

Approved Package of Practices for cotton: Gujarat State

Preparation of land:

In case of normal monsoon, the land should be prepared with 1-2 cross harrowing. This may help in conservation of moisture in the soil. If monsoon receives late, the land should be prepared with one ploughing. Deep ploughing after 2-3 years with tractor drawn implements may reduce the problem of perennial weeds in the field.

Time of sowing:

Normally, the crop is sown with the onset of monsoon in the last week of June to first week of July. Where irrigation facility is available, the crop may be sown little earlier i.e. in the first week of June. Advance sowing of the crop will give higher yield than normally sown crop.

Seed rate and spacing:

The seed requirement of the variety mainly depends upon the size of the seed and method of distance of sowing. Spacing mainly depends on the growth habit of a variety and in which condition it is to be sown i.e. irrigated or rainfed. The details of seed rate and spacing of different cotton varieties is given in table 1. Normally, seed should be sown at a depth of 4-6 cm according to availability of moisture in the soil.

Selection of variety:

In Gujarat, following varieties have been recommended to grow in different cotton zones

Zone	Recommended varieties/ hybrids
South Gujarat Cotton Zone	Digvijay
Middle Gujarat Cotton Zone	Digvijay , G.Cot-16, G.Cot-17 and G.Cot-23
Wagad Cotton Zone	V-797, G.Cot-13, G.Cot-21, G.Cot-12 (Surendranagar dist.), G.Cot-18 (Junagadh)
Mathio Cotton Zone	G.Cot.15 and G.Cot-19

All hybrids like Hybrid-4, G.Cot.Hy-6, G.Cot.Hy-8, G.Cot.Hy-10, G.Cot.Hy-12, G.Cot.DH-7, G.Cot.DH-9 and G.Cot.MDH-11 and hirsutum

varieties like Deviraj and G.Cot.10 are recommended for whole state. The economic characters of different varieties are given in Table-II.

Thinning and gap filling:

To harvest good yield one should maintain proper plant population in unit area. For the purpose one should carry out operation like thinning and gap filling as and when required.

Fertilizer:

The organic manure@ 10 tonnes/ha should be applied as this will help in conservation of moisture, increase in aeration, soil drainage, microbial activity and availability of nutrients. This will also help in improvement of soil structure. The recommended doses of inorganic fertilizers for different varieties are given in Table 1.

Weeding and inter-culturing:

The operation of interculturing and weeding may be followed as per one's requirement. The weed should be removed by following deep ploughing in earlier stage of the crop whereas shallow ploughing in later stage of the crop. This is to avoid damage to root.

In case of chemical weed control, the field should be sprayed with 2.8 litre/ha Fluchloralin in 600 liters of water. If spraying is to be done only on the rows of the crop, the quantity of the weedicide will be lesser i.e. 1 litre/ha or 50 ml in 10 litres of water.

Irrigation:

Where irrigation facility is available, irrigation should be given 3-4 weeks after last effective rainfall. In black soils, generally irrigation should be given at an interval of 20-25 days. Where as, in sandy loam soils (GORADU), it should be given at 15 days interval; irrigation water can be saved by irrigating the crop with alternate furrow method without decreasing in the yield as compared to flood irrigated area.

In rainfed cultivation, when shortage of rainfall occurs, crop should be irrigated with one or two life saving irrigations.

Intercropping:

In cotton various intercrops like soybean, tur, urid and mung can be taken up. The recommendations emerged in Gujarat are given in Table-1.

Plant Protection:

Entomology:		
No	Pest/disease	Measures to be taken
1.	Bollworm complex*	Cypermethrin 10EC @ 50g ai/ha Decamethrin 2.8 EC @ 15g ai/ha Fenvalerate 20 EC @ 100 g ai/ha Alphamethrin 10 EC @ 25 g ai/ha Endosulfan 35 EC @ 875 g ai/ha Profenphos 50 EC @ 1.0 kg ai/ha Quinalphos 20 AF @ 2.5 l/ha Polytrin C 44 EC @ 1.0 l/ha Spinosad 48 SC @ 75g ai/ha Bulldock 2.5 SC@ 18g ai/ha
		*Synthetic pyrethroids should be sprayed twice @ 15-20 days interval at the peak flowering stage alternated with conventional pesticides.
2.	<i>Helicoverpa armigera</i> **	Rimon 10 EC @ 100g ai/ha
		** The IGR is sprayed when pest crosses the ETL
3.	Pink bollworm	Decis tablet 25% @ 10 g ai/ha (20 tab/ha) Betacyfluthrin 2.5 SC@ 18g ai/ha Spinosad 48 SC@ 50 g ai/ha Methyl-o-demeton @ 1.0 l/ha
4.	Aphids, Jassids, Thrips and White flies ***	Imidacloprid 200 SL@ 20g ai/ha Acetamiprid 20 SP @ 10g ai/ha Thiamethoxam 25 WG @ 25g ai/ha Seed treatment : Imidacloprid 70 WS @ 7.5 g/kg seed or Thiamethoxam 70 WS @ 2.8g ai/kg seed or Imidacloprid 600 FS @ 9ml/kg seed.
		***Need based application of any of the insecticides is recommended.
5.	White flies	Triazophos 40 EC @ 0.75 Kg ai/ha
6.	Cotton pest complex	IPM strategy : <ul style="list-style-type: none"> o Seed treatment with Imidacloprid @ 7.5 g/kg seeds. o Hand collection of infected shoots with spotted bollworms in the early stage. o Planting of Maize as a inter crop (10:1), Marigold and Castor as trap crops in and around the cotton. o Installation of pheromone trap @ 5/ha. One week after germination.

		<ul style="list-style-type: none"> ○ Early release of Chrysoperla @ 10000 eggs or larva /ha (2 release) ○ Spraying of Neem form. or Neem seed kernel suspension @ 5%. ○ Release of Trichogramma @ 1.5 lakh/ha (3 releases). ○ Spraying of HNPV @ 450 LE/ha for Helicoverpa and SNPV @ 250 LE/ha for Spodoptera. ○ Hand collection of eggs and larva of Helicoverpa and eggs and larval masses of spodoptera from main and trap crops. ○ Need based application of insecticides for pests based on ETL.
Plant Pathology		
1	Seedborne diseases #	Delinting with sulphuric acid @100 ml/kg seed and seed dressing with mercuric fungicide @2-3 g/kg of seed
	# Wash the seeds thoroughly after acid delinting dry it in shade before seed dressing	
2	Bacterial blight \$	Streptomycin sulphate @0.005% + copper oxychloride 0.2% spray Bacterial blight (<i>Xanthomonas axonopodis</i> Pv. malvacearum) disease of cotton causes 11.95, 11.14 and 9.26% avoidable loss in seed cotton yield of cultivars LRA-5166, G.Cot.Hy-10 and BC-68-2, respectively.
	\$ Two to three sprays at 15 days interval after disease initiation	
3	Wilt and Root rot	Follow cultural practices like long term crop rotation, balanced application of NPK, organic manure, mixed cropping of Moth or Urid, irrigation at short intervals, green manuring and destruction of infected debris. Farmers of Gujarat growing cotton are advised to follow soil amendment with farm yard manure @ 20 tons/ha or pressmud or poultry manure @ 2 tons/ha for effective and economical management of root rot disease. Farmers of Gujarat growing cotton recommended to following seed treatment with commercially available biocontrol agent <i>Trichoderma viride</i> @ 5g/kg seed for safer, effective and economical management of root rot disease.
4	Alternaria leaf spot ®	Captafol or Mancozeb @ 0.2% spray
	® Four sprays at 20 days interval after disease initiation	

Plant Physiology

- Seed germination (one month after processing) is not affected by picking or position of boll. Other seed quality parameters are not

- adversely affected by either picking or position of boll. Therefore, it is recommended to the seed producers of American cotton (e.g. G.Cot. 10) that all pickings and positions are alike with respect to fulfilling certification standards of germination (65%).
- It is recommended to the cotton growing farmers especially seed producers of desi cotton that seed germination is not affected by either picking or position of boll. Therefore, all picking are alike and can be used for seed purpose.
 - Under specific conditions, defoliants like Ethrel 2000 ppm or NaCl 10% solution can be used at 50% boll bursting stage for hastening maturity of crop by about a week. This would also help in getting cleaner kapas.
 - Seed producers of desi cotton hybrid G.Cot.DH-9 are advised to give two sprays of 1 mM Sodium benzoate (1.44 g/10 L. @ 400 L/ha) on female parent at the initiation of crossing programme and twenty days later to get higher seed yield (F1) and economic gain (Rs. 11,065/ha) (ICBR 1:300).
 - Farmers of South Gujarat growing hybrid cottons (G.Cot.Hy-6 and G.Cot.DH-9) are advised to spray the crop with 30 % or 20 % Methanol at 65 and 85 days of the germination (@ 300 L/ha and 400 L/ha to realize higher yield and better economic returns (Net profit being Rs. 3802 and Rs. 2412 and ICBR being 1:1.51 and 1:1.44, respectively for the two treatments)-Recommendation put in abeyance due to ban on Methanol.
 - Acid delinting of cotton seed does not improve or advance the germination. Hence it is advised that the practice of acid delinting parent/breeder seed may be discontinued.
 - Chemical defoliant thiadiazuron @ 50 gm/ha at 50 percent boll bursting stage gave maximum yield of cotton without impairing the quality.

TABLE – I : RECOMMENDATION FOR COTTON CULTIVATION

A : Agronomic Practices on cotton.

Sr No	Varieties/ hybrids	Seed rate (Kg/ha)		Spacing in cms.		Fertilizer (Kg/ha)			
		3	4	5	6	7	8	9	10
G. herbaceum (Open boll type)									
1.	Digvijay	4-5	8-10	150x30	90x30	50	20	50 in two equal splits	20
2.	G.Cot.16	3-4	8-10	--	90x30	--	40	--	40
3.	G.Cot.17 & G.Cot.23	4-5	8-10	--	120x30 or 150x45	--	40	--	40
G. herbaceum (closed and semi open boll types)									
4.	V-797	10-12	15-20	--	45x22.5	--	20	--	20
5.	G.Cot.13 & G.Cot.21	10-12	15-20	--	120x30	--	20	--	20
G. arboreum									
6.	G.Cot.15	3-4	15-20	--	60x150-20	--	12.5	--	12.5
7.	G.Cot.19	3-4	15-20	--	60x150-20	--	12.5	--	12.5
G. hirsutum									
8.	Deviraj	8-10	12-15	120-150x60	--	25	--	50*	--
9.	G.Cot.10	2.5-3.0	8-10	90x30(NG)	90x30	50	--	100*	--
		2.5-3.0	8-10	90x60(SG)	--	75	--	150*	--
10	G.Cot.12	8-10	12-15	90-120x 60-75	--	25	--	25	--
11.	G.Cot.16	3-4	8-10	--	90x30	--	40(BCH)	--	40
Intra-hirsutum hybrids									
12.	Hybrid-4	2.5-3.0	--	120x60(SRT)	--	80	--	240**	--
				90x60(TLD)	--	45-60-60	--	135**	--
13.	G.Cot.Hy.6	2.5-3.0	--	120x45(SRT)	90x30(BCH)	80	60	240**	60
				90x45(JND)	--	40	--	120**	--
				90x60(TLD)	--	40	--	120**	--
				90x30(ACH)	--	40	--	120**	--
14.	G.Cot.Hy.8	4.0	--	120x60 (Two plants/hill) 120x45(One plant/hill)	--	80(SRT)	40	240**	40
				90x30(JND)	--	40	--	40	--
				90x30(TLD)	--	40	--	120**	--
15.	G.cot.Hy.10	2.5-3.0	--	120x45	120x30	60(SRT)	40(BHR)	180**	40
Desi hybrids									
16.	G.Cot.DH.7	3.0	--	9.x60 or 120x60(SRT)	90x60(BCH)	40	60	120**	60
17.	G.Cot.DH.9	3.0	--	90x60	--	40(SRT)	40	120**	40

			--	120x30		40-40-0 (KHB)	--	40
18	Intercropping of soybean with G.Cot.11 cotton	For securing higher profit, farmers of South Gujarat Zone-II are advised to adopt intercropping of Soybean in cotton with 100% of recommended dose of nitrogen to cotton(80 Kg N/ha) and 50% recommended dose of N and P to soybean (10 Kg N and 20 Kg P ₂ O ₅ /ha) or 50% recommended dose of nitrogen to cotton and 100% recommended dose of N and P to soybean (Bharuch)						
19	Intercropping of Urid with G.Cot.11 or Tur BDN-2	For securing higher profit, farmers of south Gujarat Zone-II growing rainfed cotton G.Cot.11 or Tur BDN-2 at distance of 120cm between rows are advised to intercrop two rows of urid (30cm apart) between the rows (Bharuch)						
20	Intercropping of Urid and Mung with G.Cot.Hy.6	For securing higher net profit, farmers of South Gujarat Zone-II growing irrigated cotton G.Cot.Hy.6 at a distance of 120 cm between rows are advised to intercrop one row of soyabean (Gujarat-1) or Urid (Zandewal) or Mung (Gujarat-2) between the rows(Surat).						
21	Double cropping with G.Cot.Hy-6 and G.Cot Hy-8 and Wheat and Groundnut	For securing higher net monetary returns, farmers of South Gujarat Zone-II growing irrigated cotton G.Cot-Hy.6 and G.Cot.Hy-8 are advised to grow wheat (Lok-1) or Groundnut (GG-2) as second crops.						

Note :

SRT = Surat, BCH= Bharuch, ACH=Achhalia, VIR= Viramgam, TLD= Talod, KHB= Khedbraham JND= Janagadh

* Through two equal splits

** Through three equal splits

List of released cotton cultivars from SAU, Surat Station with Characteristics and Economic characters

Sr. No.	Varieties	Type	Year of release	Maturity days	Seed cotton yield kg/h.	2.5 % span length (mm)	G.P. (%)	Fibre fineness (mv)	LUR	Fibre strength (g/tex)	Maturity Co-efficient	Spinning count
1	Digvijay	Herbaceum	1956	260	663	23.1	39.0	4.4	50	9.5(PSI)	0.75	40
2	G.Cot.17	Herbaceum	1995	200-230	1375	22.5	40.5	4.1	51	47.1(0mm)	0.79	--
3	G.Cot.23	Herbaceum	2000	190-210	1300	22.4	39.1	4.2	52	22.9(3.2mm)	0.81	16-20
4	G.Cot.16	Hirsutum	1995	135-140	1606	26.8	36.7	4.2	49	47.9(0mm)	0.83	40
5	V-797	Herbaceum	1966	260-300	787	22.6	39.9	3.9	47	7.7(PSI)	0.82	31
6	G.Cot.13	Herbaceum	1981	245-280	887	23.2	39.4	4.3	48	45.1(0mm)	0.74	30
7	G.Cot.12	Hirsutum	1981	210-220	600	24.3	36.0	4.3	46	8.4(PSI)	0.80	23
8	G.Cot.21	Herbaceum	1998	215-225	1129	23.6	42.1	5.3	48	52.8(0mm)	--	20
9	G.Cot.18	Hirsutum	1999	175-180	1535	27.4	34.0	3.6	48	17.6(0 mm))	0.85	--
10	G.Cot.15	Arboreum	1989	120-150	1108	21.1(MFL)	32.8	5.7	50	47.2(0mm)	0.78	--
11	G.Cot.19	Arboreum	1997	110-120	1101	25.4	34.5	4.4	50	50.8(0mm)	0.76	--
12	Deviraj	Hirsutum	1951	290	1250	27.4	36.3	3.7	45	7.2(PSI)	0.77	43
13	G.Cot.10	Hirsutum	1974	180	1350	24.3	35.7	4.2	48	8.9(PSI)	0.72	40
14	Hybrid-4	Hirsutum hybrid	1971	210-230	2103 3400*	26.7	33.4	3.5	40-51	7.5-8.5(PSI)	0.70-0.80	40-60
15	G.Cot.Hy-6	Hirsutum hybrid	1980	190-210	1305 3800*	27.5(MFL)	33.6	4.2	48	8.7(PSI)	0.77	60-70
16	G.Cot.DH-7	Desi hybrid	1984	180-200	1808 2600*	21.8(MFL)	37.5	5.6	49	9.4(PSI)	0.76	28-30
17	G.Cot.Hy-8	Hirsutum hybrid	1988	170-190	1824 3775*	25.8	36.5	4.5	50	47.8(0mm)	0.83	40-50
18	G.Cot.DH-9	Desi hybrid	1989	180-200	2108	28.4	34.1	4.7	47	49.2(0mm)	0.80	40-50
19	G.Cot.Hy-10	Hirsutum hybrid	1995	190-210	1837 3805*	28.9	34.6	4.3	48	43.7(0mm)	0.83	40-50
20	G.Cot.MDH-11	Male sterility	2002	120-140	1307 2727*	23.8	36.5	5.7	51	19.0(0mm)	0.83	20-30
21	G.Cot.Hy-102	Hir x Barb.	2002	220-230	1967	34.0	33.4	3.6	48	25.3(3.2mm)	0.76	60-80
22	G.Cot.Hy-12	Intra-hirsutum	2005	175-190	1829	26.6	34.2	4.2	51	22.9(3.2mm)	0.80	40-50

*Under high care condition

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