

ALL INDIA COORDINATED COTTON IMPROVEMENT PROJECT

ANNUAL REPORT : 1997-98

**Project Coordinator and Head
Central Institute for Cotton Research
Regional Station, Coimbatore 641003**

FOREWORD

I am happy to note that the Annual Report of the All India Coordinated Cotton Improvement Project is being brought out in "Print Form" for the first time. This is a welcome step, as it would enable in the dissemination of information faster and farther. The Project Coordinator (Cotton) and the scientists involved in the project implementation deserve full credit for this endeavour.

The country has witnessed a phenomenal increase in production and productivity of cotton during the past ten years. The location specific technologies developed from the network of research centres under the AICCIP have helped in achieving the plan targets. In spite of achieving the record production of 165 lakh bales during 1996-97 season, sustainability of the higher production still eludes us. With the cotton production target fixed at 190 lakh bales by the turn of the century, a good deal of work remains to be done.

Cotton bollworms are developing resistance to most of the insecticides used on cotton crop, underscoring the need for integrated approach of control. As the Leaf Curl Virus disease is also causing concern in the North zone, intense research efforts are needed to contain the disease. Similarly, the transfer of technology is another area that needs urgent attention. The involvement of Krishi Vigyan Kendras in the AICCIP Programme may help to disseminate the newer technologies to far flung areas. Further, research efforts are required to identify suitable varieties for the non-traditional cotton areas with suitable package of practices including pest and disease management. I am sure the Scientists of AICCIP would address themselves to these major problems, while formulating necessary research strategies for the next millennium.

(M.S. KAIRON)

Director

*Central Institute for Cotton Research,
Nagpur*

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(K. VENUGOPAL)

Project Coordinator (Cotton)

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INTRODUCTION

Cotton fibre constitutes eighty five per cent of the raw material needs of the textile industry in India and has emerged as the most important crop of commerce, contributing to one-third of total foreign exchange earnings. Along with textile industries, it sustains directly or indirectly the livelihood of about 60 million people. Cotton is grown in India in an area of 8.3 m.ha with an annual production of 17.8 m. bales of cotton during 1996-97 and 15.3 m. bales during 1997-98. The nation has, thus, witnessed a five to six fold increase in cotton production since Independence, which is a remarkable achievement.

Cotton production and productivity have increased considerably over the years. The production advance in the early periods from 1947-48 to 1956-57 was more due to increase in area from 4.3 m.ha to 8.0 m.ha than due to the increase in productivity. Increase in subsequent years was due to increase in productivity, which was spectacular. after 1966-67, when the All India Coordinated Cotton Improvement Project (AICCIP) was launched by the Indian Council of Agricultural Research (ICAR). The factors responsible for the phenomenal increase in production are the development of improved technologies by the scientists, its dissemination by the extension workers and proper adoption by the cotton farmers. The advent of hybrids during 70's resulted in quantum jump in production and brought about a sea change in cotton scenario. Other technologies associated with the increase in production are the use of quality seeds, development of genotypes responsive to fertilizer nutrients and genotypes resistant to pests and diseases and integrated pest management technologies.

AICCIP MANDATE

The All India Coordinated Cotton Improvement Project has the mandate for

- * Development of genotypes suitable for different agroclimatic conditions
- * Development of package of practices to maximize yield from improved genotype
- * Development of effective and economic plant protection measures for the management of pests and diseases

AICCIP CENTRES

The AICCIP is operated through a network of 12 Agricultural Universities at 11 Main centres and 15 sub centres (Table 1).

TABLE 1.**ALL INDIA COORDINATED COTTON IMPROVEMENT PROJECT
CENTRES**

STATE	UNIVERSITY	MAIN CENTRE	SUB CENTRE
NORTH ZONE			
Punjab	PAU, Ludhiana	Ludhiana	Faridkot
Haryana	HAU, Hisar	Hisar	-
Rajasthan	RAU, Rajasthan	Sriganganagar	Banswara
Uttar Pradesh	C.S. Azad Univ. Agri & Tech., Kanpur	-	Mathura
CENTRAL ZONE			
Gujarat	GAU, Surat	Surat	Viramgam Junagadh Talod
Madhya Pradesh	JNKVV, Khandwa	Khandwa	Badnawar Indore
Maharashtra	PDKV, Akola	Akola	-
	MAU, Nanded	Nanded	-
	MPKV, Rahuri	Rahuri	Padegaon Pune
SOUTH ZONE			
Andhra Pradesh	Acharya N.G.Ranga AU, Hyderabad	Guntur	Nandyal
Karnataka	UAS, Dharwad	Dharwad	Siruguppa Arabhavi
Tamil Nadu	TNAU, Coimbatore	Coimbatore	Srivilliputhur Kovilpatti

THE COTTON SCENARIO

Cotton is as ancient as the human civilization. Exclusive cotton fabrics have become a status symbol and are becoming increasingly costlier. Cotton, known as the 'King' fibre and called in recent times as the 'White Gold', is the most vital crop of commerce to many countries such as USA, China, India, Pakistan, Uzbekistan, Australia and to a few African and South American countries. Cotton is grown in 68 countries in about 33.5 million hectares with an estimated production of 20 million tonnes. India has the distinction of having the largest cotton area (8.5 to 9.0 m.ha) in the world and accounts for 15% of world cotton lint production (3 million tonnes). India also exports nearly one third of its cotton as lint, yam and fabrics and such exports account for nearly one third of total export earnings.

The ICAC reports that the world average yield was 597 kg/ha in 1992 and since then, there was no improvement in world average yields. Over the last nine years, cotton yields have not increased in the U.S.A. Similar is the case with many of the cotton growing countries since

1991-92, but during the same period, the growth in cotton production and productivity in India was very impressive (Fig. 1). There was an impressive export of raw cotton (Fig. 2) and a definite shift towards long staple cottons (Fig. 3)

The ICAC reports (March, 1998) that "In India, due to the high yields, total production reached 3.0 million tons during 1996-97. The average yield was 327 kg/ha, which is a record". However, compared to the rapid progress since 1990s, there is a severe jolt and set back to cotton production this year (1997-98). The production is estimated at 148 lakh bales and the average yield declined to 288 kg/ha (Table 2). The significant loss in production and productivity is mainly due to certain unseasonal rains and severe cotton bollworm incidence and damage .

Table 2. Area, Production and Productivity for 1996-77 and 1997-98

States	Area (Lakh ha)		Production (Lakh bales)		Productivity (kg lint/ha)	
	1996-97	1997-98	1996-97	1997-98	1996-97	1997-98
Punjab	7.00	7.25	16.35	9.00	397	211
Haryana	5.49	6.55	13.90	10.50	430	273
Rajasthan	6.20	5.42	15.25	11.50	418	360
Gujarat	15.24	16.02	36.80	39.00	410	414
Maharashtra	29.63	31.39	33.50	15.00	192	81
Madhya Pradesh	5.27	5.35	19.80	19.00	639	603
Andhra Pradesh	10.07	8.04	26.10	22.00	441	465
Karnataka	6.68	4.45	10.00	9.00	254	344
Tamil Nadu	2.52	2.03	5.50	6.00	371	502
Others	0.50	0.76	1.00	1.00	340	224
Loose supply	-	-	0.50	6.00	-	-
Grand total	88.60	87.26	178.70	148.00	343	288

SEASON AND CLIMATE

The climate during the cropping season 1997-98 was most unfavourable for cotton production in Punjab in the North zone, Maharashtra in the Central zone and Andhra Pradesh in the South zone. In the North zone, continuous wet spell, cloudy weather and incessant rains during October-November, which coincided with crop maturity, affected the cotton production, particularly in Punjab. The change in agroclimate is very significant as compared to previous year (Fig. 4 a to h). The adverse climatic conditions favoured extensive bollworm incidence and damage. Similarly, the unseasonal heavy rains during October - December affected the crop prospects in Madhya Pradesh, Maharashtra and northern parts of Andhra Pradesh. The erratic weather conditions combined with severe pest infestations led to a decline in cotton production from the estimated figure of 178 lakh bales to 148 lakh bales. The agro climate in Gujarat was favourable to cotton production this year. Gujarat has recorded the highest production of 39 lakh bales and productivity of 442 kg lint/ha.

RESEARCH HIGHLIGHTS

PUNJAB AGRICULTURAL UNIVERSITY, LUDHIANA

LHH-144, an intrahirsutum hybrid, with resistance to leaf curl virus was released during 1997. The genotypes F 1713, F 1528, F 1638, F 1791 showed promise in various breeding trials. The hybrids viz. Raj. HH 23, LHH 107 and HHH 217 recorded higher seed cotton yield than local check hybrid, Fateh. The genotypes RS 992, Pusa 180, HHH (CM) -1, Raj HH 469, HHH 81 and FHH 84 exhibited less jassid injury. Seed treatment with Imidacloprid 70 WS at 5g/kg seed was effective in controlling jassids upto 70 days after sowing.

The cotton leaf curl virus disease incidence was seen more (75%) in Malout, Abohar districts, while the incidence in Bhatinda and Faridkot ranged between. 10-30%. Among the varieties/hybrids, CNH 1012, CNH 123, LHH 144, RS 2060, RS 2059, RS 213 were seen resistant to CLCuV.

Cotton genotypes viz. H 1134, HS-230 and H 1123 showed stable performance with a yield potential of 11-13 q/ha as against local check (10.5q/ha). The promising hybrids viz. HHH-217, HHH-220 and HH 11221 with yield range of 16-19 q/ha exhibited wider adaptability. Among the *G. arboreum*, HD-260, HD-326 and HD-363 have been identified as high yielding strains. A male sterile based desi hybrid AAH-1 has been released for north zone. The hirsutum genotypes HS-230, HS-182, H-1197, H-1208 and arboreum genotypes HD-328, AAH-3, HD-269, HD-368 were seen tolerant to insect pests of cotton. The incidence of myrothecium and alternaria leaf spot diseases was quite high due to indiscriminate use of synthetic pyrethroids. Higher incidence of cotton leaf curl virus (CLCuV) was seen in about 50,000 ha. in Sirsa, Fatehabad and Hisar districts .

RAJASTHAN AGRICULTURAL UNIVERSITY, SRICANGANAGAR

The yield performance of *G.hirsutum* lines viz. RS 2106, RS 2210, RS 2121 and RS 2122 was superior with a range of 16-18 q/ha as compared to check, RST 9 (10.5 q/ha). Moreover, RS 2106 exhibited resistance to CLCuV along with other genotypes like RS 211 0, RS 2111, RS 2115 and RS 20 13. Among the herbicides, Pendimethalin and Trifluralin at 1.5 kg a.i./ha as pre-plant application, followed by one hand hoeing at 35 DAS helped in realising higher seed cotton yield. A hirsutum cotton-mustard crop sequence was also found economically beneficial like cotton - wheat sequence with net return of Rs.31 ,265 per ha. It was seen that Thiodicarb at 750 g a.i./ha controlled the bollworms effectively, followed by Alanycarb and RH 2185. The IPM module comprising components like tolerant variety, seed treatment (Imidacloprid), release of parasites, balanced use of fertilizers, use of soft and selective insecticides, hand picking of eggs, larvae of *Helicoverpa*, damaged fruiting parts etc., proved superior to traditional spray schedule. A new problem in *desi* cotton showing symptoms similar to "Witches broom (*Escobilla*)" has been observed. The severity of CLCuV was alarming as compared to previous years.

GUJARAT AGRICULTURAL UNIVERSITY, SURAT

G. arboreum variety G.Cot. 19 was released for cultivation in Mathio cotton areas of Gujarat. The variety is resistant to sucking pests, wilt and blight under field conditions. The agronomic requirements of G. Cot. DH-9 under rainfed conditions was worked out. With 120 x 60 cm spacing and application of 80 kg N/ha, farmers of south Gujarat can obtain higher seed cotton yield. A spacing of 90 x 30 cm and application of 160 kg N/ha for G. Cot. Hy-8 in north Gujarat was found beneficial in obtaining higher ICBR of 1:8.71. For efficient control of bollworms, three releases of *Chrysopa* (10000 /ha/week) and five releases of *Trichogramma chilonis* (2.5 lakh/ha) between 45 to 110 days have been recommended based on entomological trials. Application of HBPV at 450 LU/ha and SNPV at 250 LU /ha controlled the pests viz., *Helicoverpa* and *Spodoptera* efficiently.

JAWAHARLAL NEHRU KRISHI VISHWA VIDYALAYA, KHANDWA

Jawahar Tapti, a desi cotton variety was released with a yield potential of 15-18 q/ha and mean fibre length of 23 mm. An early maturing, high yielding, intra hirsutum conventional hybrid, JKHY-2 was released for double cropping areas of Madhya Pradesh. Notable increase in seed cotton yield was recorded in *Dhaincha* live mulch and greengram live mulch treatments. Among intercrops, cotton + Groundnut system helped in realising maximum seed cotton yield.

DR. PUNJABRAO DESHMUKH KRISHI VIDYAPEETH, AKOLA

Superior genotypes viz., CSH-320B, CZH-421, CZH-235 have been identified in different trials. Male sterility based hybrid CZHMM-666 recorded higher yields. AKA-7, a *G. arboreum* variety was released. A spacing of 60 x 60 cm and fertilizer dose of 50:25 :25 kg NPK/ha was found adequate for obtaining maximum seed cotton yield of PKV Hy-4 under rainfed conditions. A higher gross monetary return was realised under cotton + greengram, followed by cotton + blackgram compared to sole cotton.

The genotype AKA-9128 was found moderately resistant to bollworms. Maximum seed cotton yield could be obtained in Imidacloprid seed treatment (5 to 10 /kg seed). Maximum incidence of Grey mildew was seen in farmers' fields causing yield reduction.

MARATHWADA AGRICULTURAL UNIVERSITY, NANDED

The agronomic requirement of newly released hybrids were worked out; closer spacing of 60 x 60 cm and a fertilizer dose of 60:30:30 NPK kg/ha were best suited for hybrids. Integrated nutrient management studies for production of organic cotton under rainfed conditions revealed that application of FYM at 10 t/ha and *neem* cake (2 t/ha) produced higher seed cotton yields of 544 kg/ha and 525 kg/ha.

MAHATMA PHULE KRISHI VIDYAPEETH, PADEGAON

The entries CZH-407 and CZH - 402 gave highest seed cotton yield of 24 and 21 q/ha under irrigated conditions as compared to LRA 5166 (16 q/ha). Under Br. 15 trial, the yield of

entry CZHB-1507 was highest with 28 q/ha. Growing cotton preceded by sugarcane crop was found economical, as preparatory tillage expenses could be saved. The technique of paired row planting with supply of liquid fertilizers through drip irrigation brought about high yield with high water use efficiency.

MAHATMA PHULE KRISHI VIDYAPEETH, RAHURI

The entries viz. RHC-3194, RHC-1190, RHC-1489 were seen promising. Among the conventional hybrids, RHH-0492 and RHH-1594 were found superior with yield potential of 20-22 q/ha. Among the CMS based hybrids, CHH 101 and CHH 99 were seen capable of higher yields. Hybrids RHB-0388 and RHB-0387 exhibited superior performance with yield potential of 17 q/ha compared to 10 q/ha of DCH-32. The treatment with Decis tablet, RH-2485 and Bulldock controlled the bollworms effectively. The bioagent *T viride* was effective in minimising Alternaria leaf blight. The loss due to Grey mildew of cotton has been estimated at 38%.

COLLEGE OF AGRICULTURE, PUNE

About 28 cotton strains received from Dharwad were seen immune to fusarium wilt, while one from Akola and two from Bharuch were found resistant. Seed dressing with *T harzianum* at 4-6 g/kg seed reduced the wilt incidence.

TAMIL NADU AGRICULTURAL UNIVERSITY, COIMBATORE

The superiority of TCH 1452 was evident in yielding 18 q/ha, an increase of 26% over MCU 5 and 40% over LRA 5166. Another culture TCH 1569 has recorded a mean seed cotton yield of 14 q/ha (an increase of 77% over check). Interspecific TCHB 2510 was found promising with superior fibre qualities like length, strength and tolerance to sucking pests. Two new restorer lines R2 and R4 have been identified for producing CMS based intrahirsutum hybrids.

Maximization trial for yield in cotton – cowpea cropping system revealed that cotton hybrid TCHB 213 recorded significantly higher kapas yield (31 q/ha) than MCU (23 q/ha). A clear response to application of P and K was also observed. Around 40% saving in water were seen through drip irrigation with enhancement in seed cotton yield. Brassinolide (0.1ppm) was seen as effective growth regulator in enhancing the yield. Since, a new formulation of pheromone, effectively checked the pink bollworm infestation. Intercropping of cowpea with cotton resulted in less aphid, leaf hopper population and bollworm incidence than cotton alone.

At Kovilpatti, the jassid resistant and drought tolerant cotton culture TKH-590 was released as KC-2 for rainfed black soil tract. This variety recorded a mean seed cotton yield of 8 q/ha. The performance of cultures TKH 1175 and TKH 1179 was notable with yields ranging between 10-13 q/ha. Foliar spray of 0.5% ZnSO₄ and 1% MgSO₄ at 45 and 60 DAS registered higher seed cotton yield. Compartmental bunding resulted in higher seed cotton yield and lees amount of runoff. The cultures CBRT, BBR2, AH133, CAHH 98 and CAHH 99 were found resistant to leafhopper.

At Srivilliputhur, a high yielding medium staple cotton culture viz., TSH 288 with early maturity (135-140 days) and compact type has been identified. Another culture TSH 318 recorded higher seed cotton yield of 11 q/ha. It is also moderately resistant to leafhopper, stem weevil, bacterial blight and root rot.

ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY, LAM, GUNTUR

Three varieties viz., L 603, L 604 and LAHH 4 were released during the period. Among the cotton based cropping systems, cotton-chillies-cotton rotation was seen better with highest monetary return. Genotypes possessing high chlorophyll stability index, high SLW and high RWC have been identified for drought tolerance. Highest incremental cost benefit ratio of 5.9 was seen in IPM plots as compared to 1.07 in farmers' method of pest control. Amitraz at 300g a.i./ha, Decis 1.8 EC at 12.5 g a.i./ha were found effective against *Helicoverpa* and high seed cotton yield of 24 q/ha was recorded compared to 16 q/ha in control.

Basal application of neem cake at 150 kg/ha coupled with drenching 1% neem oil suspension (20 DAS) helped in minimizing stem weevil damage. Soil application of neem cake (250 kg/ha) plus seed treatment with *T.viride* (4g/kg) reduced root rot incidence significantly.

UNIVERSITY OF AGRICULTURAL SCIENCES, DHARWAD

At Dharwad, two *G.hirsutum* genotypes viz., CPD 431 and CPD 473 recorded higher seed cotton yield of 12 q/ha. A male sterile based intra hirsutum hybrid, DMSHH 4 yielded 11 q/ha compared to 8.5 q/ha by NHH 44. compact genotypes viz., AH 107, CPD 447 and CPD 448 were seen superior to Anjali, with 25-30% yield improvement at spacing of 45 × 30 cms and paired row planting with 30-60-60 cm. The response of hybrid cotton to drip irrigation was found better with DHB-105 and DHH-11 at 120 × 60 cm spacing and drip irrigation at 100% ET level. Foliar spray of 2% urea during flowering enhanced the yield by 20%. The *in situ* moisture conservation of broad furrow and ridge was seen superior to ridges and furrow as well as plough sole method of sowing. Higher seed cotton yield was obtained with 1% Mg SO₄ spray at 90 days. Bollworm tolerant genotypes had high tannin and total phenolics. The insect growth regulator tolerant genotypes had high tannin and total phenolics. The insect growth regulator RH 2485 gave good control of bollworms over insecticides. Around 12 entries have been identified as possessing multiple disease resistance.

At Siruguppa, hirsutum genotypes, ARB 8908-4, CWROK-165, RAH-100, TSH-288, ARB-104, SCS-27 were seen promising capable of yielding 10-12 q/ha. Among the conventional intrahirsutum hybrids, VARCH-67, CCHH-5569, TCHH-1423, ARBHH-5 recorded higher seed cotton yield compared to local check. The interspecific hybrids RAHB-61, DHB-290, RAHB-51, GSHB-658 were found high yielding with a range of 13.5-16 q/ha. The compact genotypes viz., AH-107 and CPD-448 exhibited their superiority in yield trials. Foliar spray of 2% DAP brought about enhanced yield.

EXPERIMENTAL RESULTS

The details of the experiments carried out by different AICCIP centres and the results obtained in Plant Breeding, Agronomy, Physiology and Biochemistry, Entomology and Plant Pathology during 1997-98 are presented and discussed below.

NORTH ZONE

PLANT BREEDING

Br.02 (a) : Initial Evaluation Trial of *G. hirsutum* varieties

In the Initial evaluation trial, thirty-one entries were tested in five locations viz., Abohar and Faridkot in Punjab, Hisar and Sirsa in Haryana and Sriganaganagar in Rajasthan. F 1713 recorded the highest seed cotton yield (17.33 q/ha). HS 248 recorded the highest ginning outturn (35.9%). One notable observation of these experiments was that the entry CNH 1012 had shown immune reaction to the leaf curl virus disease under field conditions at Faridkot, Abohar and Sriganaganagar. This culture was on par with the check variety Bikaneri Nerma in seed cotton yield and ginning outturn.

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage
1.	F 1713	17.33	5.96	34.4
2.	F 1607	16.33	5.59	34.5
3.	LH 1903	16.31	5.79	35.5
4.	CA 1397	16.28	5.70	34.9
5.	PUSA325	15.80	5.51	34.9
6.	BN (Check)	12.55	4.27	33.8
7.	CNH 1012	12.51	4.21	33.8

Br.03 (a) : Preliminary Varietal Trial of *G. hirsutum* varieties

In preliminary varietal trial, seventeen entries were tested in seven locations viz., Ludhiana, Bathinda and Faridkot in Punjab, Hisar and Sirsa in Haryana, Sriganaganagar in Rajasthan and Mathura in Uttar Pradesh. Due to low yield levels, the data from Mathura was not included for evaluating the performance of the entries. LH 1901 recorded the highest seed cotton yield (16.19 q/ha) and highest ginning outturn (35.5%).

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage
1.	LH 1901	16.19	5.77	35.5
2.	RS 2010	15.66	5.44	34.7

3.	CA 1196	15.19	5.31	35.0
4.	LH 1877	14.81	5.03	34.0
5.	F 1528	14.33	4.91	34.4
6.	B.N. (Check)	10.97	3.53	32.3

Br. 04 (a) : Coordinated Varietal Trial of *G. hirsutum* (Normal plant type) genotypes under irrigated conditions

In the Coordinated varietal trial, ten entries were evaluated against Bikaneri Nerma and the respective local checks in nine locations viz., Ludhiana, Bhatinda and Faridkot in Punjab, Hisar and Sirsa in Haryana, Sriganganagar, Hanumangarh and Ajmer in Rajasthan and Mathura in Uttar Pradesh. Due to low yield levels at Hanumangarh and Mathura, the data from these centres were excluded from computing the average. All the top five entries recorded significantly higher yield over the common check Bikaneri Nerma.

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage
1.	F 1638	14.31	5.07	33.5
2.	F 846	13.66	5.22	35.3
3.	F 1537	13.51	4.96	34.2
4.	RS 992	13.39	4.82	35.9
5.	LH 1796	13.26	4.78	35.5
6.	B.N. (Check)	9.60	3.52	34.2

In Bhatinda, F 1638 (17.67 q/ha) recorded significantly higher seed cotton yield over the local check, F 846 (12.96 q/ha). However, in Ludhiana and Faridkot, the local checks recorded the highest yield.

In Rajasthan, RS 992 recorded the highest yield at Sriganganagar (13.66 q/ha) and Ajmer (12.77 q/ha) and were superior to the local check, RST 9.

In Haryana, F 1537 was found to be better than the local check, HS 6 at Hisar (19.55 q/ha; LC 17.49 q/ha) and Sirsa (11.73 q/ha; LC 9.46 q/ha).

Br. 04 (b) : Coordinated Varietal Trial of *G. hirsutum* (Compact plant type and short duration) genotypes

The coordinated varietal trial was conducted in nine locations. The trial at Somerpur failed and the data for Hanumangarh was not included for analysis due to low yield levels. The mean data from seven locations indicated that RS 2013 recorded the highest mean seed cotton yield of 15.17 q/ha as against 8.36 q/ha of common check LH 900. The ginning outturn of LH 1889 was the best (35.5%). H 1220 with mean maturity days of 156 was the earliest culture.

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage
1.	RS 2013	15.17	5.11	33.9
2.	PUSA 19-70	14.89	4.92	33.4
3.	PUSA 3142	14.31	4.89	34.2
4.	PUSA 180	14.04	4.84	34.4
5.	F 1791	13.98	4.81	34.3
6.	CNH 123	9.54	3.27	34.2
7.	LH 900 (Check)	8.36	2.88	34.3

Persual of last five-year data indicate that cultures F 1408 (17.59 q/ha), Pusa 19-17 (16.97 q/ha) and LH 1382 (14.85 q/ha) to be promising.

The reaction of different entries to Leaf Curl Virus disease indicated that CNH 123 showed immune reactions at Faridkot and resistant reaction at Sriganganagar and was also marginally superior to LH 900 in mean seed cotton yield.

Br. 05 (a-I) Set-I: Evaluation of Intra-hirsutum Hybrids (Conventional) trials under irrigated conditions

Twenty intra-hirsutum hybrids were tested under irrigated conditions at five locations viz., Ludhiana, Faridkot, Hisar, Sirsa and Sriganganagar. There was no common check utilised in the trial and hence the performance of entries could not be assessed over locations. Raj HH 23 recorded the highest mean seed cotton yield of 19.39 q/ha. Amongst the local checks, Fateh was the best with 16.8 q/ha. The ginning outturn ranged from 32 to 35 percent. A comparative performance of Raj HH 23 over the past three years indicated that with a mean seed cotton yield of 22.72 q/ha as against 19.95 q/ha of Fateh, Raj HH 23 was superior to the local check by 14 per cent.

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage
1.	Raj HH 23	19.36	6.72	34.7
2.	Raj HH 469	19.05	6.25	32.7
3.	LHH 107	18.85	6.01	32.1
4.	HHH 217	18.20	6.13	33.7
5.	Fateh (C)	16.75	5.62	33.6
6.	HH 221	16.62	5.81	34.8
7.	LHH 1028	14.45	4.60	31.8
8.	Raj HH 16 (C)	13.75	4.66	33.8
9.	HHH 81 (C)	12.48	4.21	33.8

Br. 05 (a-I) Set II : Intra-hirsutum hybrid (Conventional) trial under irrigated conditions

In this trial, seventeen hybrids with spreading plant types were evaluated at six locations viz., Ludhiana, Faridkot, Hisar, Sirsa, Sriganaganagar and Kanpur. The yield levels at Kanpur were very low and hence the data was excluded. The local check hybrid Fateh recorded the highest mean seed cotton yield of 19.25 q/ha and all other hybrids were inferior to it in yield. Ginning outturn of most of the hybrids ranged from 32 to 35 per cent.

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage
1.	Fateh (C)	19.25	6.44	33.4
2.	HHH220	18.57	5.99	32.2
3.	LHH 731	18.30	5.84	31.9
4.	LHH914	18.12	5.83	32.1
5.	Mahesh 1	17.75	6.09	34.1
6.	CSHH84	17.26	5.67	32.7

Br. 05 (b) : Initial evaluation of Intra- hirsutum hybrid trial

Intra-hirsutum hybrids developed in Central and South Zone were tested for their inclusion in the regular North Zone irrigated trial. Eleven hybrids were tested against HHH 81. The trial was conducted at four locations viz., Ludhiana, Hisar, Sirsa and Sriganaganagar. Mean data of four locations indicated that BIO 6669 recorded the highest seed cotton yield of 16.83 q/ha followed by ACH 09 with 13.94 q/ha. The ginning outturn of the hybrids ranged from 33 to 35 per cent. Hybrids VICH 11, Kasturi, NFHH 920 and Avani Laxmi were found free from CLCV at Sriganaganagar.

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage
1.	BIO 6669	16.83	5.63	33.5
2.	ACH 09	13.94	4.80	34.6
3.	GK 111	13.39	4.65	34.8
4.	VICH 9	13.22	4.62	34.8
5.	HHH 81 (C)	13.18	4.43	33.3

Br. 23 (a) : Initial Evaluation Trial of *G. arboreum* genotypes

In the Initial evaluation trial of arboreums with a 2.5% span length of less than 20 mm, 14 entries were tested alongwith two checks (LD 327 and RG 8) at five locations viz., Ludhiana, Kheri (Punjab), Hisar, Sriganaganagar and Mathura. Due to low yield levels, Mathura data was excluded from analysis. The mean yield from other locations indicated that RG 151 recorded the highest yield of 22.39 q/ha, as against 18.34 q/ha recorded by the best check RG 8.

Culture LD 735 recorded the highest ginning outturn of 40.4 per cent. The ginning outturn of other cultures also ranged from 36 to 39%.

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage
1..	RG 151	22.39	8.38	37.3
2.	RG 143	20.66	7.43	35.6
3.	RG 150	20.57	7.74	37.6
4.	HB 260	19.76	7.27	36.6
5.	LD 762	19.75	7.61	38.6
6.	RG 8 (C).	18.34	6.76	36.6
7.	LD 327 (C)	16.93	6.49	38.4

Br. 23 (b) : Initial evaluation trials of *G. arboreum* (medium staple, > 20.0 mm) cotton genotypes

In the trial, the performances of 15 entries of arboreum genotypes with a 2.5% span length of more than 20 mm were tested. The hirsutum variety Bikaneri Nerma was used as the control. The trial was conducted at five locations viz., Ludhiana, Kheri, Hisar, Sriganaganagar and Mathura. Due to poor yield, the data from Mathura was excluded.

The top five entries based on the mean seed cotton yield, lint yield, ginning outturn and 2.5% span length are furnished in the table below. Culture HD 363 recorded the highest yield (19.95 q/ha) followed by LD 700 (19.83 q/ha). The ginning outturn ranged from 37 to 38 percent. The hirsutum check Bikaneri Nerma recorded a seed cotton yield of 13.77 q/ha and ginning outturn of 33.1 per cent and culture LD 733, recorded the highest fibre length of 25.5 mm as against 24.1 mm of Bikaneri Nerma.

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage	2.5% Span Length (mm)
1.	HD 363	19.95	7.61	38.2	21.2
2.	LD 700	19.83	7.38	37.3	22.8
3.	HD 380	19.10	7.00	37.0	21.2
4.	CAD 127	18.92	6.97	36.8	19.9
5.	CAD 366	18.24	6.86	37.8	20.2
6.	B.N. (C)	13.77	4.59	33.1	24.1

Br. 24 (b) : Coordinated Varietal Trial of irrigated *G. arboreum* cotton

In the Coordinated Varietal Trial, 15 advanced cultures were tested against RG 8 and LD 327 at six locations viz., Ludhiana, Kheri, Hisar, Sriganaganagar, Hanumangarh, Ajmer and Mathura. Data from Mathura was excluded due to poor yields. Culture RG 83 with a mean seed cotton yield of 19.24 q/ha was the best entry followed by LD 694 with 19.08 q/ha. The check variety RG 8 recorded a mean seed cotton yield of 18.59 q/ha. Culture LD 627 recorded the

highest ginning outturn of 41.6 per cent. LD 713 recorded the highest fibre length (23.2mm). A perusal of three years data indicate that RG 83 (19.1 q/ha) out yielded the check RG 8 (17.4 q/ha) by over 1.7 q/ha.

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage	2.5% Span Length (mm)
1.	RG83	19.24	7.60	36.2	19.7
2.	LD 694	19.08	8.50	39.5	19.6
3.	LD 702	18.79	8.16	39.1	19.2
4.	HD 326	18.60	8.01	38.1	21.2
5.	RG 8 (C)	18.59	7.32	36.5	18.5

Br. 25 : Initial Evaluation Trial of Intra arboreum (male sterile based) Hybrids

In the intra-arboreum male sterility based hybrid trial conducted at three locations viz., Ludhiana, Hisar and Sriganganagar, fifteen hybrids were tested along with common checks, LD 327 and RG 8. Raj DH 6 recorded the highest yield of 24.23 q/ha followed by AAH 242 (24.18 q/ha) and LMCH 3 (23.7 q/ha). Hybrid AAH 242 recorded the highest ginning outturn of 39.9 per cent. The fibre length ranged from 19.5 to 22.0 mm.

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage	2.5% Span Length (mm)
1.	Raj DH6	24.23	8.42	35.0	20.5
2.	AAH 242	24.18	9.66	39.9	19.5
3.	LMDH 3	23.70	9.10	38.2	20.0
4.	LMDH 1	22.84	8.75	38.4	20.0
5.	AAH 3	22.68	8.62	37.7	21.7
6.	LDH 11(C)	22.33	8.39	37.5	22.0

As in previous years, this year's trials also indicated the higher yielding potential of arboreum genotypes over the hirsutum genotype.

In the varietal trials conducted during the year, the top ranking entries in various trials indicated a yield range of 19.24 to 22.34 q/ha in *G. arboreum* genotypes, whereas its range in respect of *G. hirsutum* genotypes was from 14.31 to 17.23 q/ha. Similarly, in the case of hybrids, as against the highest seed cotton yield of 24.23 q/ha of intra arboreum hybrids, the maximum recorded in the intra hirsutum hybrids was 19.36 q/ha. Thus, it may be seen that on an average the arboreum genotypes had a yield advantage of 5 q/ha.

Comparative Performance of *G. arboreum* and *G. hirsutum* Genotypes

Trial No.	<i>G. arboreum</i>		Trial No.	<i>G. hirsutum</i>	
	Top Entry	Seed Cotton Yield (Q/ha)		Top Entry	Seed Cotton Yield (Q/ha)
Varieties					
CVTBr.24	RG83	19.24	Br.04	F 1638	14.31
			Br.04 b	RS 2013	15.17
PVT			Br.03	LH 1901	16.19
IET Br.23 a	RG 151	22.39	Br.02	F 1713	17.23
Br.23 b	HD 363	19.95			
Hybrids					
CVTBr.25	Raj DH 6	24.23	Br.05(a)I	Raj HH 23	19.36
			Br.05(a) II	Fateh	19.25

Similarly, the arboreum genotypes recorded a ginning outturn ranging from 38 to 40 per cent, while the hirsutum genotypes exhibited a range from 33 to 35 percent. Thus, the arboreum genotypes were found superior over hirsutum genotypes in both yield and ginning outturn. Further, the arboreum genotypes were found immune to leaf curl virus disease. In general, the arboreum genotypes were found to possess a basic resistance to sucking pests and bollworms. However, they are found inferior to the hirsutum genotypes in fibre properties. Hence, it is necessary to devote further attention towards the quality improvement of arboreum genotypes. It is heartening to note that cultures like LD 733 have recorded a fibre length of up to 25.5 mm. With further improvement in micronaire and fibre strength, the spinning performance of arboreum genotype could be improved.

Among the hundreds of hirsutum genotypes screened during the year under field conditions, it was noticed that entries CNH 1012 and CNH 123, both developed at the Central Institute for Cotton Research, Nagpur have shown immune reaction to Leaf Curl Virus disease. Off-season multiplication of these cultures has been taken up at Coimbatore. It is further necessary to test these genotypes and confirm the resistance through vector transmission studies under controlled conditions and induct them into the breeding programme. An elaborate ad-hoc scheme for the control of leaf curl virus disease has been drawn up under the AICCIP programme.

AGRONOMY

The studies on the effect of date of sowing on productivity of cotton varieties revealed that sowing by 1st May was ideal to realizing optimum yield (20 q/ha) as compared to 15th May (16.5 q/ha) and 30th May (6.6 q/ha) sowing. A spacing of 67.5 x 30 cm was found advantageous in realizing higher yield over 67.5 x 45 cm and 67.5 x 15 cm spacing. Among the entries tested, RS 810 gave significantly higher seed cotton yield (16.9 q/ha) over RS 875 (14.2 q/ha) and RST 9 (11.9 q/ha).

The desi hybrid RAJDH-7 can be planted at 67.5 x 45 cm with a fertilizer dose of 120

Kg N/ha for irrigated tracts of North-west Rajasthan.

In another study, it was seen that maximum net return of Rs. 31,265/- per hectare could be realised with *G.hirsutum* (RS 875) - Mustard sequence, followed by Cotton (RS 875) - Wheat sequence (Rs. 30,156/- per ha) and *G.arboreum* - Wheat sequence (Rs. 28,355/- per ha).

Among the various herbicides tried, Pendimethalin and Triflurali @ 1.5 kg a.i./ha pre-plant application, followed by one hand hoeing at 35 DAS led to significantly higher seed cotton yield as compared to spray of Glufosinate ammonium at 40 and 80 DAS.

ENTOMOLOGY

Seasonal influence on insect Pests

Unusual heavy rainfall received during August-November, and the abiotic factors, viz., low temperature coupled with high humidity experienced in the months of October-November was congenial for large scale multiplication of jassids and bollworms, particularly *Heliothis* and spotted bollworms. High wind velocity during October-November and rainy days were responsible for ineffectiveness of pesticide sprays. This aggravated the problem of insect pests and adversely affected the boll development and resulted in rotting of bottom bolls. All these factors are responsible for low cotton yield in northern zone, particularly in areas of Sriganganagar and Hanumangarh districts of Rajasthan.

Screening for resistance to bollworms : In the screening trials, cultures CSA 17A.93, CAD-97, HD 356, LD 730, CAD 127, HD 325 and LD 716 had significantly less boll damage over check variety LD 327.

Chemical control of pests : The use of NPV alternated with Chlorpyrifos was found effective in control of *Heliothis* larval population and thereby reducing boll damage. Imidacloprid seed treatment was effective against sucking pests and it reduced the CLCuV disease.

Integrated Pest Management in Cotton : Studies on IPM in cotton indicated that the IPM module was superior over the conventionally recommended spray schedule to control whiteflies, bollworms, leaf curl virus and simultaneously increased seed cotton yield.

PLANT PATHOLOGY

Cotton Leaf Curl Virus continued to cause concern in this zone. The disease has been observed in 50,000 and 86,647 hectares, respectively in the States of Haryana and Rajasthan. Cotton has been severely affected in Dabawadi block in Haryana adjoining Rajasthan and Punjab border and Sriganganagar, Padampur, Karanpur and Sadisahar clusters of Rajasthan.

An off season survey was conducted in the hot spot areas to identify weed hosts for the CLCuV by a team comprising Scientists from CICR, PAU, CCSHAU and RAU and has identified a number of weeds like *Achyranthes* sp. *Abuutilon* sp. and *Ageratum* sp. showing

symptoms similar to CLCuV disease. However, further tests are to be carried out to confirm the role of these weeds as alternate hosts for the virus. Early sowing (1st May) resulted in severe disease incidence, but wider spacing reduced the disease incidence at Sriganagar.

A yield loss of up to 84% and 87% per plant was recorded due to CLCuV in the field trials in RST 9 and F 846, respectively. One hirsutum line developed by CICR, Nagpur viz., CNH 1012 has shown immune reaction to CLCuV at the three centres tested viz., Faridkot, Abohar and Sriganagar. Breeder seed of Anjali is being multiplied at CICR Regional Station, Sirsa and will be tested in hot spots alongwith LRA 5166 for their performance against CLCuV. Several germplasm lines have also been evaluated for their performance against CLCuV.

Bacterial leaf blight incidence was noticed on cotton seedlings as early as 15-20 days after sowing and early sown (April) crop is more susceptible than late sown (May-June) crop. In Hisar, due to monoculture of cotton, there is an increase in the incidence of root rot due to *Rhizoctonia solani*. Frequent use of synthetic pyrethroids has also aggravated the situation leading to higher incidence of alternaria and myrothecium leaf spots.

CENTRAL ZONE

PLANT BREEDING

Br.02 (a): Initial Evaluation Trial of *G. hirsutum* genotypes under irrigated conditions

In the Initial Evaluation Trial, 26 entries alongwith LRA 5166 (Common check) and respective local checks were tested in three locations viz., Surat (Gujarat), Rahuri (Maharashtra) and Banswara (Rajasthan). Among the entries, CNH 1020 recorded the highest yield (25.43 q/ha) as against 22.44 q/ha of LRA 5166.

Br.03 (a): The preliminary varietal trial of *G. hirsutum* genotypes under irrigated conditions

In the Preliminary Varietal Trial, eight entries were tested alongwith common and local checks in four locations viz., Surat, Junagadh, Talod (Gujarat) and Rahuri (Maharashtra). CNH 131 recorded the highest yield of 16.11 q/ha as against 12.05 q/ha of common check.

Br.04 (a): The Coordinated Varietal Trial of *G. hirsutum* genotypes under irrigated conditions

In the Coordinated Varietal Trial (Br.04 a), eleven entries were tested alongwith the check varieties in five locations viz., Surat, Talod (Gujarat), Padegaon and Rahuri (Maharashtra) and Banswara (Rajasthan). GISC 25/1644 (24.94 q/ha), GISV 86/58 (24.41 q/ha) were the best entries as compared to the common checks (18.56 q/ha).

Mean seed cotton yield (q/ha)

Br.02 (a)		Br. 03 (a)		Br. 04 (a)	
LC	25.91	CNH 131	16.11	GISC 25/1644	24.94
CNH 1020	25.43	LC	15.36	GISV 86/58	24.41
GJHV 53	25.17	G.S.91/14	15.16	CNH 1001	23.12
RCH 3294	24.33	AKH 8824	14.83	GJHV 47	22.86
NH 545	24.06	CNH 121	12.78	GJHV 34	21.62
LRA 5166 (CC)	22.44	LRA 5166 (CC)	12.05	LRA 5166 (CC)	18.56

Br. 02 (b) : Initial Evaluation Trial of *G. hirsutum* genotypes under rainfed conditions

In the IET, 30 entries were evaluated under rainfed conditions alongwith the common check (LRA 5166) and the respective local checks at six locations viz., Bharuch (Gujarat), Jalgaon, Nanded, Akola (Maharashtra), Khandwa (Madhya Pradesh) and Adilabad (Andhra Pradesh). KH 117 (11.60 q/ha) recorded the highest mean seed cotton yield followed by NH 572 (11.33 q/ha). The common check recorded a mean seed cotton yield of 6.45 q/ha only.

Br. 03 (b) : Preliminary Evaluation Trial of *G. hirsutum* genotypes under rainfed conditions

In the PVT, ten entries were tested alongwith the common check and local check varieties at six locations in Amreli (Gujarat), Jalgaon, Nanded, Akola (Maharashtra), Khandwa (Madhya Pradesh) and Umerkote (Orissa). KH 113 recorded the highest yield of 11.05 q/ha, as against 3.66 q/ha by common check.

Br. 04 (b) : Coordinated Varietal Trail of *G. hirsutum* genotypes under rainfed conditions

In the CVT, eleven entries were tested alongwith the check varieties in five locations viz., Surat, Talod (Gujarat), Padegaon, Rahuri (Maharashtra) and Banswara (Rajasthan). Culture JLH 1594 recorded the highest yield (11.44 q/ha) followed by JLH 1494 (11.02 q/ha). The common check LRA 5166 recorded a mean seed cotton yield of 7.1 q/ha.

Mean seed cotton yield (q/ha)

Br.02 (b)		Br. 03 (b)		Br. 04 (b)	
KH 117	11.60	KH 113	11.05	JLH 1594	11.44
NH 572	11.33	NH 545	9.04	JLH 1494	11.02
LC	10.99	KH 112	8.00	JLH 1492	10.41
PH 92/271	10.42	JLH 1294	7.95	NH 529	10.31
NH 569	9.88	PH 92/260	7.93	KH 107	10.05
LRA5166 (CC)	6.45	LRA5166 (CC)	3.66	LRA 5166 (CC)	7.10

Br. 05 (a-I) Set-I: Initial evaluation of intra-hirsutum (Conventional) hybrids under irrigated conditions

Seventeen intra-hirsutum conventional hybrids were tested at five locations viz., Surat, Talod, Junagadh (Gujarat), Parbhani (Maharashtra) and Banswara (Rajasthan) alongwith the common check hybrids N11I-I 44 and G.Cot. Hy. 10. The best hybrid G (T) HH 49 (20.87 q/ha) was only marginally superior to the check hybrid N11I-I44 (20.12 q/ha).

Br. 05 (a-I) Set-II: Initial evaluation of intra-hirsutum (Conventional) hybrids under irrigated conditions

The initial evaluation trial of Private Sector hybrids was conducted at CICR, Nagpur and three other locations at Aurangabad, Wardha (Maharashtra) and Rayad (Gujarat). Thirty one conventional hybrids were tested alongwith N11I-I44 and G.Cot. Hy.10. Hybrid RCH 144 recorded the highest yield (12.12 q/ha) followed by PRC 31 (11.85 q/ha). The best check hybrid NHH 44 recorded 9.41 q/ha.

Mean seed cotton yield (Q/ha).

Br.05 (a-I) Set I		Br.05 (a-I) Set II	
G (T)HH 49	20.87	RCH 144	12.12
PHH 316	20.78	PRC 31	11.85
DHH509	20.76	SNSCH4	10.75
NHH44 (CC)	20.12	HARITA 3	10.45
G. COT.Hy.10 (CC)	19.32	NARMADA 2	9.98
		NHH44(CC)	9.41

Br.05 (a-2) Set I : Initial evaluation of Intra-hirsutum (Male sterile based) hybrid trial under irrigated conditions

In the male sterile based hybrid trial, eighteen hybrids were tested in three locations viz., Surat, Junagadh (Gujarat) and Badnawar (Madhya Pradesh). Data on mean seed cotton yield indicated that CIN11I-I109 (18.75 q/ha) was the best hybrid as against 8.26 q/ha recorded by the common check hybrid CAHH 468.

Br.05 (a-2) Set II: Initial' evaluation of Intra-hirsutum (Male sterile based) hybrid trial under irrigated conditions

In the Initial Evaluation Trial, sixteen male sterile based Private Sector hybrids were evaluated at five locations. The yield levels were very low in this trial. However, PAC 138 (6.88 q/ha) was numerically superior to the common check hybrid CAHH 468 (4.77 q/ha).

Mean seed cotton yield (Q/ha).

Br.05 (a-2) Set I		Br.05 (a-2) Set II	
CINHH 109	18.75	PAC 138	6.88
LC	18.73	NFHH 19506	6.73
CINHH 13	16.83	MECH302	6.60
CAHH85	16.72	ACHH444	6.31
AH 131	15.36	NIMBKAR411	6.03
CAHH 468 (CC)	8.26	CAHH 468 (CC)	4.77

Br.05 (b-1) Set I : Initial evaluation of intra-hirsutum (Conventional) hybrids under rainfed conditions .

Nineteen conventional hybrids were tested under rainfed conditions at seven locations viz, Bharuch (Gujarat), Akola, Jalgaon, Nanded (Maharashtra), Khandwa (Madhya Pradesh), Adilabad (Andhra Pradesh) and Umarnot (Orissa). The mean data indicated that the top four entries were on par with the common check hybrids.

Br.05 (b-1) Set-II: Initial evaluation of *G. hirsutum* (Conventional) hybrids under rainfed conditions

In the Initial Evaluation Trial, twenty six Private Sector hybrids were tested at three locations alongwith Ankur 651 and G. Cot. Hy. 10 as check hybrids. Only two hybrids viz., VARCHH 60 (9.69 q/ha) and Navkar 5 (9.28 q/ha) were marginally superior to the best check Ankur 651 (8.83 q/ha).

Mean seed cotton yield (Q/ha).

Br.05 (b-1) Set I		Br.05 (b-1) Set II	
AK 133	10.20	VAACH60	9.69
HARITA 3	10.14	NAVKAAR 5	9.28
PHH316	10.07	ANKUR651 (CC)	8.83
BCHH 569	10.05	MBRCH 106	8.76
G. Cot. Hy. 10 (CC)	9.89	PRC 31	8.63
NHH 44(CC)	9.67	G.Cot.Hy. 10 (CC)	7.73

Br.05 (b-2) Set I: Preliminary Evaluation Trial of intra-hirsutum (Male sterile based) hybrids under rainfed conditions

The mean yield levels in the male sterile based hybrid trial, which was conducted at Jalgaon, Nanded and Akola were very low. The best entry WHH 651(6) was only marginally superior (5.35 q/ha) to the best check hybrid Ankur 651 (4.65 q/ha).

Br.05 (b-2) Set II : Preliminary evaluation of intra-hirsutum hybrid (Male sterile based) under irrigated conditions

The best of the Private Sector hybrids evaluated were only marginally superior to the check hybrid G. Cot.Hy.10 (6.38 q/ha).

Br.05 (b-2) Set I		Br.05 (b-2) Set II	
WHH 651 (6)	5.35	NFHH95464	7.18
NCHH 54	4.96	PAC 104	6.75
MECH 301	4.66	G. Cot. Hy.10 (CC)	6.38
ANKUR 651 (CC)	4.65	BCHH 6508	6.32
AH IOi	4.29	WHH 2714	6.22
G.Cot.Hy. 10 (CC)	2.78	CAHH 468 (CC)	4.81

Br.24 : Coordinated Varietal Trial of *G. arboreum* genotypes

Eleven arboreum genotypes were tested (Br.24) at nine locations viz., Amreli (Gujarat), Jalagon, Dhule, Nanded, Parbhani, Akola (Maharashtra), Khandwa (Madhya Pradesh), Kovilpatti (Tamil Nadu) and Dharwad (Karnataka) under rainfed conditions. The available yield data do not indicate superiority of any of the entries tested against the common check AKA 5. The yield levels of entries viz., JLA 0794, PA 262, AKA 8307, AKA 9118 ranged between 8-9 q/ha, with the check recording 7.93 q/ha).

Br.34 - 1 : Coordinated Varietal trial of *G. herbaceum* (Open boll type) genotypes

The open boll types of herbaceum genotypes were tested at eight locations viz, Surat, Bharuch (Gujarat), Banswara (Rajasthan), Nagpur, Achhalia (Maharashtra), Dharwad, Raichur (Karnataka) and Nandyal (Andhra Pradesh). Of the eighteen genotypes tested, GSHV 111/90 (12.02 q/ha), GSHV 1098/99 (11.73 q/ha) and GSHV 1096/90 (11.59 q/ha) were found superior to common check Digvijay (8.86 q/ha).

Br.34 - 2 : Coordinated Varietal trial of *G. herbaceum* (Closed boll type) genotypes

In the trial 14 closed-boll types were tested at four locations in the Wagad zone of Gujarat. All the top five entries recorded significantly higher yield ranging from 11.7 to 15.5 q/ha as against the popular variety G.Cot.13 (7.7 q/ha).

Mean seed cotton yield (Q/ha).

Br.34 - 1		Br.34 - 2	
GSHV 1111/90	12.02	GCHV 177	15.45
GSHV 1098/89	11.73	GCHV 145	13.33
GSHV 1096/90	11.59	G.COT.17	12.36
RAHS14	11.23	GCHV 146	12.12

GSHV 1155/89	11.23	GCHV 126	11.78
DIGVIJAY (CC)	8.86	G.COT.13 (CC)	7.65

Br.25 : Evaluation of Desi hybrids

Sixteen *desi* hybrids (*G. herbaceum* x *G. arboreum*) were evaluated at nine locations in the States of Gujarat, Maharashtra, Madhya Pradesh in the Central zone and Kamataka, Tamil Nadu and Andhra Pradesh in the South zone. AKA 8401 and AKA 235 were used as the varietal check. MDCH 222 (14.66 q/ha), GSGDH 2 (14.09 q/ha) and MECH 45 (13.83 q/ha) were the top three entries, followed by AAAH 2 and AKDH 3 recording 12.33 q/ha and 12.18 q/ha, respectively. The best varietal check recorded a mean seed cotton yield of 10.39 q/ha.

An overall review of all the results indicated that among ninety-six hirsutum genotypes evaluated under both irrigated (3 to 5 locations) and rainfed (5 to 6 locations) conditions in the zone during the year, cultures GISV 25/1644 (24.9 q/ha; CC 18.59 q/ha) and CNH 131 (16.11 q/ha; CC 12.05 q/ha) hold promise under irrigated conditions. Under rainfed conditions, JLH 1594 (11.41 q/ha; CC 7.10 q/ha) and KH 113 (11.05 q/ha; CC 3.66 q/ha) were the best entries.

None of the arboreum cultures tested in both central and south zone centres was distinctly superior to the common check. The reasons for these needs to be looked into and new strategies to be worked out to increase the yields. However, among the open balled herbaceum types GSHV cultures from Gujarat with a yield range of 11.23 to 12.02 q/ha were far superior to the common check Digvijay (8.86 q/ha). Among the closed boll types for the Wagad zone, GCHV 177 (15.45 q/ha) was superior to the recently released variety G. Cot. 17 (12.36 q/ha).

Under irrigated conditions, the CMS based hybrids CINHH 109 (18.75 q/ha) and CINHH 13 (16.83 q/ha) recorded as much as 100 per cent yield increase over the CMS check hybrid CAHH 468 (8.26 q/ha). However, under rainfed conditions the yield levels of CMS hybrids were very low and inferior to the conventional hybrids. Hence, more attention needs to be paid to widen the genetic male sterility base to exploit the hybrid vigour. The participating centres should take up the conversion of male sterility and restorer programme in a much more concerted and planned manner and come forward to share the materials for local exploitation.

The yield levels in the conventional hybrids programme also seems to have attained a plateau. None of the hybrids tested during the year, both under irrigated and rainfed conditions, could out yield the check hybrids G. Cot.Hy.10 / NHH 44. As we envisage an increase in hybrid area from 40 to 50 per cent and production increase from 60 to 70 per cent during the Ninth plan period to meet the production target of 190 lakh bales by the turn of the Century, the yield plateau is of major concern. The breeding group should devote more attention to this problem and come out with strategies to increase the hybrid yield levels.

Eventhough the *desi* hybrids exhibit sufficient heterosis, their exploitation seems to be slow. Extensive use of genetic male sterility system and development of seed production technologies to decrease the cost of seed production will go a long way in increasing the area under *desi* hybrids.

AGRONOMY

SURAT

It was seen that production potential of *G. hirsutum* var. GJHS-34 was significantly superior to G. Cot. 10 ; hybrid G (T) HH-49 was high yielding than GSHH-1444. Application of nitrogen beyond 150 kg/ha was not seen economical, while phosphorous application at 80 kg/ha was not found advantageous over control. In an experiment using drip irrigation system, flood irrigation was found to give significantly higher seed cotton yield than 0.4, 0.6, 0.8 IW/CPE through drip and alternate furrow irrigation system. Under common adaptive trial on intrahirsutum hybrids, HH Hy-6 recorded significantly higher number of bolls/plant (46); yield/plant (124 g.) ginning percent (38%) and lint yield (11.7 q/ha).

TALOD

It was seen that G.Cot.hy.6 yielded maximum at a spacing of 90 x 30 cm, with application of 150 kg N/ha. The application of nitrogen is recommended as 25% basal and the remaining in three equal splits at an interval of one month from basal dressing.

RAHURI

The agronomic requirements of the *G. hirsutum* var. JLH-168 has been worked out as 60 x 45 cm spacing and fertilizer dose of 100:50:50 kg of NPK. The data obtained in the experiment on package of practices for ecofriendly organic cotton revealed that the yield obtained due to pure inorganic fertilizers at the recommended level was more, followed by green manuring alone with biofertilisers and inorganic fertilizers at the rate of 30, 37.5 and 50 kg N, P and K per hectare.

The studies on the response of hybrid NHH-44 to fertilizers and preparatory tillage treatment after sugarcane at Padegaon, indicated significant response to higher level of fertilizers, while the preparatory tillage treatment did not reveal any such response. However, considerable savings in expenses incurred for preparatory tillage could be achieved. Studies on liquid fertilizer through drip irrigation showed the superiority of liquid fertilizers in realizing higher yield and net saving of 47% irrigation water.

INDORE

It was seen that hybrid WHH-09 gave seed cotton yield of 14.4 q/ha on par with JKHY 2 (14.0 q/ha). A closer spacing of 60 x 60 cms and 90 x 60 cms were found to produce similar yields, which was superior to 90 x 90 cm. The biomulch of greengram was found beneficial. Various biofertilizers and organic manures did not result in better yields comparable to balanced dose of inorganic fertilizers.

AKOLA

Variety AKA-7 produced maximum seed cotton yield at 60 x 15 cm spacing. As

regards to hybrid CAHH-8 (PKV Hy-4), a spacing of 60 x 60 cm and fertilizer dose of 50:25:25 kg NPK/ha were found optimum for better yields. In an intercropping experiment, maximum gross monetary returns could be seen in cotton - greengram, followed by cotton-blackgram as compared to sole cotton. The impact of foliar feeding of nutrients and regulators on F 1 seed production of GMS based hybrid AKDH-7 was evident, resulting in higher F1 seed yield and better boll setting percentage due to NAA (10 ppm) and DAP (2%) sprays.

ANKUR AGRICULTURAL RESEARCH LAB., NAGPUR

In the study on the performance of four new hirsutum hybrids in relation to plant density and fertilizer levels, it was seen that hybrid WHH-1250 yielded 19 q/ha seed cotton, followed by WHH-09 (17.3 q/ha), as compared to 8.8 q/ha of CAHH 468. A spacing of 60 x 60 cm was found optimum.

NANDED

In a study on the agronomic requirements of newly released hybrids, it was found that closer spacing of 60 x 60 cm and a fertilizer dose of 60:30:30 NPK kg/ha were best suited for hybrids. The hybrid WHH-1250 recorded the highest seed cotton yield of 823 kg/ha.

Integrated nutrient management studies for production of organic cotton under rainfed conditions revealed that application of recommended dose of fertilizer and combined application of FYM at 10 t/ha and neem cake (2 t/ha) produced higher seed cotton yields of 544 kg/ha and 525 kg/ha, respectively.

PHYSIOLOGY

It was seen that cultures GISV -25, GISV -67 and GISV -78 exhibited better LAI growth rates. Foliar application of methanol (20% and 30%) resulted in significant increase in seed cotton yield over control. The increase is attributed to enhanced photosynthesis, low leaf temperature, increased internal CO₂ and boll weight. The performance of G.Cot Hy-8, G.Cot. DH-9 and G.Cot. 17 was seen better under water stress conditions. As regards to effect of salinity stress on cotton genotypes, the overall performance of G.Cot. Hy. 8 was found better during evaluation.

BIOCHEMISTRY

Studies on screening of cotton genotypes for oil content revealed that the oil content ranged from 12.7% in *G.arboreum* var. 824 to 21.6% in G. Cot.Hy.6. Among the species tested, the highest oil content was seen in *G. hirsutum* var. G.Cot. 16 (20.3%) followed by *G.arboreum* Var. G.27 (19.6%) and *G.herbaceum* var. V797 (18.9%)

The foliar application of methanol significantly enhanced the total soluble sugars, nitrate reductase activity and total chlorophyll content. The effect of salinity stress during crop growth on biochemical characters revealed that total chlorophyll and carotenoids decreased significantly due to stress in the varieties studied, except in var. Dhumad.

ENTOMOLOGY

Studies on opulation dynamics of key pests of cotton

During this year, the incidence of Aphids, Jassids, Thrips and Whiteflies were at low level throughout the season. The incidence of spotted bollworm started from end of August and reached peak during September-December (22.38%). The population of *Heliothis* appeared from third week of August and its maximum intensity of 14.8 -15.8% was recorded during October to December. The *Spodoptera* appeared from mid November and continued up to mid December.

Screening for resistance to key pests of cotton

In Akola, out of 100 cultures screened against jassids, 13 were resistant, 59 were tolerant and 28 were found susceptible. Out of 77 cultures screened for bollworms, one culture AKA 9128 was found to be tolerant to bollworms (20% boll damage), nine cultures susceptible (21-30%) and the remaining were highly susceptible. In Surat, culture CZHH 534 was found tolerant to jassid and whitefly. Among promising varieties / hybrids, the hybrid CZH 7 recorded lowest bollworm damage.

Evaluation of New Molecules

The treatments Decis tablet (10g and 12.5g a.i/ha) and Bulldock (12.5, 18.5g a.i./ha) were found most effective in controlling the bollworm complex and recorded higher seed cotton yield in Akola. However, increased population of whiteflies was observed in these treatments (20-23/plant on three leaves) as against 7.3 in control. In Surat, the treatment Bulldock was found superior in reducing bollworm damage and recorded higher seed cotton yield. In Rahuri, Decis tablet, RH 2485 and Bolldock were found effective in reducing the bollworm damage.

Against the sucking pests, Imidacloprid seed treatment of 5, 7.5 and 10 g/kg of seed was found effective at Rahuri, Surat and Akola. It also registered higher yield over Difenthiuron and Methyl Demeton treatments.

Integrated pest management in cotton

In Surat, IPM module 1 namely Bio Intensive module (Imidacloprid ST - chrysopa 2 releases @ 10000 /ha - Trichogramma 2 releases @ 1.5 lakh/ha - H. NPV 1 spray @ 500 LE/ha - 1 spray of NSKE 5%) was found more effective in reducing bollworm damage and gave higher yield than recommended pest control practices. In Akola, significantly lowest population of jassids, whiteflies and bollworms was recorded in bio intensive module, which was at par with adoptable module. Higher seed cotton yield was recorded in adoptable module followed by bio intensive module.

PLANT PATHOLOGY

In this zone, **Bacterial leaf blight** and **Grey mildew** are the predominant diseases. A disease intensity of 0.87 to 22.7% (BLB) and 1.12 to 36.5% (Grey mildew) was observed in

Maharashtra. At Nizar (Surat) and Suvag (Rajkot), G.Cot.Hy.1 0 and RCH 2 were severely affected by bacterial leaf blight. Similarly, Ghety and G.Cot.17 in Bharuch were affected by grey mildew.

Race 10 of *Xanthomonas axonopodis* pv. *malvacearum* was present at both Akola and Surat, and race 18 only at Surat. None of the varieties / hybrids tested have shown immune, reaction and few showed resistance to bacterial leaf blight. The bioagents tested were as effective as chemical treatments in significantly reducing bacterial leaf. blight intensity.

On AKH 4, grey mildew caused a yield loss of 40-42%. **Alternaria leaf spot** was noticed only in moderate form in this zone."

At the Pune centre, out of 203 cotton lines received from nine centres, 28 lines received from Dharwad were observed to be immune to **Fusarium wilt**. One line from Akola, seven from Dharwad and two from Bharuch were resistant to this disease.

SOUTH ZONE

PLANT BREEDING

Br. 02 (a) : Initial Evaluation Trial of *G.hirsutum* genotypes under irrigated conditions

In the Initial evaluation trial conducted at five locations viz., Coimbatore, Srivilliputhur (Tamil Nadu), Lam (Andhra Pradesh), Siruguppa and Arabhavi (Karnataka), thirty one entries were tested alongwith two common checks viz., LRA 5166 and MCU 5 VT and therespective local checks. Results from four locations indicate that TCH 1569 (11.58 q/ha) recorded the highest seed cotton yield followed by NDLH 1078 (10.80 q/ha). The best of the checks LRA 5166 recorded a mean yield of 8.09 q/ha.

Br. 03 (a) : Preliminary Evaluation Trial of *G. hirsutum* genotypes under irrigated conditions

The Preliminary varietal trial was also conducted at the same five locations with twelve entries. Srivilliputhur, being a summer cotton area, the yield data was not available. The mean data from other four locations indicated that culture CWROK 165 was the best yielder (14.37 q/ha), as against the best check MCU 5 VT (8.81 q/ha).

Br. 04 (a) : Coordinated Varietal Trial of *G. hirsutum* genotype under irrigated conditions

The Coordinated varietal trial was conducted at six locations viz., Coimbatore (Tamil Nadu), Lam (Andhra Pradesh), Siruguppa, Raichur, Arabhavi (Karnataka) and Nandyal (Andhra Pradesh). There were eleven entries. The data from all the centres barring Srivilliputhur were received. RAH 100 (13.83 q/ha) and CNH 120 MB (13.33 q/ha) were the top two entries. The best check MCU 5 VT recorded a mean seed cotton yield of 9.39 q/ha.

Mean seed cotton yield (Q/ha)

Br.02 (a)		Br. 03 (a)		Br. 04 (a)	
TCH 1569	11.58	CWROK 165	14.37	RAH 100	13.83
NDLH 1078	10.80	ARB 8821-7	13.41	CNH 120MB	13.33
NDLH 1650	9.82	ARB 8906-4	12.08	TSH 289	12.04
ARB 9701	9.75	CPD 446	11.11	TSH 288	11.74
RAC 1049	9.50	VRS 16	10.93	C 256-4	11.68
LRA 5166 (CC)	8.09	MCU 5 VT (CC)	8.81	MCU 5 VT(CC)	9.39
MCU 5 VT(CC)	7.30	LRA 5166 (CC)	8.67	LRA 5166 (CC)	8.65
LC	6.56	LC	7.76	LC	7.38

Br. 02 (b) : Initial Evaluation Trial of *G. hirsutum* genotypes under rainfed conditions

In the Initial evaluation trial, twenty three entries were tested with LRA 5166 (CC) and the respective local checks at -three locations viz., Dharwad, Nandyal and Kovilpatti. Because of very poor yields, the data from Kovilpatti was excluded from the analysis in respect of all trials. NDLH 1584 (7.63 q/ha) recorded the highest yield followed by TKH 1175 (7.25 q/ha) and CPP 420 (7.14 q/ha). The common check recorded 4.13 q/ha.

Br. 03 (h) : Preliminary Evaluation Trial of *G. hirsutum* genotypes under rainfed conditions

The Preliminary varietal trial, with five entries, was conducted at three locations viz., Dharwad, Nandyal and Kovilpatti. The local checks recorded the highest mean seed cotton yields. CPD 447 (9.00 q/ha), SLB 1 (8.65 q/ha) and NDLH 1078 (8.63 q/ha) were superior to the common check LRA 5166 (5.87 q/ha).

Br. 04 (b) : Coordinated Varietal Trial of *G. hirsutum* genotypes under rainfed conditions

In the Coordinated varietal trial, twelve entries were tested along with LRA 5166 (CC) and local checks at four locations viz., Raichur, Dharwad, Kovilpatti and Nandyal. CPD 473 recorded the highest yield of 11.29 q/ha, followed by M5KD 26 (11.13 q/ha).

Culture CWROK 165 which had recorded the highest mean seed cotton yield in the irrigated trials, stood fourth in this trial with a mean seed cotton yield of 10.79 q/ha. The common check recorded a yield of 8.43 q/ha.

Mean seed cotton yield (Q/ha)

Br.02 (b)		Br. 03 (b)		Br. 04 (b)	
NDLH 1584	7.63	LC	10.88	CPD 473	11.29
TKH 1175	7.25	CPD 447	9.00	M5KD 26	11.13
CPD 420	7.14	SLB. I	8.65	CPD 431	11.12

TAR 10	6.59	NDLH.1678	8.63	CWROK 165	10.79
TAR 26	6.56	ICMF 69	8.02	L 601	10.61
LPS 1	6.56	LRA 5166 (CC)	5.87	LRA 5166 (CC)	8.43
L.C	5.58			LC	8.03
LRA 5166 (CC)	4.13				

Br. 05 (a-I) Set I : Initial Evaluation Trial of Intra-hirsutum (Conventional) hybrids under irrigated condition

The intra-hirsutum (conventional hybrids) trial was conducted at six locations viz., Coimbatore, Lam, Nandyal, Siruguppa, Raichur and Arabhavi Twenty five entries were tested with NHH 44 and Savita as common checks and the respective local checks. The data from all the six locations were analysed and the yield difference between the best entry and the best check was not significant. ARBHH 5 (14.34 q/ha) was the best entry. While NHH 44 (12.79 q/ha) was the best hybrid check.

Br. 05 (a-1) Set II : Initial Evaluation Trial of intra-hirsutum (Conventional) hybrids under irrigated condition

The initial evaluation trial of Private Sector hybrids (conventional) was conducted at CICR, Coimbatore and three other locations. The data was received from only three locations. VARCH 87, recorded the highest yield (24.72 q/ha), followed by SNSCH 96 (24.40 q/ha). The best check NHH 44 recorded a mean seed cotton yield at 18.25 q/ha.

Mean seed cotton yield (Q/ha).

Br.05 (a-I) Set I		Br.05 (a-I) Set II	
ARBHH 5	14.34	VARCH 87	24.72
DHH 543	13.41	SNSCH 96	24.40
NDLHH240	13.21	KASTURI 18	22.35
DHH 542	13.02	SCHH3	22.20
TCHH 1243	12.90	AVANILAXMI	21.08
NHH 44 (CC)	12.79	PRC 31	21.05
SAVITA (CC)	11.42	NHH 44 (CC)	18.25
		SAVITA (CC)	15.44

Br. 05 (a-2) Set I : Initial Evaluation trial of intra-hirsutum (Male sterile based) hybrids under irrigated condition

Fifteen cms based hybrids were tested, at three locations, viz., Coimbatore, Lam and Arabhavi. VCHH 32 gave the highest yield of 17.71 q/ha, as against 14.04 q/ha of Savita (CC).

Br. 05 (a-2) Set II : Initial Evaluation trial of intra-hirsutum (Male sterile based) hybrids under irrigated condition

In the Initial evaluation trial, 20 private entries were tested at CICR, Coimbatore and three other locations with NHH 44 and Savita as common checks and the respective local checks. Results from only two locations were received. ACHH 427 recorded the highest yield of 20.82 q/ha as against 18.05 q/ha of NHH 44.

Mean seed cotton yield (Q/ha).

Br.05 (a-2) Set I		Br.05 (a-2) Set II	
VCHH 32	17.71	ACHH 427	20.82
ARCHH 32	16.39	RCH 2	20.75
MECH 99	14.07	MECH 161	20.67
SAVITA(CC)	14.04	MECH 12	19.52
NHH44 (CC)	13.45	ADCMH 14	19.24
		NHH 44 (CC)	18.05
		SAVITA(CC)	16.28

Br. 05 (b-l) Set-I: Initial Evaluation Trial of intra-hirsutum (Conventional) hybrids under rainfed condition

In the intra-hirsutum conventional hybrid trial, 24 entries were tested along with common hybrid checks NHH 44 and Savita. The trial was conducted at three locations viz., Dharwad, Nandyal and Kovilpatti. AH 133 (11.5 q/ha) and DIDI 543 (11.36 q/ha) were the top two entries. The best check NIDI 44 recorded a seed cotton yield of 8.48 q/ha.

Br. 05 (b-l) Set-II: Initial Evaluation Trial of intra-hirsutum (Conventional) hybrids under rainfed condition

Initial evaluation trial of Private Sector conventional hybrids was conducted at three locations. Twenty one entries were tested along with the common check NHH 44 and Savita. SNSCH 61 recorded the highest yield of 19.60 q/ha as against 16.14 q/ha of Savita.

Mean seed cotton yield (Q/ha).

Br.05 (b-l) Set I		Br.05 (b-l) Set II	
AH 133	11.50	SNSCH 61	19.60
DHH 543	11.36	LC	18.93
DHH 11	10.97	PRC 31	18.13
DHH.542	10.69	VARCH 60	17.64
SNSCH 99	10.61	BCHH 6527	16.81
LC	8.59	Savita (CC)	16.14

NHH 44 (CC)	8.48	NHH 44	16.00
Savita (CC)	7.28		

Br. 05 (b-2) Set-I : Initial Evaluation Trial of intra-hirsutum (Male sterile based) hybrids under rainfed condition

In the intra-hirsutum CMS based hybrids trial, 17 hybrids were tested along with the common check hybrids CAHH 468 (CMS based hybrid) and NHH 44. The trial was conducted at three locations viz., Dharwad, Kovilpatti and Nandyal. Among the hybrid entries CAHH 99 (11.69 q/ha), CAHH 98 (10.93 q/ha), AH 101 (10.22 q/ha) and CAHH 8 (10.09 q/ha) were better than the conventional check hybrid NHH 44 (8.36 q/ha). The CMS based hybrid CAHH 468 (5.76 q/ha) recorded 31 per cent lower yield than NHH 44 (8.36 q/ha).

Br. 05 (b-2) Set-II : Initial Evaluation Trial of intra-hirsutum (Male sterile based) hybrids under rainfed condition

The initial evaluation trial of private sector conventional hybrids was conducted at Dharwad. Thirteen entries were tested along with DHH 11, NHH 44 and CAHH 468. The check hybrid DHH 11 recorded the highest yield of 11.5 q/ha. In this trial also, the CMS based check hybrid CAHH 468 (5.14 q/ha) was inferior to the conventional hybrids DHH 11 and NHH 44.

Br.05 (b-2) Set I		Br.05 (b-2) Set II	
LC	12.51	DHH 11	11.52
CAHH 99	11.69	ARCHH 615	10.72
CAIHH98	10.93	RCH 2	10.66
AH 101	10.22	VCHH 1009	8.32
CAHH 8	10.09	NHH 44 (CC)	7.34
NHH 44	8.36	CAHH 468 (CC)	5.14
CAHH 468 (CC)	5.76		

Br.15 (a-1) Set I : Initial Evaluation Trial of interspecific (*G.hirsutum x G.barbadense*) hybrids

Nineteen interspecific hybrids were evaluated alongwith three checks viz., DCH 32, DHB 105 and TCHB 213 at four locations viz., Coimbatore, Siruguppa, Raichur and Shimoga. DHB 290 recorded the highest yield of 12.34 q/ha, as against 11.80 q/ha of DHB 105. DCH 32 recorded a mean seed cotton yield of 8.07 q/ha.

Br.15 (a-I) Set II : Initial Evaluation Trial of interspecific (*G.hirsutum x G.barbadense*) hybrids

The Initial Evaluation Trial was conducted at CICR, Coimbatore. Of the nineteen entries tested, NFHB 113 recorded the highest yield of 11.67 q/ha, followed by RCHB 21 (10.23 q/ha). The common check DHB 105 recorded a mean seed cotton yield of 10.05 q/ha.

Mean seed cotton yield (Q/ha)

Br.15 (a-I) Set I		Br.15 (a-I) Set II	
DHB 290	12.34	NFHB 113	11.67
RAHB 61	12.04	RCHB 21	10.23
DHB 105 (CC)	11.80	DHB 105 (CC)	10.05
DHB 435	11.27	NFHB 111	9.99
GSHB 8914	11.10	NFHB 112	9.99
NFHB 1010	11.08	DCH 32 (CC)	7.12
DCH 32 (CC)	8.07		

Among the hirsutum genotypes, culture RAH 100 (13.83 q/ha; CC 9.39 q/ha) under irrigated conditions and CPD 473 (11.3 q/ha) and M5KD 26 (11.1 q/ha; CC 8.43 q/ha) under rainfed conditions hold promise. Culture CWROK 165 was found to be suitable for both irrigated (14.4 q/ha; CC 8.8 q/ha) and rainfed conditions (10.8 q/ha; CC 8.4 q/ha).

Among the conventional hybrids, under irrigated conditions, none of the new hybrids tested was significantly superior to the popular hybrid NHH 44. In the Preliminary trial, VARCH 87 (24.8 q/ha) and SNSCH 96 (22.4 q/ha) were superior to the check hybrid NHH 44 (18.3 q/ha). Under rainfed conditions, AH 133 (11.5 q/ha) was superior to common check.

Among the male sterile based hybrids, VCHH 32 (17.7 q/ha) was superior under irrigated conditions.

AGRONOMY

DHARWAD

The promising *G.hirsutum* compact genotypes AH-107, CPD-447 and CPD-448 were found superior to Anjali, with 25-30% yield improvement at spacing of 45 x 30 cms and paired row planting with 30-60-60 cm. In another trial, highest yield of 16 q/ha was recorded with DHH-11 hybrid at 60 x 30 cm spacing and 80-40-40 NPK (kg/ha) under rainfed condition. The response of hybrid cotton to drip irrigation was found better with DHB-1 05 and DHB-11 at 120 x 60 cm spacing and drip irrigation at 100% ET level.

The studies on regulation of crop growth brought out the adverse effects of pruning monopodia and skip row planting pattern on cotton yield. Eventhough the foliar spray of micronutrients and growth regulators in combination had no beneficial effect on rainfed cotton yield. foliar spray of 2% urea during flowering enhanced the yield by 20%. In another study, it was seen that combined application of 100% recommended dose of fertilizers (RDF) and FYM (10 t/ha) produced 43,50 and 116% more seed cotton yield than the application of 100% RDF. FYM alone and control treatments, respectively.

Studies on moisture conservation structures and sowing methods with seed treatment techniques revealed that *in situ* moisture conservation of broad furrow and ridge was superior to ridges and furrow as well as plough sole methods of sowing. Furthermore, it was seen that sowing of cotton in dry soil produced higher yields than normal method and time of sowing. It was found that cultivation of sole crop of cotton was more profitable than intercropping of cotton with redgram under the assured rainfall system.

RAICHUR

Under irrigated conditions, it was seen that pre-emergent application of pendimethalin (1.5 kg ai/ha) along with cultural practice was effective in controlling weeds. Application of poultry manure (5 t/ha) along with recommended fertilizers provided balanced nutrition for cotton under irrigated conditions. The performance of compact genotypes viz., CPD 448 and RHTC-2 was equivalent to Anjali at a spacing of 45 x 30 cm. Foliar spray of MgSO₄ (1%) at 75 and 105 DAS led to 11% increase in yield over control.

ARABHAVI

It was seen that a spacing of 60 x 15 cm for compact genotypes was optimum for obtaining significantly higher seed cotton yield than other spacing. Studies on foliar application of hormones and micronutrients revealed that Mepiquat Chloride (1000 ppm) + NAA (10 ppm) + ZnSO₄ @ 2.5 Kg/ha + FeSO₄ @ 2.5 kg/ha recorded significantly higher kapas yield (11.3 q/ha), followed by MC + NAA + ZnSO₄ (10.8 q/ha) than control (8.72 q/ha) and Mepiquat Chloride alone (9.6 q/ha).

The combined application of FYM, Vermicompost and Crop residues at 33% of recommended doses recorded significantly higher seed cotton yield than applying them individually. In another study, it was seen that *in situ* green manuring sunnhemp in between two rows of cotton recorded significantly higher seed cotton yield, followed by pressmud application.

GUNTUR

It was noticed that varieties L 603 and LPS 2 recorded maximum seed cotton yield of 13 q/ha. As regards to hybrids, LAHH 6 and ARCHH 1858 produced more yields compared to Savita. Among the nitrogen levels, 120 kg N/ha resulted in maximum kapas yield (16.2 q/ha) as compared to 90 kg N/ha (14.6 q/ha).

The pooled results of four year trial on cotton based cropping system clearly revealed the superiority of chilli-cotton-chilli-cotton rotation (Net return Rs. 45,021 per ha) over other combinations. A system of cotton-greengram, cotton-gram, cotton-maize, cotton-mustard and cotton monocropping was found equally remunerative over the years (ranging from net returns of Rs. 32,000 to Rs. 41,000 per hectare)

NANDYAL

It was seen that NHH 233 and NHH 240 yielded around 13 q/ha and the effect of N

levels and spacings could not be ascertained due to prolonged drought. In another study on effect of time of sowing on yield, it was seen that sowing on 30th July and upto August middle resulted in better yield realization.

Influence of date of sowing on seed cotton yield (Q/ha)

Date of Sowing	NARASIMHA	NHH-390	NHH-44
30.7.97	17.6	18.2	20.5
13.8.97	14.3	16.1	18.3
28.8.97	11.4	12.3	14.6
10.9.97	10.3	10.5	11.6

COIMBATORE

Evaluation of new varieties / pre-release cultures under different spacing and fertilizer levels revealed that highest seed cotton yield was obtained under closer spacing of 75 x 45 cm (29,630 plants/ha). The present recommended dose of 80:40:40 kg/ha NPK was on par with the yield obtained under higher dose of 120:60:60 kg NPK/ha.

Four interspecific hybrids were evaluated under two plant spacings and four fertilizer levels. It was inferred that application of fertilizers had resulted in increased kapas yield to an extent of 30% over control (no fertilizer). However, the kapas yield was on par in fertilizer treatments of 90:45:45, 120:60:60 and 150:75:75 kg NPK/ha. In the trial on evaluation of agronomic requirements of interspecific hybrids, it was seen that NHFB 101 (12.4 q/ha) and TCHB 2510 (11.2 q/ha) produced significantly higher yield over DHB 290 (10.1 q/ha) and TCHB 213 (8.4 q/ha).

SRIVILLIPUTHUR

It was seen that higher level of application of 80:40:40 kg/ha of NPK produced higher seed cotton yield (14 q/ha), followed by 60:30:30 (13 q/ha) and 40:20:20 (11.3 q/ha). It was further observed that TSH 188 could be raised with the fertilizer application of 80:40:40 kg/ha of NPK and a spacing of 60 x 45 cm for fetching higher monetary returns.

The cotton based cropping system consisted of cotton (Summer 1997), greengram (Rabi '97) and rice (winter 97-98). It was inferred that in a cotton-greengram-rice crop rotation, the cotton crop can be fertilized with 45 kg N/ha, Azospirillum plus Phosphobacterium, 30 kg P/ha and 30 kg K/ha; and the succeeding greengram crop can be grown with 18.75 kg N/ha and 50 kg P/ha, while the winter rice can be fertilized with 75 kg N/ha and 50 kg/ha each of P and K; the system fetched a cost benefit ratio of 2.37.

KOVILPATTI

It was noticed that var. LRA 5166 and TKH 1175 produced higher seed cotton yield and the optimum spacing was 45 x 15 cm and fertilizer level being 40:20:20 kg NPK/ha. The

investigation on integrated weed management practices revealed that intercropping of cotton with greengram/cowpea, combined with pre-emergence application of Butachlor @ 2.0 lit/ha and one hand weeding at 40 DAS registered significantly lesser weed population and higher seed cotton yield.

In another study on land configuration and rainwater management, it was seen that compartmental bunding resulted in higher number of bolls per plant, sympodia and boll weight. Significantly higher seed cotton was obtained under mulching with farm wastes which was comparable to dust mulching.

PLANT PHYSIOLOGY

DHARWAD

The study on evaluation of cotton genotypes for drought tolerant characters elucidated the role of higher percent canopy light transmission, higher stomatal conductance, lower canopy transpiration etc. in the genotypes viz., NA 1588 (11 q/ha) and CPD 423 (10.9 q/ha).

Combinations of foliar sprays of 1.5% DAP and 1 % MgSO₄ resulted in higher seed cotton yield, as against DAP spray alone and control. It was seen that significantly higher seed cotton yield could be obtained with individual application of 1 % MgSO₄ (9.5 q/ha), followed by Mepiquat Chloride at 2000 ppm (9.3 q/ha) compared to control (8.0 q/ha). Foliar sprays of sodium benzoate and acetyl salicylic acid at 75 and 90 DAS resulted in significantly higher yields than control, mainly because of more number of good opened bolls, in *G. barbadense* var. SB 289 E.

GUNTUR

The classification of genotypes using different drought tolerance parameters viz., High chlorophyll stability index, high specific leaf weight, high relative water content, etc. has been done. Based on mean salinity index of germination, var. 613, C 256-4, CPD 473, L 604, L 603 and NSPHH 1 have been identified as relatively saline tolerant genotypes. The mean salinity index of seedling survival was found to be more in L 603, L 604, L 613, C 256 4, LAHH I indicating their inherent capacity to survive under stress.

SRIVILLIPUTHUR

The genotypes SVPR-2, CDE-I, AH 140, TSH 288, TSH 188, TSH 192, ICMF 23 have been seen to possess higher RWC (90%) and dry matter production alongwith better yield attributing parameters. The favourable morphophysiological attributes of SVPR-2, TSH 188, LH 900 helped them in efficient partitioning of the dry matter produced towards better seed cotton yield. The effect of methanol (20%) spray at 75 DAS stage on morphological characters and yield was seen favourable with 10% higher yield than control. However, other combinations of spray of methanol were seen at par or reducing the yields than control.

ENTOMOLOGY

Seasonal Pest Incidence

The Jassid and the bollworm, *Helicoverpa armigera* were the major pests causing considerable yield loss. Both pests appeared in the month of September - October and continued to remain above ETL throughout the cropping season. In Dharwad, the larval density of *H armigera* was up to 20 ~ 25 larvae per plant. In Coimbatore, during December - January, both jassid and the *Harmigera* were high. In Andhra Pradesh, in addition to these pests, there was an unusual outbreak of leaf worm (*Spodoptera litura*) and pink bollworm in November and December.

The cyclonic weather that prevailed during the months of November - December with high humidity and night temperature favoured the outbreak of *Harmigera* and *S.litura* in the nontraditional cotton growing regions of War an gal, Khammam and Karimnagar districts, causing 30-40 percent yield loss.

Screening for resistance to insect pests

In the preliminary screening of breeding material for resistance to leaf hopper and bollworms, the hirsutum entries 7452, 7622 and 7689; TKA 9410 of arboreum and Desi hybrid 2519 were found to be tolerant and gave higher yield.

Evaluation of new molecules

Several new molecules were evaluated against bollworms and the compound, RH 2485, thiodicarb and micro encapsulated quinolphos were found to be effective and registered low boll damage (4.1-5.9%) as against 16.5% on control. The treatments also recorded higher seed cotton yield by 69-123% over control. Amitraz@ 300 g ai/ha was also found effective against American bollworm.

Two new molecules, imidacloprid and difenthiuron, were effective against leafhopper for 40 and 70 days, respectively. The pheromone compound "*sirene*" (applied twice during the peak infestation of pink bollworm) was effective and registered low boll damage on loculi basis (9.3%) as against 25.8% in control.

Integrated Pest Management and influence of mixed cropping in cotton

Three IPM modules were compared for their effectiveness against cotton pests. Adoptable IPM module comprising seed treatment (Imidacloprid), application of biorationals (Neem/NPY/*Trichogramma*) and restricted application of insecticides based on ETL, recorded higher yield (20.2 q/ha) as compared to farmers practice (18.5 q/ha).

Cotton inter-cropped with groundnut / sorghum / marigold / soybean had less damage by *Harmigera*, 12.2-15.6 % as against 22.3% in cotton alone.

In all the zones the new synthetic pyrethroids evaluated almost remained on par with already existing pyrethroids / chlorpyrifos in reducing bollworm incidence and *H armigera* larval population. However, all the pyrethroids observed to induce the resurgence of white fly (*B. tabaci*), the vector of the CLCV disease. Hence, the industry should look into this aspect as this disease causes considerable yield loss.

In South and Central zone, the insecticide dimethoate was observed to be ineffective against sucking pests, particularly jassid and aphid.

In all the zones, the moult inhibiting chemicals RH 2485 recorded less bollworm incidence and *H armigera* population.

In many centres, the Ha NPV alone has not given encouraging performance in reducing the larval populations of bollworm.

PLANT PATHOLOGY

In Karnataka, severe incidences of **Alternaria leafspot** and bacterial leaf blight were noticed on hirsutum, barbadense and hybrid cottons and only **grey mildew** and **alternaria leaf spot** on desi cottons at Dharwad, Siruguppa and Arabhavi. **Fusarium wilt** (25% incidence) was noticed at Raichur on NHH 44.

In Tamil Nadu, low to moderate incidence of Alternaria leaf spot, grey mildew and bacterial blight was noticed in the cotton tracts. In Andhra Pradesh, only grey mildew was observed at low to moderate intensities. Bacterial blight, alternaria leaf spot and rust were absent.

In the screening trial for disease resistance, seven lines viz., AKH 4, K 53-519, 30802, 30814, G 112, B-Desh and TI/57-1-1 have shown resistance to bacterial blight, alternaria leaf spot, grey mildew and rust, whereas in Tamil Nadu 10 lines have shown resistance to grey mildew and alternaria leaf spot.

Grey mildew caused a yield loss of 11.5% in naturally infected condition. The biological agent *Pseudomonas fluorescens* was found as effective as carbedazim in reducing the grey mildew disease incidence both in Tamil Nadu and Karnataka.

At Coimbatore, Prochloraz was as effective as carbendazim in the management of grey mildew, whereas Tridemorph gave maximum disease reduction in Karnataka.

BREEDER SEED PRODUCTION

The progress of breeder seed production during the year 1997-98 was quite satisfactory. As against the total Government of India indent of 21.73 q/ha for the parents of Hybrids and 81.21 q/ha for varieties, the overall production was 105.29 q/ha for the parents of hybrids and 161.97 q/ha for the varieties.

Breeder Seed Production Figures for 1997-98 and Indent for 1998-99

(I) VARIETIES

Quintals

Figures in

S.No.	Name of Variety	Producing Centre	1997-98		1998-99
			Indent	Production	Indent
1.	F 505	PAU, Faridkot	4.48	5.80	4.05
2.	F 846	PAU, Faridkot	20.09	13.50	21.05
3.	F 1378	PAU, Faridkot	-	-	16.70
4.	LD 327	PAU, Faridkot	0.30	1.20	6.70
5.	LH 900	PAU, Faridkot	1.00	-	0.90
6.	LH 1556	PAU, Faridkot	-	-	8.60
7.	HD 107	HAU, Hisar	0.10	15.70	-
8.	H 777	HAU, Hisar	5.09	3.80	3.68
9.	HS 6	HAU, Hisar	7.40	16.60	7.50
10.	BN	ARS, Sriganaganagar	6.15	2.00	3.40
11.	RST9	ARS, Sriganaganagar	13.24	0.50	7.07
12.	GN Ageti	ARS, Sriganaganagar	1.70	1.30	1.25
13.	RG8	ARS, Sriganaganagar	12.26	21.00	6.21
14.	PUSA 8-6	IARI, New Delhi	-	-	1.00
15.	VIKAS	CAUT, Kanpur	0.60	1.40	2.00
16.	VIKRAM	JNKVV, Khandwa	-	-	0.04
17.	KHANDWA-2	JNKVV, Khandwa	-	-	0.04
18.	PKV,RAJAT	PKV, Akola	1.72	32.60	2.30
19.	Y-I	PKV, Akola	1.05	-	-
20.	DHY 286	PKV, Akola	-	-	5.72
21.	AKA 081	PKV, Akola	-	-	2.75
22.	AKA 5	PKV, Akola	-	-	9.25
23.	AKA 8401	PKV, Akola	-	-	4.70
24.	NH 452	MAU, Nanded	-	-	1.47
25.	ABHADITA	UAS, Dharwad	0.95	0.60	0.54
26.	LRA 5166	CICR, Coimbatore	26.14	29.10	13.78
27.	ANJALI	CICR, Coimbatore	8.80	12.46	9.16
28.	MCU 5VT	CICR, Coimbatore	2.12	2.00	2.15
29.	SUPRIYA	CICR, Coimbatore	1.10	1.00	-
30.	SUVIN	CICR, Coimbatore	0.11	0.11	-
31.	SURABHI	CICR, Coimbatore	-	-	1.05

32.	MCU 5	TNAU, Coimbatore	1.50	1.00	0.99
33.	NARASIMHA (NA 1325)	APAU, Guntur	0.25	0.30	-
	Variety Total		81.21	161.97	146.05

Breeder Seed Production figures for 1997-98 and Indent for 1998-99

(II) HYBRIDS

Figures in Quintals

Sl. No.	Name of Hybrid / Parental lines	Producing Centre	1997-98		1998-99
			Indent	Production	Indent
1.	Fateh LH 600 Suman	PAU, Ludhiana	- -	- -	0.02 0.01
2.	Raj HH 16 Female Male	RAU, Sriganaganagar	- -	- -	0.10 0.04
3.	Dhanalaxmi Female Male	HAU, Hisar	0.10 0.05	- -	0.10 0.04
4.	JK Hy.1 Khandwa 2 Reba B 50	JNKVV, Khandwa	0.19 0.13	0.40 0.15	0.50 0.31
5.	Hybrid 4 G.67 A.Nectariless	GAU, Surat	0.15 0.08	3.48 2.83	- -
6.	Hybrid 6 G.Cot. 100 G.Cot. 10	GAU, Surat	1.12 0.65	25.13 18.00	0.39 0.28
7.	Hybrid 8 G.Cot.10 Surat Dwarf	GAU, Surat	1.19 0.83	18.06 11.74	0.36 0.29
8.	Hybrid 10 BC 68-2 (F) LRA 5166 (M)	GAU, Surat	- -	- -	0.28 0.14

9	NHH 44 BN – 1 AC 736	MAU, Nanded	5.21 2.86	2.00 2.00	1.27 0.71
10.	PKV Hy.2 AK 32 DHY 286 – 1	PKV, Akola	0.25 0.14	4.90 4.50	0.61 0.42
11.	PKV Hy. 3 CAK 32 A CAK 32 B DHY 286 R	PKV, Akola	0.35 0.18 0.18	3.40 - 2.00	- - -
12.	DCH 32 DS 28 (F) SB 425 YF	UAS, Dharwad	2.40 1.75	2.50 1.20	1.12 0.65
13.	VARALAXMI Laxmi SB 289 E	UAS, Dharwad	1.19 0.71	0.50 0.58	0.30 0.23
14.	SAVITA T 7 M 12	CICR, Coimbatore	1.29 0.73	1.22 0.70	0.53 0.28
	Hybrid Total		21.73	105.29	8.98

FRONTLINE DEMONSTRATION

It is noticed that there is a gap between the yield potential of the genotypes observed in the research farms and the yield realised by the farmers. Again based on the level of adoption, there is lot of variability in productivity. To bridge this gap, the Indian Council of Agricultural Research launched the Frontline Demonstration (FLD) Programme. The AICCIP has been entrusted with the task of implementing the programme in Cotton from *kharif*, 1995.

The main objectives of the FLD are:

- To demonstrate the usefulness of the latest improved production and protection technologies to the farmers as well as extension workers with a view to reduce the time gap between the technology generation and its adoption by the farmers.
- To enable the scientists obtain direct opinion so that they can reorient their research programmes, accordingly.
- To create effective linkage among scientists, extension personnel and farmers.

Nodal Agency

The AICCIP acts as the nodal agency for conducting the FLD programmes in the Country. The Project Coordinator (Cotton) coordinates and monitor the implementation of the FLD programme from the Headquarters situated at Central Institute for Cotton Research, Regional Station, Coimbatore.

The FLD programmes are organised at eleven main centres and fifteen sub-centres of AICCIP network. Besides, CICR, Nagpur and its Regional Stations at Coimbatore and Sirsa, Voluntary centres of the Agricultural Universities and Dept. of Agriculture, Govt. of Tamil Nadu also participated in the programme.

Financial outlay

The Ministry of Agriculture and Cooperation, Govt. of India finances the FLD Programme. During the year 1997-98, 760 demonstrations were approved with a financial outlay of Rs. 20 lakhs. The centre wise details of the technologies taken up for demonstrations are furnished in Table.

Table: Centre wise details of the technologies demonstrated during 1997-98

CENTRE	No. of FLD trials conducted	Technologies Demonstrated
<u>North Zone</u> PAU, Ludhiana	70	Demonstration of new varieties/ hybrids – F 846, F 1378, LH 1556, F 1054, Fateh hybrid, LHH 491, LD 491 and LD 327
HAU, Hisar	70	1. Variety/hybrids-HD 107, HS 6, HS 182, HD 123, H 777, H 974 and H 1098 2. Spacing experiment 3. Integrated nutrient management 4. Integrated Pest and Disease management
CICR, Sirsa	35	Demonstration of new hybrid Om Shankar against HS 6 and F 846
RAU, Sriganganagar	9	Demonstration of improved package of practices over local practice in genotypes RS 875 and RST 9
<u>Central Zone</u> GAU, Surat	75	Newly released varieties/hybrids-G.Cot 16, G.Cot 17 & G.Cot Hy 10 were demonstrated for their yield potential

JNKVV, Khandwa	25	Newly released variety/hybrids were demonstrated for their yield characteristics
Orissa	10	Hybrid Savitha was tested against local cultivars
PKV, Akola	30	Demonstration of superiority of PKV Hy 4 over other popular hybrids PKV Hy 2, PKV Hy 3 and Nanded 44
MPKV, Rahuri	30	Demonstration of improved package of practices over local practice
MAU, Nanded	30	Demonstration of improved package of practices over local practice both under irrigated and rainfed conditions
CICR, Nagpur	35	<ol style="list-style-type: none"> 1. Cotton-Wheat rotation with use of slow release N fertilizer 2. Integrated Pest Management
<u>South Zone</u> APAU, Guntur	15	Demonstration of IPM package involving growing of jassid resistant L 604 variety, stem application of monocrotophos and use of sesame oil synergist mixed with endosulfan/Chlorpyrifos to control bollworms
UAS, Dharwad	75	Demonstration of newly released hybrid DHB 105 against popular hybrid DCH 32 and DHH 11 against NHH 44
UAS, Shimonga	25	Demonstration of newly released hybrid DHB 105 against popular hybrid DCH 32
CICR, Coimbatore	70	Extra long staple hybrid Savita and Variety Surabhi were demonstrated under winter irrigated conditions: Variety Anjali was demonstrated in summer rice fallow tracts.
TNAU, Coimbatore	60	Demonstration of improved package of practices over local practice. Hybrid trials with TCHB 213, Savitha and DCH 32

CENTRE – WISE STAFF POSITION

S.No Name of the post sanctioned Name of the incumbent

Punjab Agricultural University, Ludhiana

1	Sr. Cotton Breeder	Vacant
2	Sr. Pathologist	Dr. B.L. Chopra
3	Sr. Agronomist	Dr. A.S. Brar
4	Asst. Entomologist	Dr. R.S. Gill
5	Asst. Breeder	Dr. R.S. Sohu
6	Asst. Breeder	Shri Manjit Singh
7	Asst. Pathologist	Dr P.S. Sekhon
8	Asst. Physiologist	Vacant
9	Technical Assistant	Shri Avatar Singh
10	Technical Assistant	Shri Harmesh Kumar
11	Technical Assistant	Shri Harpal Singh
12	Technical Assistant	Shri Mangal Singh
13	Jr. Stenographer	Shri Ashok Kumar
14	Jr. Asst	Shri. Roop Lal
15	Lab Attendant	Shri. Mohinder Singh
16	Lab Attendant	Shri. Bihari Lal

Punjab Agricultural University, Regional Station, Faridkot

1	Sr. cotton Breeder	Dr. H.R. Garg
2	Asst. Agronomist	Shri. Jasminder Singh Brar
3	Asst. Entomologist	Shri. Ravinder Singh
4	Asst. Pathologist	Dr. Daljit Singh
5	Technical Assistant	Shri. Major Singh
6	Technical Assistant	Shri. Gujant Singh
7	Technical Assistant	Shri. Gurmail Singh
8	Technical Assistant	Shri. Nachhattar Singh
9	Lab Attendant	Shri. Narinder Singh

Haryana Agricultural University, Hisar

1	Sr. Scientist (Cotton)	Dr. B.P.S. Lather
2	Cotton Breeder	Dr. S.S. Siwach
3	Sr. Entomologist (Cotton)	Dr. P.D. Sharma
4	Sr. Agronomist (Cotton)	Dr. L.K. Bishnoi
5	Sr. Pathologist (Cotton)	Dr. M.S. Chauhan
6	Sr. Soil Chemist (Cotton)	Dr. A.P. Sharma
7	Sr. Biochemist (Cotton)	Dr. A.D. Taneja

Rajasthan Agricultural University, Regional Station, sirganganagar

1	Sr. Cotton Breeder	Dr. R.P. Bhardwaj
2	Cotton Agronomist	Dr. P.L. Nehra
3	Asst. Entomologist	Dr. A.P. Singh
4	Asst. Cotton Breeder	Dr. C.J. Kapoor
5	Asst. Plant Pathologist	Dr. B.D. Ajmera
6	Technical Assistant	Shri. U.V. Singh
7	Technical Assistant	Shri. S.S. Gupta
8	Technical Assistant	Shri. S.M. Yadav
9	Technical Assistant	Shri. S.R. Kumawat
10	Technical Assistant	Smt. N.R. Meena
11	U.D.C.	Shri. Hira Lal Sarswa
12	L.D.C.	Shri. Rishi Kumar Sharma
13	Plouhman	Shri. Mohan Lal
14	Ploughman	Shri. Sohan Lal
15	Peon	Shri. Ram Chander

Rajasthan Agricultural University, Agricultural Research Station, Banswara

1	Asst. Professor (Breeding)	Shri. P.K Rokadia
2	Asst. Professor (Agronomy)	Shri. Pramod Dashera
3	Technical Asst.	Shri. Ram Pratap
4	Technical Asst.	Shri. Dilip Singh
5	L.D.C.	Shri. U.S. Rana

C.S. Azad University of Agriculture and Technology, Mathura

1	Asst. Breeder	Dr. S.c. Rajput
2.	Asst. Agronomist	Vacant
3	Technical Asst.	Shri.. M.M. Agrawal
4	Technical Asst.	Shri .. Narandra Singh
5	Clerk	Shri. Ratan Singh

Gujarat Agricultural University, Surat

1	Assoc. Res. Sci. (Bot)	Dr. J.C. Patel
2	Assoc. Res. Sci. (Phy)	Dr. Vijay Kumar
3	Assoc. Res. Sci. (Ento.)	Dr. M.P. Vadodaria
4	Assoc. Res. Sci. (Agro)	Shri. M.S. Patel
5	Assoc. Res. Sci. (GNPB)	Shri. P.G. Patel
6	Asst. Res. Sci. (Path)	Shri. K.B. Patel
7	Asst. Res. Sci. (Ento)	Shri. I.M. Maisuria
8	Asst. Res. Sci. (Chem)	Shri. R.G. Vashi
9	Tech. Asst. (Agrl. Supervisor)	Vacant
10	Agrl. Supervisor	Vacant

11	Agri. Supervisor	Shri. H.K Chaudhari
12	Agri. Supervisor	Vacant
13	Agri. Supervisor	Shri. B.G. Rathod
14	Field man	Shri. G.G. Patel
15	Field man	Shri. R.B. Patel
16	Field man	Shri. R.A. Vasava
17	Field man	Shri. S.C. Patel
18	Lab. Attendant	Vacant
19	Field man	Shri. J.V. Shah
20	Sr. Clerk	Shri. N.U. Desai
21	Jr. Clerk	Smt. B.C. Patel
22	Jr. Clerk	Shri. N.C. Patel
23	Peon/Lab. Boy	Shri. D.B. Chaudhari

Gujarat Agricultural University, Junagadh

1	Assoc. Res. Sci.	Dr. C.M. Raval
2	Agri. Officer	Shri. R.L. Vasoya
3	Agri. Officer	Shri. V.B. Vasoya
4	Junior Clerk	Shri. H.N. Vakharia
5	Chokidar	Shri. M.H. Bagthia

Gujarat Agricultural University, Viramgam

1	Assoc. Res. Sci.	Dr. S. Acharya
2	Agri. Officer	Shri. B.G. Patel
3	Agri. Officer	Vacant
4	Junior Clerk	Shri. R.N. Dave

Gujarat Agricultural University, Talod

1	Associate Research Scientist	Dr. M.H. Patel
2	Technical Assistant	Shri. R.M. Dodiya
3	Technical Assistant	Shri. A.K. Parmar
4	Junior Clerk	Shri. B.K. Zala
5	Peon	Smt. G.C. Makawana

Jawaharlal Nehru Krishi Vishwa Vidyalaya, Indore

1	Asst. Breeder	Shri. Rajesh Julka
2	Asst. Agronomist	Shri. R.S.S. Tomar
3	Technical Assistant	Shri. A.L. Kushwaha
4	Technical Assistant	Shri. S.C. Pandey
5	L.D.C.	Shri. D.K. Sharma
6	Peon/Chowkidar	Shri. Kishan
7	Peon/Chowkidar	Shri. N.K. Mandawkar

Jawaharlal Nehru Krishi Vishwa Vidyalaya, Khandwa

1	Sr. Scientist (Pl. Breeding)	Dr. K.C. Mandloi
2	Agronomist	Dr. S.K. Khampariya
3	Entomologist	Vacant
4	Asst. Entomologist	Shri. R.K. Choudhary
5	Asst. Pathologist	Vacant
6	Asst. Physiologist	Dr. U.S. Mishra
7	Asst. Breeder	Dr. G.K. Koutu
8	Technical Assistant	Shri. B.S. Bagri
9	Technical Assistant	Shri. A.P. Upadhaya
10	Technical Assistant	Shri. J.K. Sharma
11	Technical Assistant	Vacant
12	Technical Assistant	Vacant
13	U.D.C.	Shri. A.K. Sharma
14	Peon	Shri. S.B. Singh
15	Jeep Driver	Vacant
16	F.E.O.	Shri. Z.A. Ansari

Jawaharlal Nehru Krishi Vishwa Vidyalaya, Badnawar

1	Asst. Breeder	Vacant
2	Asst. Agronomist	Shri. M.K. Shrivastava
3	Technical Assistant	Shri. Sudhanshu Jain
4	Technical Assistant	Shri. K.C. Jain
5	L.D.C.	Shri. B.D. Mourya
6	Peon	Shri. Ambaram

Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola

1	Sr. Research Scientist	Dr. L.D. Meshram
2	Cotton Agronomist	Dr. S.T. Wankhade
3	Asst. Entomologist	Shri. H.G. Dandale
4	Asst. Pl. Pathologist	Shri. M.R. Patil
5	Technical Assistant	Shri. R.A. Naphade
6	Technical Assistant	Shri. B.A. Sakhare
7	Technical Assistant	Dr. A.Y. Thakre
8	Technical Assistant	Vacant
9	Field man	Shri. S.N. Deokar
10	Section Asst./Store Keeper/Typist	Shri. K.L. Sapture
11	Section Asst./Store Keeper/Typist	Shri. G.A. Thakre
12	Attendant/Peon	Shri. S.R. Deshmukh

Mahatma Phule Krishi Vidyapeeth, Rahuri

1	Cotton Breeder	Dr. S.S. Mehetre
2	Cotton Pathologist	Dr. S.S. Lambhate
3	Cotton Agronomist	Dr. V.S. Mane
4	Cotton Entomologist	Prof. R.N. Nawale
5	Technical Assistant	Shri. N.D. Jadhav
6	Technical Assistant	Shri. S.R. Zanjare
7	Typist	Shri. G.B. Dhat
8	Peon	Shri. P.B. Aghav

Mahatma Phule Krishi Vidyapeeth, Padegaon

1	Asst. Cotton Breeder	Prof. R.Y. Jadhav
2	Asst. Cotton Agronomist	Prof. S.B. Kadam
3	Junior Research Assistant	Shri. S.R. Lohate
4	Junior Research Assistant	Shri. N.J. Danawale
5	Jr. Clerk	Shri. V.H. Patel
6	Watchman	Shri. J.R. Pawar

College of Agriculture, Pune

1	Junior Pathologist	Prof. J.B. Mali
2	Technical Assistant	Shri. AC. Jadhav
3	Technical Assistant	Shri C.T. Kumbhar
4	Technical Assistant	Smt. S.N. Charati (S.B. Patil)
5	Technical Assistant	Smt. S.R. Salke
6	Technical Assistant	Miss. R.D. Nimbalkar
7	Stenographer	Smt. M.M. Bapat
8	Clerk	Shri. V.G. Mohol
9	Peon/Chowkidar	Shri. G.K. Gaikwad

Marathwada Agricultural University, Nanded

1	Associate Breeder	Dr. A.S. Ansingkar
2	Asst. Breeder	Dr. S.S. Bhatade
3	Asst. Agronomist	Dr. N.N. Narkhade
4	Asst. Pathologist	Prof. K.G. More
5	Asst. Entomologist	Prof. R.C. Lavekar
6	Technical Asst.	Dr. M.D. Bhalerao
7	Technical Asst.	Shri. N.S. Dongre
8	Technical Asst.	Shri. G.R. Asolekar
9	Technical Asst.	Shri. R.B. Parihar
10	Technical Asst.	Shri. B.V. Patil
11	Driver	Shri. S.D. Naikhede
12	Peon	Shri. Manika Maroti

Tamil Nadu Agricultural University, Coimbatore

1	Sr. Scientist (Cotton)	Dr. T.S. Raveendran
2	Associate Prof. (Entomology)	Dr. S. Mohan
3	Associate Prof. (Agronomy)	Dr. V Chellamuthu
4	Associate Prof. (Pathology)	Dr. K. Eraivan Arutkani Aiyathan
5	Agricultural Supervisor	Shri. R. Radhakrishnan
6	Agricultural Supervisor	Shri M. Ragupathy
7	Agricultural Supervisor	Shri. M. Subramanian
8	Typist	Smt. Thillaikarasi
9	Lab Assistant	Shri. S. Kurnaran
10	Office Assistant	Shri. R. Karuppuswamy

Tamil Nadu Agricultural University, Srivilliputhur

1	Associate Prof. (PI. Breeding)	Dr. A. Ramalingam
2	Assistant Prof. (PI. Breeding)	Dr. M. Gunasekaran
3	Associate Prof. (Agronomy)	Dr. P. Jayapaul
4	Assistant Prof. (Entomology)	Dr. S. Subramanian

Tamil Nadu Agricultural University, Kovilpatti

1	Assistant Prof. (Entomology)	Shri. V Rajaram
2	Associate Prof. (Agronomy)	Shri. S. Senthivel
3	Assistam Prof. (Ag. Botany)	Smt. T.P. Ghanamalar

Acharya N.G. Ranga Agricultural University, Lam, Guntur

1	Senior Scientist	Dr. C. Ragunatha Rao
2	Entomologist	Dr. N. Hari Prasada Rao
3	Asst. Entomologist	Dr. B. Rama Rao
4	Asst. Breeder	Shri. J.S.V. Sumba Murthy
5	Asst. Agronomist	Dr. K. Krishna Rao
6	Asst. Physiologist	Smt. S. Ratna Kumari
7	Technical Assistant	Shri. P. Seetha Ramaiah
8	Technical Assistant	Shri. P. Prakasam
9	Clerk	Smt. V Ananda Bala
10	Peon	Shri. V. Sambasiva Rao

Acharya N.G. Ranga Agricultural University, Nandyal

1	Asst. Breeder	Shri. D. Balikondappa
2	Asst. Entomologist	Dr. A. Sreedhara Rao
3	Asst. Agronomist	Shri. Rangaswamy Reddy
4	Asst. Agronomist	Kum. C. Sudha Rani

University of Agricultural Sciences, Agricultural Research Station, Dharwad

1	Sr. Scientist (Cotton)	Dr. B.M. Khadi
2	Agronomist	Dr. H.L. Halemani
3	Entomologist	Shri. K.S. Panchabhavi
4	Pathologist	Dr. S.N. Chattannavar
5	Asst. Physiologist	Dr. B.S. Janagoudar
6	Asst. Biochemist	Dr H.M. Vamadevaiah
7	Asst. Cotton Breeder	Dr. V.N. Kulkarni
8	Asst. Entomologist	Shri. S.B. Patil
9	Research Asst.	Shri. M.R. Eshanna
10	Research Asst.	Shri. R.B. Naik
11	Research Asst.	Dr. S.V. Hiremath
12	Research Asst. (5 Posts)	Vacant
13	Field Assistant	Vacant
14	Typist/clerk	Vacant
15	Sr. Messenger	Shri. R.C. Chulki
16	Sliver maker	Shri. N.S. Kurabagatti

Agricultural Research Station, Siruguppa

1	Assistant Agronomist	Shri. M.A. Basavannappa
2	Asst. Cotton Breeder	Shri. J.M. Nidagundi
3	Research Assistant	Vacant
4	Research Assistant	Vacant
5	Field Assistant	Shri. Veeranna
6	Typist	Shri. H. Lakshmappa
7	Watchman	Shri. Kasimsab Hussainsab

Agricultural Research Station, Arabhavi

1	Asst. Cotton Breeder	Shri. N. G. Hanamaratti
2	Asst. Agronomist	Shri. C. P. Chandra Sekar
3	Sr. Technical Asst.	Vacant
4	Sr. Technical Asst.	Vacant
5	Field Asst.	Shri. VB. Hosamani
6	Watchman	Shri. U.c. Lamani

PUBLICATIONS

Punjab Agricultural University, Ludhiana

Research Articles

1. Kalsy, H.S., T.H. Singh, H.R. Garg, G.S. Chahal, L.S. Randhawa, Pankaj Rathore and P.S Nagi. 1997, F. 1378. A high yield potential variety of American cotton submitted to 1. Research.
2. Singh, Daljeet, R.S. Singh and H.V. Singh, 1997. Effect of Fungal antagonists on the growth of chickpea plants and wilt caused by *Fusarium Oxysporum* f. sp. ciceri. Plant Disease Research, 12:1 03-104.

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3. Singh, Daljeet, H.S. Kalsy, Pankaj Rathore, Ravinder Singh and Kuldeep Singh (1998). Screening of cotton (*Gossypium hirsutum* L.) germplasm lines/cultivars against cotton leaf curl virus (CLCuV). Abstract 50th annual meeting of Indian Phytopathological Society held at Dr. B.A. Marathwada University, Aurangabad from Feb. 17-19, 1998.
4. Singh, RS, Daljeet Singh, H.V. Singh and R.D. Bansal. (1997). Impact of various fungicidal seed treatment on establishment of VA-mycorrhizal association pp.299. In: Third Agricultural Science Congress, PAU, Ludhiana, March 12-15,1997.

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2. A.D. Taneja, P.D. Sharma, A.P. Sharma and B.P.S. Lather (1997). "Effect of different levels of pink bollworm infestation on biochemical composition of cotton seeds of various genotypes", J. Indian Soc. Cotton Improv. Sept. (1997), pp 151-154.
3. Jai Kashyap, J.C. Sharma, V.K. Gupta and A.D. Taneja (1997). "Effect on zinc on growth and yield characters and uptake by different parts of two cotton cultivars. Agri. Sci. Digest, 17 (2) 83-86.
4. A.D. Taneja, A.P. Sharma, S.S. Siwach and V.K. Madan (1998). "Effect of harvest dates on biochemical composition of cotton seeds and fibre quality of different *hirsutum* cotton cultivars. J. Cotton Res. and Development (1998), pp. 18-30.
5. A.P. Sharma, A.D. Taneja, L.K. Bishnoi, V.K. Madan & B.P.S. Lather (1998). "Influence of sources and levels of sulphur on yield, seed composition and fibre properties of *G. hirsutum*". J. Cotton Res. and Development, pp 14-17.
6. A.D. Taneja, A.P. Sharma, S.S. Siwach (1998). "Effect of harvest dates on biochemical composition of cotton seeds of different *G. hirsutum* cultivars. J. Indian Soc. Cotton Improv., March (1998), pp. 103-109.
7. Bishnoi, L.K., Surinder Singh and A.P. Sharma (1997). "Studies on time of sowing and nitrogen levels on promising genotypes of cotton (*G. hirsutum* L) in southern region of Haryana. Haryana J. Agronomy, 13 (2): 23-25.

8. Sharma, G.N. and Sharma, P.D. (1997). "Studies on the biology and development of cotton leafhopper *Amrasca biglittlila* on different genotypes of *G. hirsutum*. Annals. Agri. Bio Research, 1 (1-2): 181-186.
9. Sharma, P.D., and Jaglan. M.S. (1997). Field evaluation of neem formulation as deterrents for egg laying against *Helicoverpa armigera* on cotton. National J. Pl. Improvement, 1 (1): 100-101.
10. Sharma, A.P.; Sharma, P.D., Madan V.K., Taneja, A.D. and Lather, B.P.S (1997). "Effect of Nitrogen and Potassium on insect incidence and fibre qualities of cotton *G. hirsutum*. J. Cotton Res. & Devt., 11 (1): 16-21.
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12. Pala Ram, Sharma, P.D. and Chaudhary, S.D. (1997). Evaluation of inundative releases of *Trichogramma chilonis* against bollworm pests of cotton. J. Cotton Res. & Devt., 11 (1) : 116-119.
13. Sharma, G.N. and Sharma, P.D. (1997). Population dynamics of cotton and okra in relation to physical factors of environment. Annals of Biology, 13 (1) : 179-183.
14. Shanna, P.D., Yadav, P.R., Jaglan, M.S. and Viond Kumar. (1997). Role of destroying crop remains in the management of insect pests of cotton. Haryana Farming, 27 (3) : 11-13.
15. Sharma, P.D., and Sharma, S.D., (1997). Integrated Pest Management in Cotton. Indian Farmers Digest, 30 (8) : 7-10.
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2. Sharma, P.D., Maha Singh, Vinod Kumar and Lather, B.P.S., (1997). Relative efficacy of different Modules for the management of bollworm pests in cotton. Third Agri. Sc. Congress held at PAU, Ludhiana during March 12-15, 1997.

Gujarat Agricultural University, Surat

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3. Patel, J.C., Patel, R.H., Patel, D.H., Patel, M.V. and Modi, N.D., (1997). Asiatic hybrids cotton performance through GMS : Heterosis and combining ability.
4. Modi, N.D., Patel, J.C., Patel, D.H. and Maisuria, A.T., (1997). Heterosis and combining ability in desi cottons.
5. Patel, D.H., Patel, R.H., Patel, J.C., Patel, K.M. and Modi, N.D., (1997). Stability analysis and seed cotton yield of materials developed through multi species crosses.
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8. Patel, P.G., Patel, R.H., Vora, M.S., Patel, M.S., Patel, D.M., Sankat, K.B. and Sutaria, C.M., (1997). Studies on phosphatic solubilizing micro organism cultures on growth of G.Cot.Hy-8.
9. Vadodaria, M.P., Patel, R.H. Patel, R.B. and Patel, J.R., (1997). Testing of Bio-pesticide Dipel as a component of Integrated Pest Management for cotton bollworms.

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1. Patel, P.G., Patel, U.G., Patel, M.S., Patel, D.M. and Sankat, K.B. (1997). Double cropping with cotton hybrids in relation to sowing time.

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1. Modi, N.D., Patel, R.H., Patel, J.C., Patel, D.H. and Maisuria, A.T., (1997). Environmental effects on varietal performance of asiatic cotton (*G. herbaceum* L.)
2. Kumar, V., Moradia, S.V., Somani, V.J., Gohil, M.D. and Patel R.H., (1998). Genotypic response of cotton (*Gossypium* spp) to *in vitro* micropropagation.
3. Patel, J.C., Patel, R.H., Modi, N.D. and Patel, M.V, (1998). GMS based seed production in asiatic cotton - Combining ability for yield and contributing characters.

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2. Patel, J.C., Patel, R.H., Pavasia, M.J. and Patel, D.H., (1997). Morpho-bio chemical traits for breeding pests and disease resistance in cotton.
3. Modi, N.D., Patel, R.H., Vadodaria, M.P., Patil, P.V. and Maisuria, A.T., (1997). Breeding for pest and diseases resistance in asiatic cotton.
4. Patel, K.B., Patel, R.H., Vadodaria, M.P., Pathak, V.D. and Maisuria, M.J. (1997). Breeding for pests resistance in upland cotton.
5. Patel, P.G. and Patel, A.R., (1997). Hybrid seed production technology in cotton.
6. Vadodaria, M.P., Patil, R.B., Patel, C.J. and Patel, R.H., (1997). Integrated Pest Management in cotton.
7. Bandhania, K.A., Vadodaria, M.P. and Patel, R.H., (1997). Mass multiplication for production of parasites and predators for cotton pests.
8. Patel, P.G., Patel., M.S., Patel, D.M., Sutaria, C.M. and Bandhania, K A., (1997). Insect Pest Management of cotton through cultural practices.
9. Kumar, V. Gohil, M.D. and Patel, R.H. (1997). Physiological approaches to pest management in cotton.
10. Patel, R.H., Patel, J.C., Modi, N.D., Patel, P.G., Patel, K.M. and Patel, K.B. (1997). Varietal Improvement in Cotton.

Paper presented in International Conference on Ecological Agriculture towards sustainable development (ICEA) held at Chandigarh on November 15- I 7, 1997.

1. Vadodaria, M.P., Maisuria, I.M., Patel, J.R., Patel, R.B., Patel, U.G. and Patel, R.H., (1997). Integrated management of bollworms in cotton in Gujarat.

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- Gohil, M.D., Kumar, V., Patel, U.G. and Patel, R.H., (1998). Chemical defoliant induce maturity in cotton.

Mahatma Phule Krishi Vidyapeeth, Rahuri

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- Surana, P.P., Mehetre, S.S., Borle, U.M. and Dahat, D.V., (1997). Combining ability in *Gossypium hirsutum*, L. for fibre properties. J. Cotton Res. & Dev., 11 (1) : 9-15.
- Amolik, V.L., Aher, R.P., Mehetre, S.S. and Darade, R.S., (1997). Heterosis in deshi cotton (*Gossypium arboreum* L.). J. Cotton Res. & Dev. (January, 97), 11(1) : 1-8.
- Mehetre, S.S., Bhondava, T.S. and Dalvi, N.D. (1997). Soybean as an intercrop-Review. Crop Res., 13(2) : 519-531.
- Amolik, V.L., Aher, R.P., Mehetre, S.S. and Darade, R.S. (1997). Combining ability in deshi (*Gossypium arboreum* L.) cotton. ISCI. J., 22 (1) : 1-6.

Papers presented in Seminars

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- Mane, V.S. and Mehetre, S.S., 1997. Effect of biofertilizer on seed cotton yield in summer irrigated cotton. pp. 29.
- Mane, V.S. and Mehetre, S.S., 1997. Response of dwarf cotton varieties to plant spacings and fertilizers levels and yield under summer irrigated condition. pp. 29.
- Mane, V.S. and Mehetre, S.S., 1997. Effect of spacing and fertilizers level on yield of arboreum cotton (y-1). pp. 30.
- Mane, V. S. and Mehetre, S. S., 1997. Production potential of different crop sequence after summer cotton. pp. 30.
- Mane, V.S. and Mehetre, S.S. and Shinde, B.N., 1997. Effect of liquid fertilizers through drip irrigation on growth and yield of cotton. pp. 31.
- Lambhate, S.S., Zanjare, S.R. and Mehetre, S.S., 1997. Reaction of cotton genotypes against bacterial and Alternaria leaf blight. pp.40.
- Lambhate, S.S., Zanjare, S.R. and Mehetre, S.S., 1997. Cotton diseases and their control. Souvenir on Silver Jubilee of Cotton. pp.105-116.
- Lambhate, S.S., Zanjare, S.R. and Mehetre, S.S., 1997. Reaction of cotton genotypes against bacteria and Alternaria leaf blight.
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- Mane, V.S., Mehetre, S.S., Zanjare, S.R. and Patil, V.R., 1997. Production potential of different crop sequences after cotton.

Jawaharlal Nehru Krishi Vishwa Vidyalaya, Khandwa

Research Articles

- Mandloi, K.C., G.K. Koutu, U.S. Mishra and R. Julka, (1997). Character association in coloured cotton. ISCI. Journal (in press)
- Mandloi, K.C., R. Julka and G.K. Koutu, (1997). Jawahar Tapti - a new high yielding variety in desi cotton. Journal of Cotton Research and Development (in press)
- Mandloi, K.C., G.K. Koutu and U.S. Mishra, (1997). Coheritability and correlated response in upland cotton. JNKVV Res. Journal.
- Mandloi, K.C., G.K. Koutu and U.S. Mishra, (1997). G X E interaction and correlation studies in upland cotton. JNKVV Res. Journal. (in Press)
- Jain, Sudhanshu, (1997). Studies on combining ability in intra and inter specific hybrids of cotton. Crop Res., (1): 91-95.

Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akoaia

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- Meshram, L.D., Kalpande, H.V., Swati Bharad and Golhar, S.R., (1997). Heterosis studies in asiatic cotton. Journal of Soil and Crops.
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- Patil, M.R., Ghoderao, B.N. and Patel, J.D., (1997). Field resistance of cotton to grey mildew (*R. gossypii*). J. Cotton Res. & Dev., 11 (1) : 123-124.
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- Meshram, L.D. Swati Bharad and Kalpande, H.V., (1997). Studies on isogenic cotton .hybrids based on different cytoplasm. National Seminar on Irrigated Cotton held at Rahuri, September, 97.
- Meshram, L.D., Jain, P.P. and Kalpande, H.V., (1998). Diversification of CMS and restorer system in upland cotton *G.hirsutum*. National Seminar on Heterosis - Its exploitation, Nagpur.

College of Agriculture, Pune

- Patil, S.B. and Pawar, V.M., (1997). Bioefficacy and compatability of methyl 40sp alone and in combination with Helicoverpa NPV against sucking pests of cotton. Pesticides Information 23(1) : 14-18.

Tamil Nadu Agricultural University, Coimbatore

Research Articles

- Amutha, K., T.S. Raveendran and D. Krishnadoss., (1997). Path analysis in coloured cotton varieties. Madras Agric. J., 83 : (11) 693-696
- Kowsalya, R. and T.S. Raveendran, (1997). Correlation and path analysis in cotton. Madras Agric. J., 83 : (11) 705-706
- Kowsalya, R. and T.S. Raveendran, (1997). Combining ability studies in intra-hisutum hybrids. Agric. Sci. Digest, 17(2): 105-107
- Santhini, S. and S. Uthamasamy, (1997). Susceptibility of cotton leafhopper (*America de vas tans*) to insecticides in Tamil Nadu. Indian J. Agric. Sci., 67(7) : 330-333.
- Sundaramuthy, V.T. and S. Uthamaswamy, (1997). Integrated insect management in cotton. pp. 189-206. In "Plant Protection and Environment" (Eds). D.V.R. Reddy, H.C. Sharma, T.B. Gour and B.J. Divakar, Published by Plant Protection of India, Hyderabad.
- Uthamaswamy, S. (1997). Role of insect resistant varieties in IPM. Paper presented at ICEA 97, November 15-17, 1997 held at Chandigarh, Abstract pp. 150
- Uthamaswamy, S. (1997). Cultural methods of pest management. In Biological and cultural control of insect pests, an Indian Scenario (Ed.) Dvnston, P. Amprose. pp. 209-215. Adeline publiishers, Tirunelveli.

Acharya N.G. Ranga Agricultural University, Lam, Guntur

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- Rama Rao, B., N.H.P. Rao and C. Raghunatha Rao, (1998). "Stem application - A new technique for controlling sucking pests". Journal of Cotton Research and Development.
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- Murthy, J.S.V.S., and B. Rama Rao, (1997). Path analysis of yield components under completely unprotected conditions in rainfed American cotton. Journal of Cotton Research and Development, 11 (2): 144-149.
- Murthy, J.S.V.S., B. Rama Rao and N.R. Charyulu, (1997). Heterosis for yield and yield components in cotton under completely unprotected conditions. Journal of Cotton Research and Development, 11 (2) : 251-256.
- Murthy, J.S.V.S., Raja Sekhar, P., Venkataiah, M. and N.R. Charyulu. (1998). Evaluation of some cotton genotypes for resistance to bollworms (*H.armigera*) Ann. of Agric. Res., 19(1): 30-33.

- Murthy, J.S.V.S., Raja Sekhar, P. Venkataiah, M. and N.R. Charyulu, (1997). Heterosis for yield and yield components and bollworm incidence in upland cotton under varied environments. *Journal of Cotton Research and Development*, 12(1) : 5-9.
- Murthy, J.S.V.S., (1997). Genetics of glanded nature in different plant of upland cotton (*G.hirsutum* L). *Journal of Cotton Research and Development*, 11(2): 251-256.

University of Agricultural Sciences (Dharwad)

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- Halemani, H.L., Koraddi, V.R. Doddamani, M.B., and Hoogar, C.I., 1997. Response of rain fed cotton to application of micronutrients. *J. Fmg. Systems*. 13:63-66.
- Halemani, H.L., Nagappa, Hallikeri, S.S., and Hoogar, C.I., 1997. Spacing and fertilizer requirement of recently released intra hirsutum hybrid cotton DHH 11 under irrigated conditions. *J . Fmg. Systems*. 13 : (3 and 4).

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- Basavarajappa, R., Chandrashekarappa, C.P., Ginjesh, G.K. and Halemani, H.L., 1997. Role of organic manures in sustainable cotton production. Paper presented in Seminar on Third Agricultural Science Congress, 1997 held at NASS, PAU., Ludhiana during May, 97.
- Halemani, H.L., Nagappa, Hoogar, C.I., 1997. Spacing and Fertilizer requirement of recently released hybrid cotton DHH 11 under irrigated conditions. Paper presented in the National Seminar on increasing the cotton production and productivity for 21st Century held at MPKV, Rahuri, 14-15th September, 1997.
- Janagoudar, B.S., Halemani, H.L. Bambary, R. and Rajgopal, 1997. Allelopathic effects of parthenium extracts on seed germination and seedling growth in cotton. 1st International Conference on Parthenium Management, October, 6-8, 1997 held at U.A.S., Dharwad. Vol.II: 169-172.
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- Patil, S.B., and Khadi, B.M., 1997. *In vitro* Androgenesis in *Gossypium herbaeceum* cotton. Paper presented at the Third Agricultural Science Congress, 1997 held at P.A.U., Ludhiana from 12-15th March, 1997.
- Janagoudar, B.S., Khadi, B.M., Patil, B.C., and Kategeri, S. 1998. Productivity and degree days requirement for phenological characters in desi cotton. Paper presented at the National Seminar on Role of Plant Physiology and Biotechnology in Agriculture and discussion held at Osmania University from 14-16th February, 1998.
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- Patil, J.R., Janagoudar, B.S. and Patil, B.C., 1998. Effect of 2,4 - dichlorophenoxy

acetic acid pretreatment on seed germination and seedling vigour in cotton. Proc. of the National Seminar on Plant Physiology, Hyderabad.

AICCIP BUDGET

An amount of Rs. 170 lakhs being the ICAR share to different centres was released during the year 1997-98, as indicated in the table below.

Budget provision for AICCIP centres

SI.No.	Name of the Centre	1997-98			1998-99		
		ICAR Share	State Share	Total	ICAR Share	State Share	Total
1.	Ludhiana	9.69	3.23	12.92	16.40	5.40	21.40
2.	Hisar	9.56	3.19	12.75	18.07	6.03	24.10
3.	Sriganganagar	10.26	3.42	13.68	14.85	4.95	19.80
4.	Surat	14.45	4.82	19.27	20.77	6.93	27.70
5.	Khandwa	9.37	3.12	12.49	11.10	3.70	14.80
6.	Akola	6.86	2.28	9.14	9.90	3.30	13.20
7.	Nanded	7.65	2.55	10.20	13.12	4.38	17.50
8.	Dharwad	12.12	4.04	16.16	17.55	5.85	23.40
9.	Guntur	10.81	3.60	14.41	12.07	4.03	16.10
10.	Coimbatore	6.67	2.22	8.89	12.90	4.30	17.20
11.	Faridkot	5.47	1.83	7.30	10.65	3~55	14.20
12.	Banswara	2.69	0.90	3.59	4.20	1.40	5.60
13.	Talod	2.43	0.78	3.12	3.22	1.08	4.30
14.	Charodi	2.15	0.71	2.86	3.22	1.08	4.30
15.	Junagadh	2.34	0.78	3.12	3.97	1.33	5.30
16.	Badnawar	2.88	0.96	3.84	4.20	1.40	5.60
17.	Padegaon	2.88	0.96	3.84	4.95	1.65	6.60
18.	Pune	3.74	1.23	4.94	5.47	1.83	7.30
19.	Nandyal	3.70	1.22	4.92	5.17	1.73	6.90
20.	Arabhavi	2.88	0.96	3.84	3.45	1.15	4.60
21.	Siruguppa	2.88	0.96	3.84	2.70	0.90	3.60
22.	Kovilpatti	4.12	1.37	5.49	8.17	2.73	10.90
23.	Srivilliputhur	6.95	2.31	9.26	10.87	3.63	14.50
24.	Mathura	2.70	0.89	3.59	4.20	1.40	5.60
25.	Indore	3.48	1.16	4.64	6.45	2.15	8.60
26.	Rahuri	6.99	2.32	9.31	9.15	3.05	12.20
27.	Zonal Coordinators (3)	0.35	-	0.35	0.35	-	0.35
	Total	170.00	51.78	208.46	290.00	78.93	316.35

--- End of the Report ---