

9. All India Coordinated Cotton Improvement Project

Crop Improvement

National Trials

Ten National trials with an objective of improvement of *G. hirsutum* and *desi* varieties and *intra-hirsutum*, interspecific (*G. hirsutum* x *G. barbadense*) and *desi* hybrids were conducted during the year 2006-07.

- ~ In the initial evaluation trial of *G. hirsutum* varieties under irrigated conditions, GJHV374, CPD 812 and ARBH 813 performed better at both Central and South Zone locations. H 1300 was the best culture in North Zone.
- ~ Under Rainfed situations, *G. hirsutum* cultures HAGH 819, TSH 2005 and PH 1024 recorded more than 1400 kg/ha of seed cotton in Central Zone. HA GH 819 and CPD 817 were better in South Zone.
- ~ Among the conventional *intra-hirsutum* hybrids under irrigated conditions, SVHH 139, VBHH 2303 and RAHH 246 were the best hybrids under North, Central and South Zone conditions, respectively.
- ~ Among the male sterile based hybrids HHH 433 in North Zone and ARCHH 8188 in Central Zone alone were promising.
- ~ Under Rainfed situations the conventional *intra-hirsutum* hybrids NGHH 311 and KCH 707 showed consistency under both Central and South Zone. However, none of the male sterile based hybrid was found to out perform the local check.
- ~ Several interspecific hybrids (*G. hirsutum* x *G. barbadense*) recorded better yield than the common check hybrid DCH 32. Hybrids RAHB 189 and MLCHB 6 showed consistency over both the zones.
- ~ Among the *G. arboreum* varieties none tested showed promise in North Zone and under rainfed situations in Central Zone. DLSa 101 recorded the highest yield. Similarly, JLA 1799 was the best hybrid in South Zone test locations.
- ~ In the *desi* hybrid trial, LMDH 30 recorded the highest yield in North Zone. AAH 28 was the best hybrid in Central Zone.

North Zone Trials

- ~ LH 2076 and F 2006 were the promising *G. hirsutum* varieties in the *G. hirsutum* varietal trial.
- ~ Among the *intra-hirsutum* hybrids, HSHH 11, USHH 11 and FHH 136 were promising.
- ~ In the *G. arboreum* varietal improvement

programme, CISA 614 and FDK 124 hold promise.

- ~ The *desi* hybrids FMDH 6 and AHH 20 recorded better yield over both the local and zonal check hybrids.

Central Zone

- ~ P 72-9-37 and GSHV 01/1338 under irrigated conditions and NH 630, GTHV 0135 and NH 615 under rain fed conditions were the best *G. hirsutum* genotypes under evaluation.
- ~ Under irrigated conditions several hybrids were found to be higher yielding. RATNA, ARCHH 9770 and PMCH 99 among the *intra-hirsutum* hybrids, PSCHB 901, KDCHB 407 and USHB 25 among the interspecific hybrids were promising.
- ~ Under rain fed situations also several hybrids outperformed the check hybrids MLCH 318 and Ajeet 177 among the *intra-hirsutum* hybrids and GGCH 81 among *desi* hybrids were consistent.

South Zone

- ~ Among the *G. hirsutum* genotypes tested, GSHV 97/612 and CCH 510 in the Co-ordinated Varietal Trial and GISV 103 and NDL 762 in the Preliminary Varietal Trial were better than the zonal check. Under rainfed situations, CPD 818 and RAH 3 were better than both zonal and local checks.
- ~ Among the *intra-hirsutum* hybrids, Indam 178, Tulasi 27 and SSB 3 under irrigated conditions, BSSCH 29 and Tulasi 9 under rainfed situations were promising.
- ~ Among the *desi* varieties, KWA 23, GAM 93 and ARBHH 35 were better than the zonal check. *Desi* hybrid GGCH 81 was also found to out yield the checks.

Agronomy

- ~ Integrated nutrient management plays a key role in realization of sustainable yield in cotton. Suitable and judicious combination of RDF, FYM and foliar spray of desired nutrients may be recommended based on the agronomic trials taken up at the location.
- ~ Under rainfed condition at Lam (Guntur, A.P.), FYM @ 10 Uha along with 50 % of RDF was optimum enough to sustain cotton yield and soil health.
- ~ Boron @ 0.1 % as foliar for Khandwa, MgSO₄ @ 1% + ZnSO₄ @ 0.5% for Nanded and Rahuri and 0.5%

- FeSO₄ for Coimbatore may be recommended for yield gains in cotton.
- ~ 2% KNO₃ (4 sprays) may be taken up for inclusion in package of practice on cotton for Nanded and Siruguppa, while 3% KNO₃ (3 sprays) for Akola and Junagarh condition.
- ~ Under rainfed conditions at Nandyal, FYM @ 10 t/ha followed by vermicompost @ 2 t/ha were useful, while a combination of vermicompost @ 1.25 t/ha + Azospirillum + PSB may be suitable for Indore.
- ~ Detopping at 65 DAS along with adoption of narrow row spacing (60 x 30 cm) may be recommended for Khandwa condition.
- ~ Fertigation with RD-NK applied as 10% at planting and the remaining 90% in 9 splits (at 30 - 120 DAS) may be adopted in practice for Nandyal condition.
- ~ Sulphur may be combined with Zn for inclusion in fertilizer recommendation for cotton in Hisar and Sriganganagar condition.
- ~ An organic combination consisting of FYM @ 5 t/ha, green manuring of *dhaincha* incorporated *in-situ*, Azotobacter, Azospirillum and PSB (as seed treatment) may be included in the current practice of crop husbandry for cotton in cotton-chickpea sequence for Rahuri.
- ~ Compatible intercropping system viz. cotton + cluster bean (1:1) for Rahuri; single row of sunflower with two rows of cotton or one row of castor with three rows of cotton for Dharwad was seen beneficial.
- ~ Osmoprotectants like mercaptoethyl amine (100 ppm), glycine betaine (0.3%), CaCl₂ (0.25%) and KNO₃ (0.5%) were seen useful for higher yield especially under rainfed conditions.
- ~ Promising genotypes for stress tolerance based on physiological attributes like DMSI, LASI and YSI may be used in further breeding programme.

Entomology

- ~ Cultures resistant to jassid and tolerant to bollworms were identified from breeders' material from the three cotton growing Zones of India.
- ~ Jassid population was above threshold level from last week of June to mid July and again from second week of September to first week of October in Ludhiana, from mid August to first week of September and last week September to first week of October in Banswara, during November in Surat, from first week of July to last week of August in Rahuri, from mid September to mid November in Junagadh and from mid August to end of August in Khandwa.
- ~ In South Zone it was above threshold level from third week of October to end of November in Raichur, third week of October to second week of November in Dharwad during first fortnight of October & again during the second week of January in Guntur and from fourth week of May to end of July in Srivilliputhur.
- ~ Aphid population was above ETL from last week of July to end of August & mid November to mid January in Akola, from second week of July to end of August in Rahuri, from second week of November to end of December in Dharwad.
- ~ Thrip population was at peak (27-35/ 3 leaves) from mid July to mid August in Sriganganagar, from last week of July to first week of August & from third week of October to first week of November in Surat, during the second fortnight of August in Nanded and second week of July to last week of August in Rahuri, from last week of July to first week of November in Dharwad and from fourth week of May to third week of June in Srivilliputtur.
- ~ Whitefly population crossed ETL from mid June to mid July in Ludhiana and during second fortnight of August in Sriganganagar.
- ~ Occurrence of new pest, Mirid bug on cotton was observed in epidemic form (8 to 24/ 25 squares) in Dharwad from September to November and in Coimbatore during November to December months. Mealy bug, a minor pest has also assumed serious proportion in some parts of all the cotton growing Zones of India.
- ~ *Heliothis* bollworm was below threshold level in all the centres throughout the cropping season in North Zone. It was at above threshold level from third week of September to first week of October in Akola, from last week of July to second week of August in Rahuri and from last week of September to last week of October in Junagadh. In South zone it was at higher level (4.8 to 9.7/ 5 plants) in Dharwad during September to November and 4.5 to 5.3 in Raichur during October to November.
- ~ Spotted bollworm incidence was at above threshold

level during first fortnight of August in Ludhiana and during second fortnight of August in Sriganaganagar. In central Zone, it was above threshold level during November and December in Junagadh, Surat and Akola and July to August in Rahuri. It was at moderate level during October and November in Raichur and August to October in Dharwad (2.2 to 5.4/plants).

- ~ Pink bollworm incidence was at higher level during September and October in Ludhiana and during November to January in Banswara. In Central Zone, it was at moderate level (1.0 to 1.8 larvae) in Junagadh, Nanded and Surat, while at higher level in Rahuri (3 to 14) during July to November and during October to January in Akola. Very high level of pink bollworm incidence was observed in almost all the centres of South Zone from September to end of January.
- ~ Relationship between incidence of major pests of cotton and weather parameters in Coimbatore: Minimum temperature was negatively correlated to *H. armigera* and pink bollworm during 2006-07. Correlation study with three years (2003 -06) data on weather factors revealed that minimum temperature and RH positively correlated with aphid and jassid incidence. Maximum temperature was negatively correlated with *H. armigera* incidence, while minimum temperature and rainfall were negatively correlated with the incidence of pink bollworm.
- ~ New insecticide RIL 042 at 400 and 500 ml/ha was effective against whitefly and recorded significantly higher yield over control by 31 and 32 % respectively.
- ~ Seed treatment with new formulation of Cruiser 500 FS at 3 g/kg of seed was effective against jassid, aphid and thrips and recorded significantly higher seed cotton yield by 11% over control.
- ~ Foliar spray with new molecule of insecticides spinosad 45 SC at 300 ml/ha, BYI 08330 150 OD at 500 ml/ha and SYN 13623 at 200 & 300 ml/ha were effective against sucking pests (Jassid, aphid, thrips) and recorded significantly higher yield by 22 to 55% over control.
- ~ RIL042 at 500ml/ha, RIL043 at 1000 ml/ha, E2Y45 20 SC at 30 and 40 g a.i./ha and Flubendiamide 24% + Thiocloprid 24% 480 SC were effective against bollworms damage and recorded significantly higher yield by 69 to 76% over control.

- ~ Thiodicarb, quinalphos, lambda cyhalothrin and Deltamethrin were effective against pink bollworm and recorded significantly higher yield (21.8 to 27.4 q/ha) over control (12.7 q/ha).
- ~ Adoption of location specific IPM resulted in reduction of 47% spray numbers and 40% plant protection cost besides increasing seed cotton yield by 22% and net returns by Rs. 4270/ha over Farmers' practice. In addition, substantial increase in predators population was observed in IPM fields.

Plant Pathology

- ~ Cotton leaf curl disease (CLCuD) is still the major disease in the farmer's field of Punjab, Haryana and Rajasthan with nearly 100 per cent of the plants showing symptoms of the disease in many places.
- ~ CLCuD was seen on both Bt and non Bt cotton hybrids at varying intensities.
- ~ Bacterial leaf blight, alternaria leaf spot and grey mildew were the other major diseases affecting cotton in Central and South Zone states.
- ~ Severe incidence of rust disease (35.0-50.0 PDI) was noticed in farmer's fields in Andhra Pradesh during later half of the season.
- ~ Eleven entries have been found to have resistance to CLCuD in the field and screen house tests conducted in the North Zone centres.
- ~ The test fungicide, Probineb 70 WP @ 1400 g a. i./ha has given good control of fungal foliar diseases and was effective as Propiconazole 0.1 % spray.
- ~ Seed treatment @ 109/kg seed with talc powder formulation of the bio-agents *Pseudomonas fluorescens* Pfl followed by foliar spray 0.2 % on 30, 40, 50, 60, 70, 80 and 90 DAS was found either superior or on par with the fungicide (Carbendazim 50 WP @ 0.1 %) or Copper oxychloride 0.3 % + Streptocycline @ 100 ppm in the management of *Alternaria* leaf spot, grey mildew, *Myrothecium* leaf spot and bacterial blight.
- ~ Spraying of Carbendazim 50 WP (0.1 %) at fortnightly intervals (four to five times) starting from 35 DAS gave effective control of grey mildew and averted an yield loss of 22 to 28 per cent.
- ~ Propiconazole 0.1 % spray prevented an yield loss of up to 10.0 per cent, and gave good control of alternaria leaf spot, if proper plant protection measures were given between 35 and 95 DAS.



~ Maximum control of bacterial leaf blight could be obtained if plant protection measures were undertaken with copper oxychloride (0.3 %) plus Streptocycline 100 ppm between 35 and 45 DAS thereby preventing an yield loss of 27.00 per cent.

Front Line Demonstration

During the year 2006-07, 1350 Front Line Demonstrations (FLDs) on cotton production technology, 23 unit demonstrations on Integrated Pest Management (IPM) and 21 unit demonstrations on Farm Implements were conducted all over India.

North zone

Punjab

Fifty demonstrations on improved hybrids/ varieties of both *G. hirsutum* and *G. arboreum* viz., LHH-144, MRC-6301Bt, MRC-6304Bt, F-1861, F-1378, LH-1556 and Moti recorded 3.4 to 40.2 per cent increase in the mean seed cotton yield as compared to yield in their respective check plots. Demonstrations on improved agronomic practices had considerable impact on the seed cotton yield, which ranged from 23.2-68.7 per cent as compared to check. FLD's on Integrated Pest Management in 50 hectares recorded higher seed cotton yield in the range of 4.76-25.0 per cent than farmers' practice. Demonstrations on farm implements viz., hybrid cotton planter and Rotavator, hybrid cotton planter and Disc harrow and Aeroblast sprayer helped in realization of better seed cotton yield.

Haryana

One hundred demonstrations were conducted on improved cotton hybrids viz., AAH 1, HHH 223, HD 324, HD 123, H 1226 and H 1117 with advanced package of practices by Haryana Agricultural University, Hisar. The increase in seed cotton yield due to these advanced hybrids ranged from 7.21 to 26.95 per cent. Due to the demonstrations on IPM, on an average of 23.33% increase in seed cotton yield was obtained. Demonstrations on Farm implements viz., sub-soiler for deep ploughing and rotavator for hoeing in standing cotton crop resulted in 5.88 per cent increase in yield.

Rajasthan

Rajasthan Agricultural University, Sriganaganagar conducted thirty demonstrations on improved cotton varieties RS-2013, RS 810, RST-9 and Raj DH -9 with improved package of practices as against Bikaneri nerma, RST-9 and F-846 with local package of practices.

The demonstrations increased the seed cotton yield from 13.7 to 30.8 per cent. Due to the demonstrations on IPM, the number of pesticides sprays had come down to four and the average seed cotton yield was 20.30 q/ha in IPM as compared 18.50 q/ha of non-IPM. Considering the total income and expenditure incurred, IPM farmers got more C:B ratio (1:2.63) than non-IPM farmers (1:2.15). Demonstrations on aero blast sprayer were also conducted to show the usefulness of the implement and also effective reduction in cost of spraying besides considerable savings in insecticides.

MPUAT, Banswara carried out twenty demonstrations on Integrated Crop Management practices of cotton on hybrids H-8 and PA-255, which increased the yield to utmost 19.56 per cent. On an average, the per cent increase in yield due to demonstrations on IPM technology was 11.92 per cent. Demonstrations on rotavator, Self Propelled Power weeder, improved weeder, power sprayer, battery-operated sprayer reduced the cost of cultivation.

Central Zone

Gujarat

Navsari Agricultural University, Surat carried out 52 demonstrations on improved varieties viz., G.Cot.Hy-12, G.Cot. Hy.10, approved Bt hybrids, G.Cot.23 and G.Cot.21 and 18 demonstrations on improved agronomic practices. The G.cot.23 varietal demonstrations gave the maximum of one and half fold yield increase (1250 kg/ha) than the local *desi* variety (500 kg/ha). Similarly the demonstrations on improve agronomic practices on G.Cot 23 offered 164.30 per cent yield increase (1850 kg/ha) than Digvijay with traditional practices (700 kg/ha).

Junagadh Agricultural University, Junagadh conducted varietal demonstrations on improved cotton varieties / hybrids viz., Mallika Bt, RCH -118, JK varon, Sai-118, Shakti-9, Tulasi, Mallika 207, Ankur, RCH 2 Bt, Vikram 5, Viswanath, Aji-BG II, Ajit-155, Guj. Gold-22 and Bunny, fertilizer management, intercropping with sesame and irrigation management.. Results of varietal demonstrations indicated 6.56 per cent average yield increase over check with a range of 5.56 to 38.89 percent..

Madhya Pradesh

J.N. Krishi Vishwa Vidyalaya, Khandwa conducted twenty demonstrations to exhibit the efficiency of Integrated Nutrient Management (INM) practices on the farmer's field over traditional practices. INM practices gave on an average of 16.22 q/ha seed cotton yield as

compared to 14.17 q/ha in farmers practices indicating an increase in the range of 8.24 - 25.10 per cent over the traditional practice of cultivation. Twenty demonstrations conducted with the local IPM module gave an increase of nine per cent in the seed cotton yield as compared to the conventional method of pest control.

J.N. Krishi Vishwa Vidyalaya, Indore conducted demonstrations on improved cotton varieties and hybrids viz., H8 and DCH 32 that yielded 12-17 % more kapas than farmers' practices. Demonstrations on cotton intercropping with maize (2:1 row ratio) found more remunerative by giving on an average returns of Rs 20830/ha to Rs 24380/ha as compared to Rs 14960/ha to 18920/ha in sole cotton. Demonstrations on Integrated Nutrients Management (INM) recorded on an average of 17-36% higher yield than farmers' practices.

Maharashtra

MPKV Rahuri, conducted fifty demonstrations on improved cotton varieties / hybrids viz., JLA-794, Y-1, Phule 492 and NHH-44, intercropping with green gram and pigeonpea, INM and Integrated Disease Management (IDM). The demonstrations on INM and IDM attributed 10.75 and 7.08 per cent yield increase respectively than the farmers' practices. Demonstrations on IPM resulted in 11.48 per cent more seed cotton yield.

Central Institute for Cotton Research, Nagpur carried out demonstrations on NHH 44 with the recent technologies for cotton improvement viz. INM, cotton + soybean intercropping system, foliar application of DAP and detopping opening of ridges and furrows for moisture conservation. It also conducted demonstrations on improved cotton hybrids NCS 145 Bt, Ankur 651 Bt, Ankur 09 Bt and MRCH 6301 Bt in comparison with the traditional hybrid NHH-44. In INM demonstrations the per cent increase in seed cotton yield ranged from 6.67-28.57 per cent with an average increase of 19.37 per cent. On an average, an additional monetary return of Rs 6305/ha has been obtained from demonstrations on cotton + soybean intercropping. Demonstrations on IPM offered 11.67 per cent increase in yield. Power sprayer, battery operated sprayer, cotton plant puller, animal

drawn ridger, acid delinting machine and ginning machine were demonstrated to the farmers under demonstrations on farm implements.

South Zone

Andhra Pradesh

ANGRAU, Guntur organized demonstrations on performance of Bt cotton hybrids viz., Bunny Bt, RCH 2 Bt, Ankur Bt, JK Durga Bt, Mallika Bt and Signa Bt as against non-Bt hybrids. Demonstrations on Bt cotton hybrids with recommended package of practices offered 31.45 per cent higher yield than the non-Bt hybrids. Due to IPM demonstrations farmers got an additional benefit of Rs. 6,031/- per hectare. Thaiwan Sprayer and Rotavator were demonstrated under demonstrations on farm implements.

CRIDA, Hyderabad conducted one hundred demonstrations on improved varieties / hybrids viz., Bunny Bt, Bunny, Dassera, JK Durga Bt and RCH 20 Bt, improved agronomic practices and intercropping with cowpea, soybean and pulses. The demonstrations increased the seed cotton yield from 12.41 to 46.63 per cent as compared to the check plots. Demonstrations on IPM yielded an average additional income of Rs. 23,169 per acre.

Tamil Nadu

Central Institute for Cotton Research, Coimbatore conducted demonstrations on improved cotton varieties Surabhi and Sumangala, Extra Long Staple (ELS) cotton hybrids Sruthi and DCH 32, Bt cotton hybrids and cotton + vegetables intercropping, Integrated Weed Management (IWM) and IDM. Demonstrations on improved varieties and Bt cotton hybrids increased the seed cotton yield to the maximum of 50 per cent. To reintroduce the ELS cotton, two demonstrations were conducted on cotton hybrids Sruthi and DCH 32. Demonstrations on IPM reduced the number of sprays from eight to three. Demonstrations on animal drawn junior hoe for intercultural operations in cotton fields reduced the cost of weeding to the extent of Rs. 4625/- per hectare.

