

# Package of Practices for Cotton Cultivation

Cotton Research Station, JAU, Junagadh (Gujarat)

## Introduction:

Cotton is one of the most important fibre and cash crop of Gujarat playing dominant role in industrial and agricultural economy of the Gujarat. It provides basic raw materials for textile, oil and animal feed manufacturing industries as well as livelihood to farmers and persons employed in processing, value chain and trade. Further, the seed, fertilizer and pesticide industries have major share of consumption from cotton cultivation in large area in Gujarat and India. Thus cotton is the key driving force of agriculture economy in the state. Cotton is cultivated in 30 districts out of 33 districts in diversified area, soil types and climatic conditions. In Gujarat, cotton occupied approx. 26.8% of the gross cropped area (9.88 million ha) of the state. Area of Gujarat was 22.75 lakh hectare and production 80.96 lakh bales and productivity 610 kg/ha. (AICRP, Annual report 2021)

## Soil Type:

Cotton succeeds in various soil types from heavy black clay to light sandy soils; it also has a good tolerance to soil salinity but it requires good drainage.

## Temperature:

Cotton requires a warm, dry climate (optimum temperature: 25-35°C) for its cultivation and a frost-free period of ~200 days is essential.

## Land preparation:

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.

## Sowing:

Generally sowing can be done by the first week of June to second week of July. After getting sufficient amount of rainfall. Avoid early and late sowing for management of pest and diseases.

## Seed rate and spacing:

The seed rate of cotton depends on the variety/hybrids, the size of the seed and spacing. Spacing mainly depends on the growth habit of a variety/hybrids, soil type 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 as under. Normally, seed should be sown at a depth of 4-6 cm according to availability of moisture in the soil.

**Seed rate:**

Hybrid (Bt): 2.5 to 4.0 kg/ha  
 Bt variety: 4.0 kg/ha

**Spacing:**

Varieties/hybrids:  
 Rainfed: 90 x 30 cm  
 Irrigated: Hybrids :120 x 45 cm  
 Bt variety :120 x 45 cm

**Selection of variety/ hybrids:**

Following varieties have been recommended in Gujarat:

Improved varieties American cotton	Deshi cotton hybrid varieties	American cotton Hybrid or Bt hybrids
G. Cot. -10 G. Cot. -16 G.J. Cot - 102 G. Cot.-38	G. Cot.Deshi Hy -7 G. Cot.Deshi Hy -9 G. Cot. Deshi Hy -11	G. Cot. Hy. -22 G.Cot.Hy -8 BG-II G.Cot.Hy -10 BG-II G.Cot.Hy -12 BG-II G. Cot. Hy.-24 BG-II G. Cot. Hy.-26 BG-II GTHH-49 BG-II

**Fertilizer management in cotton**

- FYM 10 tons per hectare mix with soil at the time of land preparation.
- Recommend chemical fertilizer dose for Bt hybrid per ha. 240 kg nitrogen, 50 kg phosphorus and 150 kg potassium per ha. To give basal application of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O 25 kg and 75 kg per hector respectively at the time of land preparation and remaining dose will be given at time of earthing up.
- Maximum 240 kg/hector nitrogen is required for Bt cotton.
- Apply ZnSO<sub>4</sub> 50 kg/ha and MnSO<sub>4</sub> 25 kg/ha are given at the time of land preparation
- For getting higher yield two to three spray of 19-19-19 (N-P-K) 100g and micro mix (G-4) 15 g in 10 liter of water and for reddening/parawilt management spray KNO<sub>3</sub> 200 g in 10 liter of water.

**Irrigation Management**

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. Whereas, 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.

- To adopt drip irrigation
- To avoid irrigation at the time of squares and flowers formation.
- To give irrigation at the time of boll formation
- If you have limited irrigation facilities, you give alternate furrow irrigation.
- Avoid excess irrigation

### **Weeding and inter-culturing:**

- The operation of inter-culturing and hand weeding may be followed as per requirement. The weeds should be removed by following deep harrowing in earlier stage of the crop. whereas shallow harrowing in later stage of the crop. This is to avoid damage to root.
- In case of weed control through chemical, the field should be sprayed pendimethalin 0.9 kg/ha as pre- emergence in 500 l of water. If spraying is to be done only on the rows of the crop. Two hand weeding and two–three cultivation is required for good weed management. Quizalofopethyl @ 1.00 kg/ha is very effective for the control of monocot weeds as post emergence application.

### **Canopy management:**

- Spray growth promoter Naphthalene Acetic Acid (NAA) @ 30 ppm (0.3g /10 lit. water) at 50 & 70 DAS
- Spray growth inhibitor Cycocel / Chlormequat Chloride (CCC) @ 40 ppm at 90 DAS (0.4g /10 lit. water)
- Detopping at 75 days after sowing

### **Plant protection:**

#### **Important insect-pests and their control measures:**

- The sucking pests like aphid (*Aphis gossypii*), jassid or leaf hopper (*Amrasca biguttula*, thrips (*Thrips tabaci* Linda.), whitefly (*Bamisia tabaci* Genn.) and red cotton bug (*Dysdercus cingulalis* (Fab)), both adults and nymphs suck sap from the underside of the leaves and devitalize and reduce the vitality of the plant.

#### **Mealybug:**

- Mealybugs are small sap-sucking insects, measuring about 5-6 mm in length and 3-4 mm breadth. This insect occurs severally during last five years and cause considerable damage to the cotton crop. For control of this pest, follow crop rotation, before onset of monsoon clean the farm boundary, uproot infected plant and destroy it, dusting on 25 to 50 plants & soil with Quinalphos 1.5 DP around the infected plants. In case of severe

infection of the pest, spray chloropyriphos 20 EC @ 25 ml, quinalphos 25EC @ 20 ml, profenofos @15ml in 10 lit of water.

### Bollworms:

- **American boll worm** larvae feed on the leaves initially and then bore in to the square/bolls and seeds with its head thrust into the boll, leaving the rest of the body outside. **Spotted bollworm** caterpillars cause damage by boring into the growing shoots, buds, flowers and bolls. The attacked shoots wither, droop and ultimately die, and flowers and buds drop off. **Pink bollworm** feeding on the flower buds, panicles and bolls. The holes of entry close down by excreta of larvae which are feeding inside the seed kernels. They cut window holes in the two adjoining seeds thereby forming "double seeds" and finally damage them. The attacked buds and immature bolls drop off. For 65-100 days crop, 5-10% infested fruiting bodies is the ETL. **Tobacco caterpillar** (*Spodoptera* spp) larvae feed gregariously on the under surface of the leaves and skeletonize them leaving only the mid-rib and veins in severe cases. They also attack flowers, buds and squares causing considerable loss.

### Integrated Pest Management in cotton:

1. Seed treatment with Imidacloprid @ 7.5 g/kg seeds.
2. Hand collection of infected shoots with spotted bollworms in the early stage.
3. Installation of pheromone trap @ 5/ha one week after germination for *Spodoptera* and bollworms.
4. Early release of Chrysoperla @ 10,000 eggs or larva /ha (3 re-lease)
5. Spraying of Neem form or Neem seed kernel suspension @5%.
6. Release of *Trichogramma* @ 1.5 lakh/ha (5 releases).
7. Spraying of *HaNPV* @ 450 LE/ha for *Helicoverpa* and *SaNPV* @ 250 LE/ha for *Spodoptera*.
8. Hand collection of eggs and larva of *Helicoverpa* and *Spodoptera* from cotton and trap crops.
9. Planting of Maize/Sorghum as a inter-crop (10:1).
10. Planting of Marigold and Castor as a trap crops around the cotton for the management of *Helicoverpa* and *Spodoptera*.
11. Need based application of insecticides for pests based on economic threshold level.

**Table-: Control measures of important insect-pests**

No	Name of Insect	Measures to be taken	Quantity of insecticides in10 lit. of water
1	Aphids, Jassids and Thrips	Neem extract 5% Dimethoate 30 EC Thiamethoxam 25 WG Acetamiprid 20 SP Imidacloprid 200 SL	25 ml 10 ml 2 g 2 g 4 ml

		Acephate 75 SP Dinotefuran 20 SG Flonicamid 50 WG	20 g 5 g 3g
2.	Whitefly	Acetamiprid 20 SP Diafenthiuron 50 WP	2 g 10g
3.	Mealybug	Chloropyryphos 20 EC Profenofos 50 EC	25 ml 15 ml
4.	Bollworms	Emamectin Benzoate 5% SG Quinalphos 25 EC Profenofos 50 EC Spinosad 48 SC Indoxacarb 14.5 SC Thiodicarb 75 WP Lambda cyhalothrin 2.5 EC Deltamethrin 2.8 EC	5g 20 ml 15 ml 2 g 7 g 40 g 10 ml 10 ml

Control measure of important diseases		
1.	Bacterial blight ( <i>Xanthomonas axonopodis</i> pv <i>malvacearum</i> )	<ul style="list-style-type: none"> <li>➤ Delinting seed with sulphuric acid @ 100ml/kg seed and seed dressing with <i>Pseudomonas fluorescens</i> strain -1, 10 g/kg seed and also spray @ 20g in 10 lit. water (Three spray at 30 days interval)</li> <li>➤ Spray 2-3 times streptomycin sulphate @0.005% + Copper Oxychloride 0.2% after initiation of the disease. at 15 days interval</li> </ul>
2.	Alternaria leaf Spot ( <i>Altenaria macrospora</i> )	<ul style="list-style-type: none"> <li>➤ Remove diseased residue</li> <li>➤ Three spray of Captan 70WP + Hexaconazole 5SL (750 g/ha) and pyraclostrobin 5WG + Metiram 55WG (30 g/10lit. of water) at 15 days interval after initiation of disease. or Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/l SC 7ml/10 l water</li> </ul>
3.	Grey mildew ( <i>Ramularia areola</i> )	<ul style="list-style-type: none"> <li>➤ Two spray of Carbedazim 0.05% (10g in 10 lit. of water) or Copper oxichloride 0.2% at 15 days interval or Kresoxim methyl 44.3% SC @10ml in 10 l water.</li> </ul>
4.	Root rot ( <i>Rhizoctonia solani</i> , <i>R.bataticola</i> and <i>Macrophomina phaseoli</i> )	<ul style="list-style-type: none"> <li>➤ Seed treatment of Carboxin 37.5% + Thiram 37.5% DS 3 g/kg seed</li> <li>➤ Follow cultural practices like long term crop rotation, deep ploughing, balanced application of NPK &amp; organic manure, mixed cropping of Moth or Urid, irrigation at short intervals, green manuring and destruction of infected debris.</li> <li>➤ Drenching of Mancozeb 75% WP 0.2% solution (27 g in 10 lit of water) around the infected plant and after 4-5</li> </ul>

		<p>days apply Urea /Ammonium Sulphate to the crop</p> <ul style="list-style-type: none"> <li>➤ Drenching Copper Oxichloride 0.2% solution around the infected plant (40 g in 10 lit of water)</li> <li>➤ Soil application of <i>Trichoderma harzianum</i> (<math>2 \times 10^6</math> cfu/g-JAU isolate) @ 2.5 kg/ha in 250 kg of FYM</li> </ul>
5.	Wilt ( <i>Fusarium oxysporum</i> f.sp <i>vasinfectium</i> )	<ul style="list-style-type: none"> <li>➤ Seed treatment of Carboxin 37.5% + Thiram 37.5% DS 3 g /kg seed</li> <li>➤ Seed dressing with Thiram or Captan or</li> <li>➤ Follow cultural practices like, Grow disease resistance varieties, follow crop rotation, apply well decomposed Farm yard manure and potash in soil</li> <li>➤ Drenching Copper oxychloride 0.2% solution around the infected plant (40 g in 10 lit of water)</li> <li>➤ Soil application of <i>Trichoderma harzianum</i> (<math>2 \times 10^6</math> cfu/g-JAU isolate) @2.5 kg/ha in 250 kg of FYM</li> </ul>

### Physiological disorder:

#### Reasons for leaf reddening:

- Varietal characters
- Water logged condition
- Deficiency of magnesium, nitrogen, potassium and more no. of bolls per plant
- Due to mixing of more than one insecticide, pesticides and hormones
- Production of acid in plant due to temperature difference day and night more than  $10^0$  c
- Disturbance in root systems of plant
- Deficiency of Zn, Cu, Fe in soil
- Shortage of humidity at the time of squaring increase in wind speed

#### Control Measures:

- To select proper time of sowing
- To spray 1 to 2 % DAP or Urea solution
- To apply  $MgSO_4$  @ 20-25 kg/ha before sowing
- To spray of  $MgSO_4$  1 % at 90 DAS.
- Application of irrigation water as when required

Information supplied by: Cotton Research Station, JAU, Junagadh (Gujarat), 2023

Information collected and uploaded by Dr. M. Sabesh, CICR

