



## CROP IMPROVEMENT

### National Trials

- Nine National Trials, four North Zone trials, eight Central Zone trials and seven South Zone trials were conducted during the year in 221 locations across the country.
- In irrigated national trials, *G. hirsutum* culture viz., F 2228 was found promising in North zone, whereas MR 786 was seen promising in both Central and South zones.
- In the preliminary intra *hirsutum* hybrids trial, the hybrids FHH 200, BHH 624 and RAHH 951 ranked first in North, Central and South Zone, respectively.
- All the twelve *G. barbadense* cultures recorded higher seed cotton yield over the common check variety Suvin in both Central and South zone locations. The entry GSB 40 occupied first rank in Central zone, while GSB 41 occupied first position in South zone.
- In the preliminary interspecific hybrids (*G. hirsutum* x *G. barbadense*) trial, the hybrids GSHB 929 and ARHB 1011 were found promising in Central and South Zone, respectively.
- Promising *G. arboreum* genotypes like RG 585 and JLA505 have been identified for promotion in different zone which was found better than the check varieties in terms of seed-cotton yield. Desi hybrids like Simulai, RAJDH 444 and NACH 18 showed promise in different zones.
- In Central zone locations, the *G. hirsutum* genotype GBHV 164 was promising and occupied the top rank under rainfed situations, whereas in South Zone locations, CPD 168 was the best culture.
- In the preliminary intra *hirsutum* hybrids trial under rainfed conditions, the hybrid NHH 421 was noticed promising in both Central and South Zone locations.
- *G. herbaceum* culture GBhv 288 was found to be superior to the zonal check variety G.Cot 23 in Central Zone.

### Zonal Trials: North Zone

- In the *G. hirsutum* Preliminary Varietal Trial, six cultures

showed promise and F 2164 recorded the highest yield of 2686 kg/ha.

- In the Coordinated hybrid trial, all the five test hybrids performed better than both the check hybrids and RAJHH 743 (3021 kg/ha) was the best hybrid compared to zonal check hybrid (1836 kg/ha).
- *G. arboreum* genotypes viz., CAD 3 and RG 542 were promising.

### Zonal Trials: Central Zone

- In irrigated trial, culture CCH 2623 was the best in the Preliminary Varietal Trial and the genotype BS 279 was found superior in the Coordinated varietal trial with seed cotton yield of 2209 kg/ha as compared to 1635 kg/ha by check variety. In rainfed trials, GISV 218 was promising.
- In the Coordinated hybrid trial, the hybrid RAHH 259 exhibited yield superiority in intra- *hirsutum* category (2176 kg/ha) and RAHB 189 was the best in interspecific (*G. hirsutum* X *G. barbadense*) hybrid category under irrigated conditions.
- In the Coordinated intra *hirsutum* hybrid trial, the hybrid NHH 206 was the best and MRDC 233 was the best in *desi* hybrid group under rainfed situations.
- GAM 141 was the best performing genotype in the coordinated varietal trial of *G. arboreum*.

### Zonal Trials: South Zone

- The *G. hirsutum* genotype, GSHV 155 was the best in Preliminary Varietal Trial and BS 279 was superior in Coordinated Varietal Trial under irrigated situations.
- The hybrid NSPL 423 was the best entry under irrigated conditions in coordinated hybrid trial.
- In interspecific hybrid category, the highest seed cotton yield was recorded in JKCHB 217 (2292 kg/ha) as against 1632 kg/ha in check hybrid DCH 32.
- Under rainfed situation, the NHH 59 was found superior.
- In *desi* category, *G. arboreum* variety CINA 1003 and the hybrid MRDC 233 were the best performing entries.

## CROP PRODUCTION

- Foliar feeding of micronutrients with  $MgSO_4 @ 1.0\% + ZnSO_4 @ 0.5\%$  at Kanpur and Banswara,  $MgSO_4 @ 1.0\%$  at Faridkot and  $FeSO_4 @ 0.5\%$  at Ludhiana gave significantly higher seed cotton yield in North Zone locations. Similarly in Central and South Zone locations, spraying of  $MgSO_4 @ 1.0\% + ZnSO_4 @ 0.5\%$  gave significantly higher seed cotton yield.
- Full dose of MOP at sowing at Sriganaganagar and four sprays of  $2\% KNO_3$  at Kanpur were found effective in North Zone, whereas in Central and South Zones, three sprays of  $3\% KNO_3$  at Nanded and Banswara, four sprays of  $3\% KNO_3$  at Indore, four sprays of  $2\% KNO_3$  at Rahuri and two sprays of  $3\% KNO_3$  at Siruguppa gave significantly higher seed cotton yield.
- Effective management strategies for the mitigation of leaf reddening in Bt cotton has been worked out in both Central and South zones.
- Under crop canopy management studies, narrow spacing of  $60 \times 30$  cm combined with detopping after 55 DAS led to higher seed cotton yield at Khandwa.
- Effective integrated weed management strategies have been standardized for different locations.
- The plant height, stomatal conductance, relative water content, transpiration rate, number of bolls, biomass, boll weight and yield were significantly reduced due to moisture stress in *G. hirsutum*. Genotypes with least susceptibility index have been identified that can withstand stress.
- Per cent defoliation was higher when ethrel was applied at 145 DAS as compared to application at 130 DAS for all concentration.
- Parawilt affected plants recovered with the timely treatment by Cobalt chloride.
- Free amino acid and proline content were higher in the leaf under rainfed condition as compared to irrigated condition, while reducing sugar and protein declined under rainfed condition. The higher amount of free amino acid and proline might have helped in building the osmotic potential fortolerance.
- Different biochemical parameters viz., total chlorophyll content, chl a: chl b ratio, anthocyanin content and nitrate reductase activity were studied at boll developmental stage and all these parameters showed significant variation in response to various leaf reddening management applications.
- *Cry 1Ac* expression was found to be significantly variable among the Bollgard I and Bollgard II hybrids and also between different parts like leaf, squares and boll rinds. The leaves of the Bt cotton hybrids were found to have highest levels of endotoxin protein expressed compared to squares and boll rinds. The *cry 1 AC* expression decreased drastically over the crop growth with endotoxin level falling below the critical level of  $1.91 \mu g/g$  after 110 DAS.
- The high oil containing genotypes 26.01 per cent (CSH-7106), 26.50 per cent (B-58-1290), 25.55 per cent (3HS) and 25.02 per cent (F-1861) has been identified at Dharwad which can be used in breeding programme to increase the oil content keeping the present level of fatty acid composition intact.

## ENTOMOLOGY

### North zone:

- Population dynamics study revealed that jassid population was at higher level (8.5 to 33.0 / 13 leaves) in Ludhiana , at

moderate level (5.8 to 8.8) in Hisar and at below threshold level throughout the season in Faridkot and Sriganaganagar. Whitefly was in higher level only in Sriganaganagar (31.2 to 35.8/3 leaves), while thrips were at below threshold level in all the centres.

- There were no incidences of *H. armigera* and *S. litura* in Sriganaganagar, Faridkot and Ludhiana. Sriganaganagar and Ludhiana had moderate to higher level of Spotted bollworm (5.0 to 9.5 larvae / 5 plants). Pink bollworm was at higher level (2.0 to 6.2/20 green bolls) only in Sriganaganagar and almost no incidence was noticed in Faridkot and Ludhiana.

### Central Zone:

Except Khandwa, in all other centres viz., Akola, Banswara, Junagadh, Bhawanipatna, Nanded and Rahuri, high population of jassid was recorded ranging from 7.8 to 47.1 / 3 leaves. Junagadh recorded higher thrips population (33.2 to 63.6 / 3 leaves), while Banswara had higher whitefly population (32.6 to 35.6 / 3 leaves). Junagadh also had higher aphid population (35.0 to 64.0 / 3 leaves). Very low intensity of mealy bug damage was observed in Junagadh, Surat and Rahuri, while it was absent in other centres.

- *H. armigera* bollworm was at moderate level (3.0 to 8.0 larvae / 5 plants) in Akola, Bhawanipatna, Junagadh, Khandwa, Rahuri and Surat, while Earias bollworm was at higher level (4.0 to 10.0 larvae / 15 Plants) in Bhawanipatna and Rahuri. Pink bollworm was at higher level in Junagadh (6.4 to 5.6 larvae / 20 green bolls), Surat (5 to 9.4), Rahuri (4 to 8) and in Akola (3.4 to 6.4).

### South Zone:

- Jassid population was at higher level in Lam (13.8 to 52.7/3 leaves), Srivilliputtur (10.2 to 18.4), Coimbatore (6.0 to 15.7), Dharwad (6.2 to 13.2) and Raichur (6.9 to 13.2). Aphid was at higher level in Lam (2.6 to 52.7/3 leaves), while thrips were higher in Dharwad (37.0 to 41.0 / 3 leaves).
- The intensity of mealybug infestation was 2.0 to 4.0 grade in Coimbatore and 1.0 grade in Srivilliputtur. Mirid bug was at higher level in Dharwad (10.0 to 29.0 / 25 squares).
- *H. armigera* was at higher level in Dharwad (5.3 to 10.2 larvae / 5 plants) and at moderate level in Raichur (2.2 to 4.6). Earias bollworm was at moderate level in Srivilliputtur (2.0 to 4.0 larvae / 15 plants) and at higher level in Dharwad (4.3 to 8.2). Pink bollworm was at higher level in Dharwad (5.0 to 23.0 larvae / 20 green bolls), Nandyal (6.0 to 9.0), Raichur (2.8 to 4.4) and Srivilliputtur (2.0 to 5.0).

### Chemical Control of Insect Pests

Acephate 75 SP (750 g) and the new formulation of Acephate 95 % SG (562.5 & 750 g) were seen effective against major sucking pests (Jassid, aphid, thrips and whitefly) and helped in higher yield realization ranging from 63.3 to 76.0 %, followed by Imidacloprid (57.3 %) and Acetamiprid (51.1 %) in North zone.

- Acephate 95 % SG and Acephate 75 SP (750 g) were effective against major sucking pests (Jassid, whitefly, thrips and aphid) and gave higher yield by 52.0 to 59.6 % over control in Central zone
- Acephate 75 SP, Thiomethoxam, Acetamiprid and Acephate 95 % SG were effective against major sucking pests (Jassid, aphid, thrips and whitefly) and resulted in higher yield by 35.0 to 38.0 % over control in South zone.
- Profenophos, Chlorpyrifos and Buprofezin were effective against mealybug and resulted in higher yield in North, Central and South zone. Biopesticides viz., Mealy kill, Mealy quit, *M. anisopliae*, *B. bassiana*, *V. lecanii* were

moderately effective.

## PLANT PATHOLOGY

- Cotton leaf curl disease (CLCuO) appeared in epidemic form in Ferozpur district of Punjab on RCH BG II and non descript susceptible genotypes resulting in considerable yield losses. In Rajasthan, out of 6 districts, the disease incidence was seen in two districts only i.e., Sriganganagar and Hanumangarh, which are the traditional cotton growing belts of the State. The remaining four districts viz., Nagour, Jodhpur, Alwar, and Palli were found completely free from leaf curl attack. It was observed that Sriganganagar district was having higher average disease intensity compared to Hanumangarh district. CLCuO was observed in traces at farmer's fields in different *Bt*cotton hybrids in Haryana.
- Low rainfall, high temperature and moderate relative humidity during the vegetative phase of crop favoured high population build up of white fly early in the season with available virus inoculum and some susceptible Bt cotton hybrids, especially in the hot spots, showing higher disease incidence.
- Bacterial blight was reported as important disease in Central zone in Khandwa in Madhya Pradesh (32.3%), Maharashtra (Vidahrbha- 5.5-21.11 %, Rahuri-%, Nanded 2.2-16.2 %) and in South zone in Karnataka (5.0-15.0 %) and Andhra Pradesh (27.0%).
- Alternaria blight was serious in Saurashtra area (2.0-25.0%), Bharuch (5-60%) of Gujarat, Khandwa in Madhya Pradesh (48.2%) and Rahuri (0-29.3 %) and Nanded (3.0-21.5%) in Maharashtra and in South zone in Karnataka (5.0-15.0%) and Tamil Nadu (10.0-26.0%). *Myrothecium* was severe in Madhya Pradesh (39.3%). *Cercospora* was reported to be severe in Tamil Nadu (12.0-50.0%).
- Grey mildew occurred in Maharashtra in the irrigated areas of Vidarbha region (14.6-21.0%). In south zone, it was severe in two states i.e., Karnataka (5.0-30.0%) and Andhra Pradesh (23.3%).
- Tobacco Streak Virus incidence upto 28.06 % was also

observed in Andhra Pradesh in January.

- Tetraconazole 11.6% w/w ME @ 900ml/ha, followed by Tetraconazole 11.6% w/w ME @ 800ml/ha and Tetraconazole 11.6%w/w ME @650ml/ha showed the lowest POI of *Alternaria*. Maximum yield increase of 22.97% was observed in Tetraconazole 11.6%w/w ME @ 900ml/ha, followed by 15.14% in Tetraconazole 11.6%w/w ME @ 800ml/ha.
- Seed treatment with *Pseudomonas fluorescens* (TNAU) @ 10 g/kg seed plus foliar spray @ 0.4% on 60 and 90 OAS has given a good per cent disease control of 53.73 followed by SAR inducing chemical (Salicylic acid) @ 50ppm on 60 and 90 OAS with per cent disease control of 50.75 in case of Grey mildew.
- Five sprays of carbendazim at 35, 50, 65, 80 and 95 days after sowing showed reduction of Grey mildew POI from 14.46 to 5.61 and reduction of yield loss upto 27.51 %.
- Five sprays of COC (0.3%) + SS 500 ppm at 35,50,65,80 and 95 days after sowing led to reduction of bacterial blight POI from 28.06 to 14.26 and reduction of yield loss upto 22.85%.
- Five sprays of Propiconazole (@0.1%) at an interval of 35, 50 65 80 and 90 OAS at Khandwa showed reduction of *Myrothecium* leaf spots POI from 22.36% to 7.56% and reduction of yield loss upto 40.66 percent..
- Four sprays of Propiconazole (0.1%) at an interval of 15 days starting from 75 days after sowing has given a good disease control of leaf rust at Oharwad (47.46%) with maximum yield of 3598 kg/ha as compared to 3071 kg/ha in control..
- The number of bolls (40.9% & 31.4%) and seed cotton yield (41.9% & 41.4%) were significantly reduced by CLCuO in RCH 134 in farmers' fields and MRC 6304 Bt at research farm, respectively, when the OI was 100.0 with mixed infection grades in Faridkot district, whereas reduction in seed cotton yield ranging from 8.0 to 77.6% in different severity grades were noted in Bt cotton hybrid RCH 134 at Abohar.

