

RESEARCH HIGHLIGHTS

CROP IMPROVEMENT

- In North Zone, the *G. hirsutum* cultures viz., RS 2909 and RS 2913 (compact) were the best from National Trial, whereas PBH 116 and RS 2818 were the best from zonal trial. Similarly, the desi culture PBD 36 (from National trial) has shown promise.
- In Central Zone under irrigated conditions, the *G. hirsutum* cultures viz., GJHV 554, DSC 1801 (compact) were the best, whereas RAH 1075 and DSC 1851 (compact) were promising in rainfed conditions from National Trial. From Zonal trials, TCH 1828, RHC 1217 and RHC HD 1406 (compact) were the best in irrigated conditions and ND LH 2051-1, CPD 1652 and RHC HD 1406 (compact) were the best in rainfed trials.
- Among ELS *G. barbadense* cultures evaluated in Central Zone, DB 1801 was the best in National trial and DB 1701 and DB 1602 were the best in zonal trials.
- Among ELS H x B hybrids, RHB 1624 (National) and RHB 1002 (Central zone) showed promise.
- Among desi cultures evaluated in Central Zone, JLA 1207 (National Trial) and GAM 259 (Zonal trial) were the best for yield and PA 806 (National Trial) and PA 809 (Zonal trial) were the best for fibre length.
- Among desi hybrids, NACH 560 and NACH 556 were the best in National and Zonal trials, respectively in Central Zone locations.
- In South Zone under irrigated conditions, the *G. hirsutum* cultures viz., RAH 1076, LHDP 5 (compact) were the best, whereas RAH 1075 and RAH 1029 (compact) were promising in rainfed conditions from National Trial. From Zonal trials, TSH 324, GSHV 185 and RHC HD 1433 (compact) were the best in irrigated conditions and ND LH 2051-1, SCS 1061 and RHC HD 1420 (compact) were the best in rainfed trials.
- Among ELS *G. barbadense* cultures evaluated in South Zone, DB 1801 was the best in National trial and DB 1701 and RHCb 1014 were the best in zonal trials.
- Among ELS H x B hybrids, RHB 1624 (National) and ARBHB 1601 (South zone) showed promise.
- Among desi cultures evaluated in South Zone, DWDa 1802 (National Trial) and JLA 1110 (Zonal trial) were the best for yield and PA 806 (National Trial) and PA 809 (Zonal trial) were the best for fibre length.
- Trials were conducted both at National and zonal level on naturally coloured cotton belonging to *G. hirsutum* and *G. arboreum* cultures and promising ones were identified for further evaluation.
- Based on pooled data, the promising cultures / hybrids were recommended for agronomic evaluation in all the three zones.

CROP PRODUCTION

- Agronomic requirements of PA 812 in North Zone; ARBB 1502, TCB37, RHB 1008, GSHV 172, CCH 15-1, NDLH 2005-4, ARBH 1551, JLA 906, PA 812 and CSA 1028 in Central Zone; PA812, RHB 1008, BGDS 1033, CCH 15-1, ARBH 1551, NDLH 2028-2 in South Zone were worked out.
- Nutrient and geometry requirements were worked out for RS 2814, GTHV 13/28, DSC 1501, GSHV 180, GISV 272, LHDP 1, GTHV 13/32 and ARBC 1551 under High Density Planting System (HDPS).
- Weed infestation in cotton causes yield reduction to the extent of 62.1 per cent. The results of Chamrajnagar revealed that plastic mulching recorded significantly higher seed cotton yield (1616 kg/ha) and higher weed control efficiency (87.7 %). But net returns was higher with pre emergence application of Pendimethalin @ 1.0 kg a.i/ha followed by Tank mixture (Quizalofopethyl 50 g a.i/ha+ Pyrethiobac Sodium @ 62.5g a.i/ha) at 2-4 weed leaf stage + one hoeing (Rs. 42377/ha).
- Seed cotton yield was increased by 48 % in crop residue mulch on Broad Bed Furrow (BBF) with drip as compared to control at Akola. WUE (5.35 kg ha mm⁻¹) and water productivity (219 Rs m⁻³) gross monetary return (Rs 1,78,975 ha⁻¹), net return (Rs 1,17,909 ha⁻¹) and B:C ratio (2.93) were highest with crop residue mulch on BBF with drip.
- Research on reducing nitrogen dose and enhancing of nitrogen use efficiency in Bt cotton found that at Bathinda, Junagarh and Nandyal, there are possibilities of reducing 25 % N for Bt cotton by making Spot application in four splits of 75 % RDF + Foliar application of 1% urea at three times. In Hisar, Rahuri, Khandwa, Raichur and Dharwad, it is reported that there is saving of 25 % of N by applying 75 % of RDN in spot application of four splits and raising of Sunnhemp between rows incorporated before flowering.
- Organic nutrient management packages including seed treatment, soil application of recommended bio fertilizers, foliar application of **Pink Pigmented Facultative Methylotrops (PPFM)** at flowering, soil application of Neem cake @ 250 kg/ha and raising and incorporation of Sunnhemp / fodder cowpea between rows registered significantly higher seed cotton yield at Sriganaganagar (2464 kg/ha), Khandwa (1248 kg/ha), Srivilliputhur (1748 Kg/ha and Dharwad (1731 kg/ha). Seed treatment and soil application of recommended bio fertilizers and foliar application of PPFM with Neem cake 250 kg/ha and Intercropping with green gram/black gram/ ground nut/soybean registered significantly higher seed cotton yield at Junagarh(1678 kg/ha), LAM (1186 kg/ha), Raichur (1231 kg/ha)
- Labour saving package including land shaping by machine, pre and post emergence application of weed control, intercultural operation by animal and boom / other sprayer for spraying registered the least labour requirement of 126.3,114.8,69,135,114.8 and 112 respectively at Bhawanipatna, Nanded, Akola, LAM and Surat respectively, which was 35.5,30.0,31.0, 44.9 and 42 per cent less for one hectare of cotton cultivation as compared to control.
- Canopy management in HDPS cotton cultivation using growth retardant found that mepiquat chloride application @ 20 g a.i./ha. at 60 and 75 DAS reduced sympodial length by 1.9,10.0,10.0 and 13.6 per cent respectively at Sriganaganagar, Surat, Junagarh, Dharwad. The same chemical and the dose increased the seed cotton yield respectively of 9.5,11.3,11.4 and 15.6 per cent at Sriganaganagar, Surat, Junagarh, Dharwad.
- Conservation agriculture results found that at initial stage Conventional tillage+ No residue management had been observed higher seed cotton yield at Rahuri, Junagarh, Chamrajnagar and Srivilliputhur. However subsequent crop yield is affected by the treatments and

Permanent bed system + Zero tillage+ 100 % residue management observed significantly higher grain yield of sorghum at Chamrajnagar

- Cost of production per quintal on the basis of Cost C3 was arrived as 3969, 4399, 4566, and 4559Rs/q respectively arrived with Faridkot (Bt hybrid), Faridkot (non Bt), Bathinda (Bt hybrid) and Hisar(Bt hybrid) in North Zone. In central Zone , cost of production per quintal on the basis of Cost C3 was arrived as Rs 3664,4105, 4265, 4868, 5064 and 4155Rs/Q respectively with Akola (Bt hybrid), Nanded (Bt hybrid), Surat (Bt hybrid), Surat (herbaceum), Bhawanipatna (Bt hybrid and Rahuri (Bt hybrid).In south Zone , cost of production per quintal on the basis of Cost C3 was arrived as 3964, 12349, 4514, 5058,5290,8250 and,4735,Rs/Q respectively with Tamil Nadu (arboreum), Tamil Nadu (Suvin), Nandyal (Bt hybrid(I), Chamrajnagar (HxB), Nandyal (Bt hybrid (R), LAM (Bt hybrid) and Srivilliputhur (Hirsutum variety).
- The Genotype, RS 2814 has been identified as drought tolerant at Hisar. The Genotypes viz., ARBH 1551, JLA 0906, GJHV-522, GJHV-554, GISV 272 and GSHV 180 at Junagarh, ARBC 1551, ARBH 1551, LHDP-1, BGDS 1033, ND LH 2082-2 and CCH-15-1 at Dharwad were identified for drought tolerant. The genotypes, GSHV-172, GSHV-522 and GISV-272 were known for drought tolerance at Surat.
- The genotypes viz.,H1519 and HD 123 were identified as saline tolerant at Hisar
- The management of climate change was attempted by using genetic variability associated with cotton. The results found that *arboreum* genotype recorded significantly higher yield at delay sowing environments than *hirsutum* and Bt cotton hybrid at Surat (G.Cot- 15 and G.Cot-19), and LAM (Phule Dhanwanthari , PA 528 &PA 255). At Dharwad, *hirsutum* genotypes (Sahana and ARBH-813) showed least reduction in yield under less suitable environment.
- In moisture stress management, stress imposed by providing limited moisture at critical condition is managed by osmoprotectants. The osmoprotectant, identified as PPFM@1 % for three times spray at 10 days interval at Hisar, Surat and Sriganaganagar, Glycine Betaine @100 ppm single spray at Faridkot and KNO₃ at four times spray at 2% found better with Dharwad & LAM
- Oil contents of different genotypes varied with the range of 16.75 to 20.50 at Hisar, 15.74 to 17.55 % at Surat and 14.1 to 24.3 at Dharwad. The gossypol content was varying with the range of 0.36to 0.74 % at Hisar, 0.42 to 0.47 % at Dharwad and 0.38 to0.89% at Surat.
- The Effect of Plant Growth Regulators (PGRs) on insect resistance in cotton found that leafhopper population counted on 7thdayafter PGR spray was significantly less with application of NAA @ 20 ppm foliar spray at 60 DAS followed by MC @ 50 ppm foliar spray at 90 DAS at Dharwad and Surat. Levels of secondary metabolites and defensive enzymes were found altered significantly due to the PGR spraysand foundhigher with PGR sprayed plots.

CROP PROTECTION ENTOMOLOGY

- Genotypes tolerant to leafhoppers were identified from National and Zonal breeding trials and also through advanced screening of promising entries at Central and South zones.
- In Central Zone under National trials and Zonal trials 10 and 20 cultures were identified as tolerant to leafhoppers, respectively.
- In South Zone under National trials and Zonal trials 2 and 7 cultures were identified as tolerant to leafhoppers, respectively.
- Through advanced screening 6 and 5 genotypes were identified as tolerant to leafhoppers in Central and South zones, respectively.
- Seasonal dynamics of key pests of cotton in relation to climatic conditions recorded in Central and South zones indicated that leaf hoppers and thrips were the key sucking pests. **In Surat**, scattered damage of mealybug was noticed in late season from 42nd to 52nd SW. **In Bharuch**, mealybug was first noticed in 35th SW and infestation remained low throughout the crop season. Activity of *Coccinellids*, *Chrysoperla*, syrphids and spiders were noticed throughout the cropping season in Central and South zone centres. Infestation of Pink bollworm was higher than other bollworms in Central and South zones.
- Through survey for key and emerging pests in cotton farmers fields the weekly status of cotton pests was updated based on the observations weekly advisories were issued to the farmers.
- In the trial on Mass trapping of PBW under farmers field conditions, phero-sensor TM-SP-Sleeve Trap was found effective in reducing the larval population, infestation on flowers, green and open bolls and maximum number of moths trapped per trap in Central and South zones.
- The results of the trial on estimation of yield losses and management of cotton pink bollworm indicated that the treatment, Achook spraying at 45 DAS followed by Thiodicarb spraying at 60 DAS, Chloropyriphos spraying at 90 DAS and Lambda-Cyhalothrin at 120 DAS (T14) was effective against PBW followed by the treatment Thiodicarb spraying at 60 DAS, Chloropyriphos spraying at 90 DAS and Lambda- Cyhalothrin at 120 DAS (T12). The lowest seed cotton yield loss (0.25%) was recorded in T12 followed by T14.
- Validation of IPM module for PBW indicated that the IPM Module was proved effective against PBW by reducing the pest infestation than the farmers practice.
- Evaluation of BVG Agro safe (a product from plant extracts) on cotton sucking pests indicated that BVG Agro safe @ 6 ml/lit recorded lowest population of sucking pests followed by BVG Agro safe @ 4.5 ml/lit.
- In Central zone insecticide treatments were effective against sucking pests and bollworms as compared to botanical pesticides. In South zone insecticide treatments were effective against PBW in all the tested hybrids than the botanical pesticide treatments and botanical pesticides were effective in managing sucking pests but not against PBW.