅ + T ₇	32.9(36.3)	3.0(3.0)
	S.Em.±	0.73	0.072
	C.V. %	3.46	6.98
	C.D.	NS	NS

Table 98: Intensity of diseases under organic cotton production (G. Cot. 20) Surat

Sr. No.	Treatments	Bacterial leaf blight		Alternaria leaf spot	
		PDI	DR	PDI	DR
T ₁	Absolute control (No organic & Inorganic)	15.0	R	0.0	DF
T ₂	Control (STCR)	8.8	R	0.0	DF
T ₃	RD of Nutrient through organic based on P - equivalent basis. (No P recommended)	8.0	R	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.)	6.8	R	0.0	DF
T ₅	Neem cake 250 kg/ha. (0.945 kg/plot)	3.8	R	0.0	DF
T ₆	Raising of Sunhemp between rows incorporated before flowering.	15.2	R	0.0	DF
T ₇	Intercropping with black gram crop residue has to be incorporated after harvesting insitu condition.	10.7	R	0.0	DF
T ₈	T ₄ +T ₅	4.8	R	52.7	MS
T ₉	T ₄ +T ₆	6.8	R	0.0	DF
T ₁₀	T ₄ +T ₅ +T ₆	7.8	R	0.0	DF
T ₁₁	T ₄ + T ₅ + T ₇	3.8	R	0.0	DF



Table 99: Intensity of diseases under organic cotton production (*G. hirsutum*) Dharwad

Sl. No	Treatments	ALB PDI	Rust PDI
T1	Absolute control (No organics & No inorganic)	40.0 (39.2)	41.1 (39.8)
T2	Control (RDN through inorganic)	32.8 (34.9)	31.3 (34.0)
T3	RD of Nutrient through organic based on P equivalent basis	35.0 (36.3)	34.5 (35.9)
T4	Seed treatment and soil application of rec. bio fertilizers and foliar application of PPFM @ 1% at flowering and boll development	33.7 (35.4)	31.1 (33.9)
T5	Neem cake 250kg/ha	34.3 (35.8)	33.0 (35.0)
T6	Raising of Sunnhemp /fodder cowpea between rows incorporated before flowering	35.5 (36.6)	37.7 (37.8)
T7	Intercropping with green gram/black gram/ground nut/soybean	34.1 (35.7)	32.6 (34.8)
T8	T4 + T5	30.1 (33.2)	29.7 (33.0)
T9	T4 +T6	31.7 (34.2)	30.3(33.4)
T10	T4 + T5 + T6	29.5 (32.9)	28.9 (32.5)
T11	T4 + T5 + T7 (PPFM from TNAU)	27.3 (31.5)	28.7 (32.4)
T12	T4 + T5 + T7 (PPFM from UASD)	25.3 (30.2)	27.7 (31.7)
	SEm±	0.75	0.69
	CD at 5%	2.20	2.05

Agron. Standardization of geometry for Bt varieties



Table: 100. Statement showing the intensity *Corynospora* leaf spot diseases *Kharif-2021***Standardization of geometry for Bt varieties**

Treat. No.	Treatment Detail	CoLS PDI
T1	Suraj Bt with 60 X 15 cm	#5.21 (27.12)
T2	Suraj Bt with 60 X 30 cm	4.82 (23.25)
T3	Suraj Bt with 90 X 15 cm	3.46 (11.99)
T4	Suraj Bt with 90 X 60 cm	3.31 (10.99)
T5	PKV 081 Bt with 60 X 15 cm	5.63 (31.74)
T6	PKV 081 Bt with 60 X 30 cm	5.27 (27.75)
T7	PKV 081 Bt with 90 X 15 cm	4.23 (17.88)
T8	PKV 081 Bt with 90 X 60 cm	3.67 (13.49)
T9	Rajat Bt with 60 X 15 cm	3.63 (13.24)
T10	Rajat Bt with 60 X 30 cm	3.71 (13.76)
T11	Rajat Bt with 90 x 15 cm	3.28 (10.75)
T12	Rajat Bt with 90 X 60 cm	3.12 (9.75)
T13	GJHV374 Bt with 60X 15 cm	4.27 (18.24)
T14	GJHV374 Bt with 60X 30 cm	3.64 (13.26)
T15	GJHV374 Bt with 90 x 15 cm	3.32 (11.01)
T16	GJHV374 Bt with 90X 60 cm	3.27 (10.74)
	S.Em.±	0.1171
	C.V. %	5.0
	C.D.	0.3483



Table: 101. Statement showing the intensity *Corynespora* leaf spot diseases *Kharif-2021*

Treat. No.	Treatment Detail	CoLS PDI
T ₁	Sole Bt cotton at spacing 120 X 45 cm	#4.71 (22.14)
T ₂	Paired row planting of Bt cotton with two rows of intercrop Sesamum (A)	5.95 (35.37)
T ₃	Paired row planting of Bt cotton with two rows of intercrop Soybean (B)	6.80 (46.27)
T ₄	Paired row planting of Bt cotton with two rows of intercrop Groundnut (C)	6.40 (40.96)
T ₅	Paired row planting of Bt cotton with one rows (A) +one row (B)	6.32 (39.94)
T ₆	Paired row planting of Bt cotton with one rows (B) +one row (C)	6.28 (39.41)
T ₇	Paired row planting of Bt cotton with one rows (C) +one row (A)	5.76 (33.21)
T ₈	Farmers practice Cotton + Sesamum (1:1) (150 X 30 cm) ATM	4.17 (17.39)
T ₉	Recommended intercropping. Cotton + Sesamum (1:1) (120 X 45 cm)	5.61 (31.44)
T ₁₀	Paired row planting of Bt cotton	5.66 (31.98)
	S.Em.±	0.15
	C.V. %	5.55
	C.D.	0.46

Table 102. Agron. IB: Evaluation of compact culture under HDPS with different nutrient levels (2021-22).

Sr. No.	Treatments	Bacterial leaf blight		Corynespora leaf spot	
		PDI	Rating	PDI	Rating
1	S ₁ N ₁	0.0	DF	13.5	R
2	S ₁ N ₂	0.0	DF	32.8	MR
3	S ₁ N ₃	0.0	DF	34.8	MR
4	S ₂ N ₁	0.0	DF	9.2	R
5	S ₂ N ₂	0.0	DF	16.2	R
6	S ₂ N ₃	0.0	DF	31.8	MR
7	S ₃ N ₁	0.0	DF	6.2	R
8	S ₃ N ₂	0.0	DF	23.2	R
9	S ₃ N ₃	0.0	DF	14.8	R
10	S ₄ N ₁	0.0	DF	6.2	R
11	S ₄ N ₂	0.0	DF	0.0	DF
12	S ₄ N ₃	0.0	DF	9.2	R

