

Package of Practices for Cotton Cultivation in Vidarbha Region of Maharashtra

Cotton Research Station, Dr. PDKV, Akola

Crop season: June to February-March

Land preparation: For rainfed it is necessary to plough the soil once after three years and for irrigated cotton ploughing every year is necessary. Two harrowing after Ploughing and third harrowing before sowing after receipt of monsoon rains to reduce the weed infestation. Mix 12-15 cartloads of well rotten FYM or compost for rainfed cotton and 20-25 cartloads (5 tonns/ha.) of FYM/compost to irrigated cotton before sowing to reduce the dose of chemical fertilizers. Use 2.5 tonns of vermicompost if available with FYM/Compost and mix in soil before sowing.

Seed treatment: Treat the seed with fungicide and insecticide and biofertilizers before sowing. Treat the seed with Imidachloprid or Thiomixom @7.5 gm/kg of cotton seed. To avoid the fungal diseases of cotton treat the seed with Thirum/Captan @ 3 gm/kg cotton seed. Seed treatment of biofertilizers viz. Azatobactor (25 gm/kg seed) and Phosphate solublizing bacteria (20 gm/kg seed) is required for nitrogen fixation and phosphate solublization.

Time of sowing:

Irrigated cotton (Pre-monsoon): 20-30 May when the temperature is below 40⁰ c. Irrigate the land before sowing of cotton. Sow the cotton on broad-bed furrow for good drainage.

Dry sowing: Sow the straight varieties for dry seeding in first or second week of June 7-8 days before the monsoon rains arrives.

Monsoon Sowing: 15-30 June after receipt of 75-100 mm of rainfall.

Varieties/method of sowing/spacing/seed rate and per hectare plant population

Sr.No	Variety/Hybrids	Method of sowing	Spacing cm (Medium to heavy soil)	Plant population /ha. (00)	Seed rate Kg/ha
1.	Irrigated Cotton Hybrid/Bt cotton	BBF, Drip Irrigation	120x90	9.3	2.0-2.5
2.Rainfed cotton					
A)	Improved Deshi varieties AKA-5,AKA-7,AKA-8, AKA-8401	Drilling/ Dibbling	60x15 60x30	111.1 55.6	12-15 9-10
B)	American Hirsutum varieties AKH-09-5(Suvarna Shubhra) PKV Rajat AKH-8828 AKH-081 AKH-081(HDPS)	Dibbling Dibbling Dibbling Drilling Drilling	60x30 60x30 60x30 60x15 60x10	55.6 55.6 55.6 55.6 111.1	8-10 10-12 10-12 15-20 20-25
C)	Deshi Hybrids (Arborem) PKVDH-1 PKV Suvarna	Drilling Drilling	60x45 60x45	37.0 37.0	3.0-3.5 3.0-3.5
D)	American Hybrids PKV Hybrid-2 PKV Hybrid-4 PKV Hybrid-5	Drilling Drilling Drilling	90x60 90x60 60x60	18.5 18.5 27.8	3.5-4.0 3.5-4.0 4.5-5.0
<ul style="list-style-type: none"> The spacing shown in the table is suitable for medium deep cotton soil. Spacing should be as per the type of soil.AKH-081 variety is suitable for light to medium soil and recommended for high density planting system. 					

Intercropping in cotton: In cotton for getting higher monetary returns, it is recommended to take the intercropping system like Cotton+ Green gram (1:1 ratio), Cotton+ Blackgram (1:1ratio), Cotton+ soybean early varieties (1:1 ratio) or Cotton + Sorghum+ Pigeonpea+ Sorghum (6:1:2:1 ratio).

Gap filling/Thinning: For maintaining the optimum plant population in cotton fill the gaps immediately 3-5 days after emergence and undertake the thinning operation for keeping the desired plant population per hectare.

Fertilizer dose and time of application

Variety/Hybrids	Dose/ha.		
	At sowing time	Top Dressing	
	N:P:K	N at 30DAS	N at 60DAS
Irrigated Cotton			
Bt cotton	40:60:60	40	40
Hybrid cotton	35:50:50	34	30
Rainfed Cotton			
Bt cotton	30:30:30	30	--
Deshi Improved Varieties	20:20:20	20	--
American Improved Varieties	30:30:30	30	--
Deshi Hybrids	30:30:30	30	--
American Hybrid Cotton	30:30:30	30	--
Dose of chemical fertilizer should be based on the soil testing data before sowing			

- The application of basal dose of fertilizer to dibbled cotton crop should be given at the time of sowing by ring method 5 to 6 cm away from dibbled seed. Delay application of basal dose of fertilizers reduces the yield of seed cotton to the tune of 10 to 40% with in late duration period of 10 to 30 DAS.
- Spraying of 2% urea at flowering stage DAP at the rate of 2% at the time of boll development stage gave 10 to 20% higher seed cotton yield as well as avoid the redding of cotton.

Fertilizer management through drip irrigation in cotton:

In Cotton for increasing the productivity, economic returns and nutrient use efficiency, it is recommended to apply 100 per cent N and K in five splits through drip irrigation and P as basal through soil application as per the following table:

Fertilizer dose through drip	Days after sowing
10% Recommended dose of N and K	At the time of sowing
20% Recommended dose of N and K	20 DAS
25% Recommended dose of N and K	40 DAS
25% Recommended dose of N and K	60 DAS
20% Recommended dose of N and K	80 DAS

Interculture and weed management:

- Keep the field weed free up to 60 days after sowing (9 weeks) by adopting three to four hoeing followed by 2 to 3 manual weedings.
- If the labours are not available, to keep the cotton field free from weeds use pre-emergence herbicide Pendimethalin 38.7 % @ 1.5 to 1.75 Kg commercial product per hectare (20-25 ml in 10liter of water) or use pre-emergence herbicides Diuron 80WP @ 1.00-2.00 kg commercial product per hectare(20-30gm per 10 liter of water).Use

700 liter of water /ha and spray the pre-emergence herbicides on soil after sowing of cotton upto 48 hrs.

- For controlling weeds after emergence use recommended post emergence herbicide at proper time and in recommended dose. At 30-40 days after sowing use post emergence herbicide Pyrethrin sodium 10% EC @ 0.625-0.750 kg commercial product per hectare (12.5-15 ml per 10 liter of water) and for controlling grassy weeds in cotton use Quinclorac ethyl 5% @ 1.0 liter per hectare (20ml in 10 liter of water as a post emergence herbicide). Use Knapsack sprayer and flat fan nozzle for spraying the herbicides in cotton.

In-situ moisture conservation: For moisture conservation in cotton, it is recommended to open the furrow at the time of last hoeing operation by tying the ropes to the tyne of the hoe. Generally it is recommended to open the furrow at 40-60 days after sowing.

Irrigation Management:

Rainfed cotton: At flowering and at boll development stage in the situation of dry spell give 2-3 protective irrigations at an interval of 10-12 days in alternate row. Crop should not be exposed to water stress at flowering and boll development stage as it will reduce the yield and quality of produce.

Irrigated cotton: Irrigate the crop as and when required and as per the stage of the crop. In drip irrigation irrigate the crop as per the daily evaporation data at an alternate day to keep the field always at field capacity level and to provide sufficient moisture to cotton crop.

Management of Insect pest and diseases

Management of Insects

Jassids (Leaf hopper)-

- Seed treatment with Imidacloprid (Gaucho^R) 70 WS @ 10gm/kg seeds
- Spraying of Dimethoate 30 EC @ 10 ml/10 lit. or Acetamiprid 20 SP @ 1.5g/ 10 lit. or Methyl demeton 25 % @ 08 ml/10 lit.

Thrips-

- Spraying of Dimethoate 30 EC @ 10 ml/10 lit. or Acetamiprid 20 SP @ 1.5g/ 10 lit. or Methyl demeton 25 % @ 08 ml/10 lit.

Whitefly-

- Set up yellow sticky trap @ 5 trap/acre. Avoid excess use nitrogen fertilizer.
- Methyl demeton 25% @ 40 ml /10 lit., or Dimethoate 30 EC @ 33 ml/10 liter of water and Triazophos 25 % @ 10 ml/ 10 liter of water.

Aphid-

- Dimethoat 30 EC @ 10 ml/10 lit. or Acetamiprid 20 SP @ 1.5g/ 10 lit. or Methyl demeton 25 EC @ 08 ml/10 lit.

Mite-

- Dimethoate 30 EC @ 10 ml/10 lit. or Acetamiprid 20 SP @ 1.5g/ 10 lit. or Methyl demeton 25 EC @ 08 ml/10 lit.

American bollworm-

- Monocrotophos 36 % @ 17ml /10 lit. or Quinolphos 25 % @ 20 ml/10 lit. or Phosalon 35% @ 14 ml/10lit. or Spinosad 45 % @2.22 ml/10 lit. of water. If infestation is high, used following one of the synthetic pyrethroid- Cypermethrin 10% @ 7.5 ml/10 lit. or Decamethrin 2.8% @ 9ml/10 lit. or Fenvalerate 20% @ 6.0 ml/10 lit. or Cypermethrin 25% @ 3.0 ml/10 liters of water.

Spotted Bollworm-

- Monocrotophos 36 % @ 17ml /10 lit. or Quinolphos 25 % @20 ml/10 lit. or Phosalon 35% @ 14 ml/10lit. or Cyfluthrin 2.5 % @ 10 ml/10 lit. of water. If infestation is more used following one of the synthetic pyrethroid- Cypermethrin 10% @ 7.5 ml/10 lit. or Decamethrin 2.8% @ 9ml/10 lit. or Fenvalerate 20% @ 6.0 ml/10 lit. or Cypermethrin 25% @ 3.0 ml/10 liters of water.

Pink bollworm-

- Monocrotophos 36 % @ 17ml /10 lit. or Quinolphos 25 % @20 ml/10 lit. or Phosalon 35% @ 14 ml/10 lit. of water. If infestation is more used following one of the synthetic pyrethroid- Cypermethrin 10% @ 7.5 ml/10 lit. or Decamethrin 2.8% @ 9ml/10 lit. or Fenvalerate 20% @ 6.0 ml/10 lit. or Cypermethrin 25% @ 3.0 ml/10 liters of water.
- Release of parasitoids *Trichogramma chilonis* eggs @ 1 to 1.5 lakh weekly for three to six times. Spraying of Neemark 300 PPM @ 50ml/10 liters of water.
- Deep ploughing during January- February would kill the hibernating larvae. Infested and fallen bolls, leaves and sticks collected after the harvest should be burnt. Ratoon cropping should be avoided and seed should be sun or machine heated to 60°C any time from April –mid-May to kill the larvae in the double seed
- Use of synthetic pheromone traps (Gossyplure).

Management of Diseases

Bacterial Leaf Blight-

- Seed treatment of carboxin 1 gm + Thiram 3 g /kg seed
- Spraying of Copper Oxy Chloride 25 g + Streptocycline 1 g/ 10 L water, 2 sprays at 10–15 days interval

Grey mildew-

- Two foliar application of wettable sulphur@ 25 g/10 L water at 10 days interval from the day of first appearance or Carbendazim 10 g/10 L water is effective in controlling the disease

Myrothecium leaf spot-

- Foliar application of Copper oxychloride 0.3% or Carbendazim 0.1% or Mancozeb 0.25% to control the disease

Alternaria leaf spot-

- Seed treatment of Carboxin 1 g + Thiram 3 g / kg seed.
- Spraying with 0.2 % Mancozeb at 20 days interval from first appearance of the symptoms.

Para wilt-

- Drenching of 100 ml solution at the bottom of plat prepared from Copper oxychloride 25 g + Urea 150 g/ 10 L water

Picking of Cotton: Fully opened and matured bolls should be picked during picking. Care should be taken while picking and picked cotton should be kept variety wise to avoid the mixing of cotton.

The BMPs recommended for Vidarbha region by Dr.PDKV,Akola

The number of research recommendations had been given by Dr.PDKV, Akola based on the farmers need.

- Sowing of black gram and green gram as intercrops in early and dwarf cotton variety AKH 081 is recommended to get higher gross monetary returns.
- Sowing distance of 60 x 45 cm (37037 plant/ha) and a fertilizer dose of 50:25:25 NPK Kg/ha are recommended to deshi cotton hybrid PKV DH-1 for getting maximum seed cotton yield under rainfed condition
- Foliar spraying of 2 per cent Urea at flowering and 2 per cent DAP at boll development stage are recommended for Increasing seed cotton yield

- Application of FYM @ 5 t/ha along with low fertilizer dose of 25:12.5 N and P₂O₅/ha is recommended for cotton variety AKH 081 grown on shallow soil depth (less than 25 cm) to get maximum monetary returns under rainfed condition
- For obtaining higher yield of pre monsoon and improvement in soil status application of 2.5 t FYM+ 75:37.5:37.5 kg NPK/ha is recommended
- In-situ Moisture Conservation: In rainfed cotton opening of furrows at last hoeing is recommended for in-situ moisture conservation.
- Application of FYM @ 5 t ha⁻¹ +100 % RDF (50+25+25 N , P₂O₅ & K₂O kg ha⁻¹) or in situ green manuring of sunhemp at 30 DAS + 50 % RDF is recommended to PKV Hy-2 for obtaining higher seed cotton yield, net monetary returns, improvement in physico-chemical properties of soil and fiber quality under rainfed condition.
- Application of FYM @ 5 t ha⁻¹ + Cotton stalk residues @ 2.5 t ha⁻¹ is recommended to hirsutum cotton variety (PKV Rajat) for organic cotton production and higher monetary returns under rainfed conditions.
- Application of FYM 10 t/ha to rainfed hirsutum cotton is recommended as substitute for recommended dose of inorganic fertilizer (50: 25:00 NPK kg/ ha) in order to sustain the production of cotton.
- Under rainfed condition for higher Seed Cotton Yield and monetary returns of Bt cotton, foliar spray of Urea 2 % at flowering and DAP 2 % at boll development stage is recommended
- It is recommended to adopt PDKV module -2 (Seed treatment with thirum + Imadacloprid 70 WS +RDF 50 +25+0 NPK kg ha⁻¹) + foliar spray of 2 % urea at flowering and 2 % DAP at BDS with recommended plant protection schedule) for higher seed cotton yield and monetary returns of hirsutum variety
- It is recommended that Bt cotton hybrid should be sown in medium deep black soil at 90 x 45 cm spacing and fertilized with 60 : 30 :30 kg NPK ha⁻¹ for obtaining higher seed cotton yield and monetary returns under rainfed conditions
- For control of reddening FYM @ 5 tonnes/ha at the time sowing and NPK @ 30:30:30 kg/ha and 30 kg/ha nitrogen 30 days after sowing should be applied. Spray of 2% urea at flowering stage and 1% urea and 1% magnesium sulphate at boll development stage.
- Under protective irrigation Bt cotton hybrid may be sown at the spacing of 120 x 30 cm with fertilizer dose at 150:75:75 kg/ha NPK.
- Application of FYM 10t/ha or Castor cake @500Kg/ha or Green manuring of sunhemp 40 days after sowing in Cotton + seed treatment of Azotobactor + PSB @25g and trichoderma 4 g /kg seed is recommended for sustainable production of organic Arboreum cotton.
- The genotypes AKH 081 , Suraj and NH 615 are recommended high density planting at 60 x 10cm with 1.66 lakh population per ha under medium depth soils of cotton growing area in Vidarbha on BBF (Broad Bed and Furrow)with 125% RDF(75:37.5: 37.5 NPK+ 2.5 Zn Kgha⁻¹) and foliar spray of 1% urea and 1%

magnesium sulphate at boll development stage for higher seed cotton yield , economic returns and rain water use efficiency.

- Pre emergence application of Pendimethalin 38.7 CS PE @ 1.25 kg a.i./ ha (3.3 litre in 700 litre water) fb hoeing at 30 DAS and one hand weeding at 45 DAS is recommended for effective weed management of weeds under high density planting of cotton for getting higher economic returns.
- In cotton pre emergence application of Pendimethalin 30 EC @ 1.00 kg a.i./ha followed by directed spray (by using protective shield) of non-selective herbicide Paraquat 24 SL @ 0.60 Kg a.i./ha at 45 days after sowing is recommended for controlling weeds with higher yield and monetary returns.
- It is recommended to apply 100 per cent dose of N and K in five splits through fertigation along with P as basal for maximizing the yield, productivity and economic returns in Bt cotton. Fertigation through drip in splits saves 25 per cent fertilizer as compared to conventional soil application method.

The recent technologies (package of practices) added in State Package of Practices of Cotton during 2022-23

- For obtaining higher productivity and monetary returns of Bt cotton under HDPS, it is recommended the sowing of Rajat Bt variety at row to row spacing of 60 cm and plant to plant spacing of 15 cm under rainfed condition with recommended dose of fertilizer 60:30:30 Kg N:P₂O₅ and K₂O per hectare.
- Under organic cotton production, intercropping of blackgram in cotton (1:1) with soil application of Neem cake (250 Kg ha⁻¹) + seed treatment of recommended biofertilizers (Azotobacter & PSB) + foliar application of Pink-pigmented Facultative Methylootrophs (PPFMs) @ 1% at flowering and boll development stage and in-situ application (mulching) of blackgram residue after pod plucking is recommended for higher monetary returns, improving soil organic carbon, major nutrients availability and physical properties of soil under rainfed condition.
- In cotton-based cropping system, for obtaining higher system productivity and monetary returns, it is recommended to grow chickpea or wheat (late sown variety) as a sequence crop after early Bt hybrids (140-150 days) in *kharif* with 100 percent RDF to rabi crops grown in sequence. (Adhoc recommendation)

Information provided by: Cotton Research Station, Dr. PDKV, Akola, Maharashtra. (2023)

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