

Approved Package of Practices for cotton: Andhra Pradesh

Recommended Cultivars

Varieties (<i>hirsutum</i>)	:	MCU 5, LRA 5166, Kanchana (LPS -141) , L 389, L 603, L 604 & NA 1325 (Narasimha)
Desi	:	Aravinda, MDL 1875 (Veena)
Hybrids	:	H 6, JKHy I, H 8, LAHH 4, NHH 44, Savitha, DCH 32 and NSPHH 5

Prominent cultivars in cultivation

Varieties

Variety/ Hybrid	Year of Release	Yield (q/ha)	Duration (days)	Ginning percentage	2.5 Span Length (mm)	Counts	Remarks
LK 861	1993	25-26	170	34	29	50	Immune to whitefly
LPS141	1987	24-25	170	34	26	40	Resistant to whitefly
L 389	1993	25-30	160-170	35.5	29	50	Resistant to whitefly
L603	1997	25-30	150-160	35	28	40	Resistant to whitefly
L604	1997	25-30	150-160	36	27	40	Resistant to whitefly
MCU 5	1968	28	160-180	34	30	60	Tolerant to jassids
LRA 5166	-	26	160-180	35	24	40	Tolerant to jassids
NA 1325 (Narasimha)	---	18	160	36.2	25.6	30-40	Tolerant to jassids

Hybrids

Variety/ Hybrid	Year of Release	Yield (q/ha)	Duration (days)	Ginning percentage	2.5 Span Length (mm)	Counts	Remarks
LAHH4	1997	35	160-170	35	27	40	Wider Adaptability
NSPHH5	2002	32-35	160-165	35	29	40	Resistant to BLB, Cercospora
NSPHH7	2006	34-35	160-170	36	32	40	Resistant to jassids (Pre released)
H 6	1979	35	180	36	27	50	Long staple cotton
JKHy I	1976	34	180	36	26	40	
H 8	1988	35	165	34	25	40	Superior medium staple
LAHH 4	1997	35	160-170	35	27	40	Wider adaptability
NHH 44	1983	34	160	34	25	40	Suitable for delayed sowing
Savitha	1987	34	170	34	28	50	-
DCH 32	-	35	200	31	33	80	Superior long staple

Soil/Areas : Deep black soils and Red soils with irrigation

Land preparation : For rainfed cotton, deep ploughing or sub soiling once in 3 to 4 years with disc or mould board plough facilitates deep infiltration of water and charging of soil profile with large quantities of water. The land has to be ploughed 2 to 3 times and work with harrow to bring the soil to good tilth. Seeds can be dibbled at the intersecting points of lines made with markers. For irrigated crop ridges and furrows are to be formed at recommended spacings after deep ploughing.

Seed and Planting method and time

Region	Seeding time	Seed rate	Spacing (cm)		Method
			Row to row	Plant to plant	
Desi cotton					
Mungari Rayalaseema	Last week of May to first week of June	4-5	60	22	Drilling
Hingari Rayalaseema	Mid August to mid September	4-5	60	22	Drilling
Western Rayalaseema	Mid September	4-5	60	22	Drilling
Adilabad Gaurani tract	June to July	4-5	60	30	Drilling
American varieties					
Red soils of costal AP	Mid June	3-4	90-105	45-60	Dibbling
Black soils of costal AP	July to August	3-4	90-105	45-60	Dibbling
Hingari region of Rayalaseema	August to September	4-5	60	30	Drilling
Hill slops of Telangana	June to July	4-5	75	30	Drilling
Shriramsagar area of Telangana	June to July	3-4	90-105	45-60	Dibbling
Nellore and Prakasham district	February	3-4	60-75	45-60	Dibbling on Ridges and furrows
Hybrids					
Red soils of costal AP	Mid June	0.75-1	120	60	Dibbling
Black soils of costal AP	July to August	0.75-1	120	60	Dibbling
Black soils of Rayalaseema	July to August	0.75-1	120-150	45-60	Dibbling
Telangana	June to July	0.75-1	90-120	60-90	Dibbling

Seed treatment :

For acid delinting seed should be treated with 80-100 ml H₂SO₄ per 1kg of seed for 2-3 minutes followed by thorough washing with water 2-3 times and to remove the acid, it should be washed with lime to neutralize. Seed dressing with appropriate insecticide, Imidachloprid 70 WS @ 5 g/Kg or Thiomethoxam 70 WS @ 4g/kg or Carbofuran SD @ 40 g/kg of seed. Seed

treatment with Paushamycin/Plantomycin 100 mg + Carboxin 1 g/lit of water and allow to soak for 6-8 hrs and then shade dry.

Inter cropping :

Monocropping of cotton and heavy dependence on chemical fertilizers should be avoided in order to maintain stability of cotton production. Some suggested inter crops in cotton and black gram / green gram / soybean in 1:2 ratio.

Thinning and gap filling:

Gap filling should be done 10 days after sowing. Excess seedlings should be removed within three weeks, retaining 2 plants per hill in case of varieties, one plant per hill in case of hybrids.

Cropping systems

Cotton-soybean-groundnut system has been found more remunerative than cotton monocropping. Cotton-groundnut intercropping in 1:2 ratio is more profitable than sole crop of cotton.

Fertilizers recommended for different regions of Andhra Pradesh

Region	Recommended dose (kg / acre)			Method
	N	P	K	
Costal AP				Phosphorus fertilizer must be applied as basal dose. Nitrogen and potash should be applied in three equal splits at 30,60,90 days after sowing, 7-10 cms away from plants in Rayalaseema for American varieties under hybrid conditions only Nitrogen should be applied in two splits i.e. 30 and 60 days after sowing
American varieties	36	18	18	
Hybrids	48	24	24	
Rayalaseema				
Desi cotton	8	8	-	
American rain fed	16	8	8	
American irrigated	36	18	18	
Hybrids	48	24	24	
Telangana				
Desi cotton	16	8	8	
American	36	18	18	
Hybrids	48	24	24	
Rice fallows				
American	54	18	18	
Hybrids	60	24	24	

Micronutrients Deficiencies

In case of Magnesium deficiency spray 10 g Magnesium sulphate liter⁻¹ water at 45 days and 70 days after sowing. In case of zinc deficiency spray 2-3 times at interval of 5-6 days 2 g Zinc sulphate liter⁻¹ and apply 20 kg zinc sulphate acre⁻¹ once in three years as prophylactic measure. Boll drying is common due to B deficiency for controlling boron deficiency spray 1-1.5 g borax liter⁻¹ water at 60-90 DAS twice at the interval of one week.

Intercultivation and other Management Practices:

Rainfed crop must be kept weed free by harrowing 2-3 times within the first 30-60 days of crop growth. In case of irrigated cotton crop, earthing up should be done with the help of a plough or blade harrow after fertilizer application and irrigation. Topping (i.e., nipping the terminal bud) should be done after emergence of 15 to 16 sympodial branches at the age of 90-100 days crop.

Irrigation:

- Generally irrigated crop requires 2-3 irrigations depending upon soil type.
- Cotton cannot tolerate excess water, therefore drainage is very essential, depend upon available soil moisture (ASM), irrigation may be given at the interval of 20-25 days. Generally after fertilizer application, flowering and boll development stage are critical for irrigation. The irrigation requirement in kharif is 2-3 irrigations and in Rabbi 6 irrigations.
- Water logging condition and prolonged drought spells leading to soil moisture stress. Adequate drainage provision is a must, especially for vertisols during periods of continuous rains (September).
- In the case of irrigated cotton, earthing up should be done with blade harrows after fertilizer application to provide adequate drainage and to facilitate water application. In all, about 3 irrigations may be optimum for vertisols and five for alfisols during *kharif*.

Pest Management :

Sucking pests (Jassids, aphids, thrips, whitefly) Seed treatment with imidacloprid 70WS 5g/Kg or thiomethoxam 4g/Kg or carbosulfan 40-50g/Kg. Stem application with monocrotophos/ methyl demeton 1:4 or imidacloprid 200SL in 1:20 dilution with water at 20, 40, 60 DAS or spraying of monocrotophos 1.5ml/lit or methyl demeton 2ml/lit or imidacloprid 200SL 0.2ml/lit or acetamiprid 0.1g/lit or thiomethoxam 0.2g/lit or acephate 1.5g/lit was also equally effective in controlling sucking pests.

Whitefly triazophos /profenophos 2ml/lit+5ml neem oil.

Mealy bug 1.Stem application; 2. 1ml dichlorovas + 2ml methyl parathion/malathion or 3ml quinalphos/lit.

Bollworms

- Spotted bollworm, American Bollworm, Tobacco cut worm and pink bollworm : monocrotophos 2 ml/lit or quinalphos 3 ml/lit or chlorpyriphos 2.5 ml/lit or endosulfan 2 ml/lit or carbaryl 3 g/lit or acephate 1 g/lit or indoxacarb 1 ml/l or thiodicarb 1.5g/lit or spinosad (Tracer) 0.6ml/lit or emamectin benzoate 0.45g /lit.
- Bollworms attack cotton from 50-60 DAS such as *Heliothis*, tobacco budworm, spotted bollworm and pink bollworms which requires integrated management techniques (IPM).
- The ETL for boll worms is 10% losses, 1 larvae, or egg of *heliothis* plant⁻¹ or one group of eggs of semilooper per 10 plants or 10 % bolls/ locules affected by pink boll worms.

INTEGRATED PEST MANAGEMENT IN COTTON

1. Growing cotton as a rotation crop rather than a continuous crop year after year to restore the phenomenon of polyculture in the system.
2. Application of chemical fertilizer as supplement to organic or biological fertilizers as per the recommended doses.

3. Growing intercrops/strip crops/barrier crops. Crops like, Cowpea, Groundnut, Greengram, Soybean, Clusterbean were found better intercrops in increasing the effectiveness of natural enemies like coccinellids, syrphids, chrysopids, spiders, Trichogrammids, Apanteles etc. Growing fodder jowar or maize as barrier crops around cotton and castor and marigold as trap crop was also found more advantageous to manage pests of cotton.
4. Using delinted seed to take up seed dressing with imidacloprid/ carbosulfan and mancozeb before sowing crop. Replacement of sprayable insecticides in the initial stages of crop would help to preserve the populations of natural enemies of cotton pests.

Recently, stem application with monocrotophos or imidacloprid at 1:4 or 1:20 dilution at 20,40 and 60 DAS was found effective in controlling the sucking pest like aphids, leafhoppers etc., in initial stages of crop growth.

5. Monitoring pests by using sticky, pheromone and light traps. The adult monitoring should be supported by egg and larval monitoring following sequential sampling technique at frequent intervals in case of boll worm. Bird perches should be arranged @ 10 to 20 per acre for encouraging bird predation on bollworm larvae.
6. The build up of broad spectrum predators-spiders, coccinellids and chrysopids should be synchronised in other cultural operations. Release of Trichogramma egg parasite @ 50000/ha and Chrysopa egg larval predator @ 100,000/ha, should be done as soon as the first brood of bollworms are noticed.
7. Removal of top leaves by topping of cotton plants when maximum egg laying of *Helicoverpa armigera* is noticed formation of 16 to 18 sympodial branches.
8. Application of Helio NPV @ 500 LE/ha or Neem seed kernel extract (5%) in synchrony with early larvae of Heliothis. Neem oil formulation to manage whitefly initially.
9. Resorting to chemical insecticides - Need based application of recommended insecticides Endosulfan 2ml or Quinalphos 2.5ml or Chlorpyrifos 3ml or Acephate 1.5g, Triazophos 2ml or Thiodicarb 1.5g/lit. For eggs control profenophos 2ml or Thiodicarb 1.5g or Triazophos 2ml/lit. In case of more incidence Indoxacarb(Avaunt) 1ml or Spinosad (Tracer) 0.3ml or Emamectin Benzoate(Proclaim 5% SG) 0.5g /lit. For managing red spider mites application of water soluble sulphur(3g/lit) or dicofol (5ml/lit) must be done. Similarly if mealy bugs spread in patches to alarming level methyl parathion(3ml/lit) or triazophos (3.0ml/lit) may be used by mixing with sandovit or teepol.
10. Removal of cotton stubbles after last picking, without opting for ratoon crop or prolonging the crop growth with irrigations and fertilizer applications. This is essential to break the cycles of problem pests in the system as a whole.

Management Strategy for Pink Bollworm

Since eggs are mostly protected by calyx and the newly hatched larvae bore into the bolls immediately, it is difficult to manage this pest with insecticides. Therefore, hygienic methods are more important than chemical control. However, from the available literature the following integrated methods to control this insect can be suggested.

- 1). Grow early maturing varieties so that the cotton bolls mature before the heavy population of pink bollworm builds up.
- 2). Avoid staggered sowing in an area and take up timely sowings.

- 3). Use of acid delinted seed only.
- 4). Adopting efficient and timely agronomic practices such as use of organic manures and recommended doses of 'N' fertilizers only.
- 5). Keep the crop free from weeds.
- 6). Regular monitoring for pest builds up with field scouting and pheromone traps.
- 7). Destroy pink bollworm larvae in rosette flowers and also through periodical removal of dropped squares, dried flowers and pre-matured bolls, to suppress pest population in the initial stage.
- 8). Avoid ratooning and summer cotton.
- 9). Allow cattle, sheep and goats to graze upon immature green bolls and attacked bolls after final picking to prevent carry-over of the pest to the next season.
- 10). Prompt removal and destruction of cotton stubbles to prevent carry over of pest to next season.
- 11). Restrict the movement of cotton seed from other areas/states
- 12). Need based use of insecticides.
 - a). Seed fumigation with methyl bromide at 0.4 kg/1000 cuft/ phostoxin 50 tablets/1000 cuft for 24 hours.
 - b). Spraying of persistent insecticides like quinalphos/chlorpyrifos at 2.5 ml/l It at 15 days interval on need basis.
- 13). Even at the ginning mills burning the stained kapas have to be advised regularly.

Disease Management:

Blackarm : Seed treatment with 80-100 ml concentrated sulphuric acid. Use of resistant varieties like L-389. Removal and destruction of infected seedlings. Seed soaking in antibiotic (Paushamycin/Agrimycin 100 mg/lit) solution along with vitavax 1 g for 6-8 hours will eliminate seed borne diseases. Agrimycin 0.01% + copper oxychloride 0.3% at fortnightly intervals for 3 rounds.

Root rot: Seed treatment with Carbendazim 2 g/kg of seed. Drenching with copper oxychloride @ 3 g/lit of water around the base of affected plants.

Leaf spots: Mancozeb 0.25% or Copper oxychloride 0.3% for 4-5 times at 15 days interval.

Greymidew : Wettable sulphur at 3 g/lit or Carbendazim 1 g/lit of water for 2-3 rounds at 7 day interval.

Bollrots : Commonly used conventional insecticides along with fungicides and antibiotics.

Harvesting and Post Harvesting Technology:

Kapas from fully opened bolls should be collected during cooler times of the day. Kapas picked should be free from debris like dried leaves; dried bracts etc., Kapas from the first and last pickings should not be mixed with middle pickings, which are of better quality. Kapas damaged by bollworms should be picked separately. The cleaned kapas is to be graded and stored in heaps or in gunny boras in dry and well ventilated godowns.