

ALL INDIA COORDINATED COTTON IMPROVEMENT PROJECT

ANNUAL REPORT : 1998-99

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FOREWORD

The All India Coordinated Cotton Improvement Project (AICCIP), since its inception from 1967, has come out with impressive achievements. I am glad to note that the research efforts have led to the release of about 180 varieties and hybrids for the different cotton growing tracts of the country. The development and release of pest and disease resistant varieties are notable achievements under the AICCIP. Fine-tuning of location specific Integrated Pest Management modules in cotton has been the major focus. Cotton Front Line Demonstrations organised under the Transfer of Technology programme for the dissemination of recent production technologies since 1995 throughout the country have been successful in producing desirable results.

Initial Evaluation Trials conducted so far on Zonal levels have been organised as Nation I trials cutting across the zonal barrier under the able guidance of Dr. Mangala Rai, Deputy Director General (Crop Sciences), Indian Council of Agricultural Research, New Delhi. The faster spread of hybrids and the exchange of germplasm and Cytoplasmic male sterile restorers among the participating centres are the salient features this year.

I commend the whole team of the AICCIP for their sincere and hard work under the leadership of Dr. K. Venugopal, Project Coordinator (Cotton). With a pool of talented and dedicated scientists, vast and efficient research infrastructure and with the active collaboration of extension agencies, I sincerely hope that it would be possible to improve the production and productivity of cotton substantially in achieving the goals for the Plan period.

I am sure the AICCIP would address well the emerging issues of improving fibre quality and the need for developing multi-adversity resistant genotypes of cotton in enhancing the 'Productivity, quality and achieving stability.

I appreciate the editorial team for their efforts in bringing out this report.

(C.D. Mayee)
Director, CICR, Nagpur

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Cotton, the king fibre of the globe, continues to ascertain its importance as the most premier crop of commerce to our country and accounts for nearly thirty per cent of foreign exchange earnings. Cotton has brought fortune and economic boon to many of the textile cities in our country, besides providing job opportunities to about 60 million people. Over the decades, the country has witnessed a sea change in cotton area, production and productivity (*Fig. 1*). From the position of an importing country till 1970, *India has emerged as a net exporter, more specifically in items like garments, apparels and yarn*. With a record production of 178 lakh bales of cotton lint during 1996-97, India has emerged for the first time as the leading cotton yarn exporter, exporting about 500 million kg. of cotton yarn valued at Rs. 5,860 crores. In other words, we are exporting nearly one-third of our national cotton produce (50 lakh bales of cotton) in the form of cotton yarn. Probably, after the commercial crops of coffee and tea, cotton is the only item available for such a trade surplus, thanks to the millions of Indian Cotton farmers who took to hybrid cotton cultivation in a big way (40% of cotton area is under hybrids) under conditions of small and marginal farm holdings with limitations on credit and farm machineries.

Thanks to the Indian cotton seed growers who had shown to the cotton world, that *India can produce cotton hybrid seeds more successfully on a sustainable basis*. The cotton seed processing and packaging technology adopted by cotton seed growers in India today, is the most modern in the world.

Though we have nearly trebled cotton productivity since 1950s, still the productivity (320 kg lint/ha) remains low compared to the world average (560 kg lint/ha). In spite of the fact that we could offer convincing explanations on the limitations of climate, irrigation facilities and market forces for the low yield levels, still there are plentiful opportunities to raise cotton productivity. In this respect, All India Coordinated Cotton Improvement Project (AICCIP) continues to play a vital role in effectively implementing National Network Research in cotton involving 12 Agricultural Universities located in the nine major cotton growing States besides the Central Institute for Cotton Research and about 25 leading Cotton Seed Firms who have emerged successful with strong Research and Development capabilities.

Global cotton scenario and national production

World cotton production (18.3 million tons) this year is lower by 8% compared to previous year. Cotton production is falling by a combined 1.9 million tons in three of the (USA, China and Uzbekistan) five largest producing countries. In the USA, the production is estimated to be 11 % lower due to drought in Texas and cool rainy weather in California. Production in China is less by 0.4 million bales from 4.6 million bales in the last season. Production in Uzbekistan is about one million tonnes, down from 1.4 million tonnes in the previous year. However, in India, the production (161.50 lakh bales) has increased marginally compared to 158 lakh bales produced last year, despite the climatic adversities of excess rains and unusually long

wet spell during October and November. This is a remarkable production sustainability that we are able to achieve against the odds over the years.

During the year 1998-99, there was excess rainfall in almost all the Cotton growing States. If there were wide spread damages due to pests like *Heliothis* (American bollworm), *Spodoptera* (Army worm) and Leaf Curl Virus during previous year (1997-98), the current year crop witnessed more damage due to adverse climatic conditions of excess rains, floods and inundation during early crop growth phase and continuous wet spell during peak flowering and boll maturity periods.

Punjab and Haryana were the most affected cotton growing states followed by Maharashtra, Madhya Pradesh and southern parts of Andhra Pradesh. Few districts in Madhya Pradesh received a record rainfall of 360 mm in 24 hrs. during September causing heavy floods in cotton growing areas. In a nutshell, it could be said that the climatic adversities caused more damage to the crop during this year than the usual pest and disease damages.

However, some States such as Rajasthan, Gujarat and parts of Tamil Nadu, Karnataka, western Maharashtra and northern Andhra Pradesh enjoyed a normal and favourable climate for cotton. The performance of cotton in Gujarat state continued to be excellent for the second year in succession, thanks to the favourable climate which allowed expression of full potential of high yielding hybrids and varieties and the State has emerged as the leader in cotton production (45 lakh bales).

Due to adverse abiotic factors, the cotton production drastically reduced to 161.5 lakh bales as against the original estimates of 175 lakh bales.

Cotton area and production during 1998-99

States	Area (lakh ha)	Production (lakh bales)
Punjab	5.47	5.50
Haryana	5.87	7.50
Rajasthan	6.38	12.00
Gujarat	16.97	45.00
Maharashtra	31.99	25.00
Madhya Pradesh	5.32	20.00
Andhra Pradesh	10.03	25.00
Karnataka	6.09	8.50
Tamil Nadu	2.20	5.50
Others	0.80	1.25
Loose cotton	-	6.25
Total	91.12	161.50

Cotton Balance Sheet

Figures in Lakh bales*

	1997-98	1998-99
Opening stock (as on Oct. I)	30.38	30.00
Production	158.00	161.50
Imports	4.00	6.50
<u>Total supply</u>	<u>192.38</u>	<u>198.00</u>
Mill consumption	143.24	141.00
Small scale unit consumption	6.54	6.00
Non mill use	9.10	9.00
Exports	3.50	2.00
<u>Total demand</u>	<u>162.38</u>	<u>158.00</u>
Closing stock (as on Sept. 30)	30.00	40.00

* (as revised on 18.2.1999)

When the pest damage was severe last year and with the reported cotton failures in northern Andhra Pradesh and whole of Maharashtra, production estimates were scaled down to 145 lakh bales in December 1997. However, the final estimate in October, 1998 indicated higher cotton production at 158 lakh bales. Experts in the trade now place indigenous production at 170 lakh bales as against 158 lakh bales.

Mill consumption is reported to have gone down substantially due to overall recession in the Indian Textile Industry and decreasing prospects for yarn export to the South East Asian countries. The mill sector in the textile industry should have a long term policy and planning for yarn production. Accordingly, cotton production could be augmented. It appears that the 190 lakh bales of lint fixed as target for production by 2000 A.D. may not be valid, since the Indian mill consumption is stagnating around 140 lakh bales during the last five years and also there are no prospects for increasing exports of yarn or raw cotton. It may be reasonable to sustain cotton production at 180 lakh bales during next five years. In this regard, it is desirable to concentrate on quality aspects, aiming for better export markets.

PROGRESS OF RESEARCH PLANT BREEDING

NORTH ZONE

Evaluation of G. hirsutum genotypes

In the Initial Evaluation Trial (Br.02) conducted at five locations *viz.*, Faridkot, Ludhiana, Sriganaganar, Hisar and Sirsa, thirty three entries were tested with Bikaneri Nerma as a common check and their respective local checks. Cultures F 1861 and F 1867 recorded 63% higher mean seed cotton yield over the common check Bikaneri Nerma. Culture F 1867 recorded the highest mean lint yield and ginning per cent.

In the Preliminary Varietal Trial (Br.03a) conducted at six locations *viz.*, Faridkot, Ludhiana, Bhatinda, Sriganaganar, Hisar and Sirsa, ten entries were tested with H 777 as a common check and respective local checks. Culture LH 1913 (17.06 *q/ha*) recorded the highest mean seed cotton yield and ginning per cent.

In the Coordinated Varietal Trial (Br.04a) conducted at nine locations *viz.*, Faridkot, Ludhiana, Bhatinda, Sriganaganar, Hanumangarh, Ajmer, Hisar, Sirsa and Mathura, five entries were tested with F 866, Bikaneri Nerma and RS 875 as common checks and respective local checks. Culture F 1638 (16.62 *q/ha*) recorded the highest mean seed cotton yield.

In the Coordinated Varietal Trial (Br.04b) conducted at six locations *viz.*, Faridkot, Ludhiana, Bhatinda, Sriganaganar, Hanumangarh and Kanpur, eighteen entries were tested with LH 900 as common check and respective local checks. Culture RS 2013 recorded highest seed cotton yield (14.64 *q/ha*) and lint yield (**Table 1**).

Table 1: Yield performance of promising G. hirsutum genotypes

Br.02		Br.03		Br.04a		Br.04b	
Entry	(Q/ha)	Entry	(Q/ha)	Entry	(Q/ha)	Entry	(Q/ha)
F 1861	20.02	LH 1913	17.06	F 1638	16.62	RS 2013	14.64
F 1867	19.98	LH 1903	15.70	F 1424	16.38	Pusa 317	14.13
LH 1918	17.22	F 1607	15.51	RS 992	16.30	F 1794	13.85
H 1224	16.93	CA 1397	15.25	H 1123	16.25	LH 900	13.60
F 1875	16.50	Pusa 325	15.14	F 846(c)	16.06	F 1854	13.59
B.N.(c)	12.24	H 777	3.98	B.N.(c)	14.24	-	-

Evaluation of Intra-hirsutum Hybrids

Twelve hybrid entries (Br.05a - set I) were tested at five locations *viz.*, Faridkot, Ludhiana, Sriganaganar, Sirsa (CICR) and Hisar with LHH 144 as common check. The entry

CSHH 25 (19.45 q/ha) recorded the highest mean seed cotton yield.

In Br.05a - set II trial, eleven hybrid entries were tested at six locations *Viz.*, Faridkot, Ludhiana, Sriganaganagar, Sirsa (CICR), Kanpur and Hisar with LHH 144 as the common check. The entry LHH 922 (17.36 q/ha) recorded the highest mean seed cotton yield (**Table 2**).

Table 2 : Yield performance of Intra-hirsutum Hybrids

S.No.	Br.05 (a) Set I		Br.05 (a) Set II	
	Entry	Q/ha	Entry	Q/ha
1	CSHH 25	19.45	LHH 922	17.36
2	HHH 224	19.18	FHH 93	17.21
3	HHH 223	18.47	LHH 943	17.13
4	CSHH 68	17.25	LHH 935	17.10
5	LHH 899	16.82	CAHH 2	17.09
6	LHH 144	16.58	LHH 1254	16.55

Evaluation of G. arboreum genotypes

Initial Evaluation Trial (Entries with less than 20 mm fibre length)

Eighteen entries were tested at five locations *viz.*, Ludhiana, Kheri, Sriganaganagar, Hisar and Mathura with RG 8 as common check and respective local checks. Culture HD 269 recorded the highest mean seed cotton yield (**Table 3**).

Table 3 : Performance of G. arboretum entries in the Initial Evaluation trial (Set I)

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage	2.5% Span Length (mm)
1	HD 269	15.08	5.65	38.7	18.8
2	RG 175	14.16	5.71	40.4	18.6
3	RG 176	14.09	5.50	39.3	18.6
4	RG 180	14.04	5.81	41.4	18.8
5	LD 772	13.77	5.60	40.6	19.3
6	RG 8(C)	10.45	3.82	35.9	18.3

In another trial (entries with more than 20 mm fibre length), fourteen entries were tested at five locations *viz.*, Ludhiana, Kheri, Sriganaganagar, Hisar and Mathura with Bikaneri Nerma (*G. hirsutum*) as common check and respective local checks. Culture HD 414 recorded the highest mean seed cotton (13.93 q/ha) and lint yield (5.01 q/ha). (**Table 4**).

Table 4 : Performance of *G. arboretum* entries in the Initial Evaluation trial (Set II)

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage	2.5% Span Length (mm)
1	HD 414	13.93	5.01	35.9	17.7
2	HD 415	13.35	4.62	36.7	18.9
3	CAD 3	12.25	4.44	36.3	20.5
4	B.N(C)	10.99	4.00	35.2	22.6
5	RG 101	10.54	3.69	34.4	20.6

Coordinated Varietal trial of *G. arboreum* genotypes (Br. 24 a)

Seventeen entries were tested at seven locations *viz.*, Ludhiana, Kheri, Jullandhar, Sriganganagar, Ajmer, Hisar and Mathura with RG 8 as common check and respective local checks. Culture LD 735 recorded the highest mean seed cotton yield, lint yield and ginning per cent (**Table 5**).

Table 5 : Performance of *G. arboreum* genotypes in the Coordinated Varietal Trial

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage	2.5% Span Length (mm)
1	LD 735	18.90	7.15	40.1	18.6
2	LD 762	17.73	6.94	39.3	18.8
3	LD 694	17.13	7.03	39.9	19.8
4	HD 260	15.29	4.85	37.6	18.5
5	RG 150	14.84	5.66	37.3	18.3
6	RG 8	12.15	3.75	36.1	18.3

Evaluation of Intra – arboretum hybrids (Br. 25)

Fourteen male sterile based intra-arboreum hybrids were tested at three locations *viz.*, Ludhiana, Hisar and Sriganganagar with LDH 11 as common check and respective local varietal checks. Hybrid Raj DH 10 registered the highest mean seed cotton and lint yield (**Table 6**).

Table 6 : Performance of intra arboretum hybrids

S.No.	Entry	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage	2.5% Span Length (mm)
1	Raj DH 10	22.97	8.55	37.6	17.9
2	LMDH 2	21.67	8.44	38.9	18.9
3	AAH 7	21.50	7.84	36.3	17.9
4	Raj DH 9	19.35	7.37	38.4	18.4
5	AAH 8	18.53	7.88	40.2	18.3
6	LDH 11	15.92	5.52	37.8	20.3

CENTRAL ZONE

Evaluation of G. hirsutum genotypes (Irrigated trial)

In the Initial Evaluation Trial (Br. 02a), 26 entries along with LRA 5166 (common check) and respective local checks were tested at two locations. Entries NH 572 and GJHV 163 recorded 18.83 and 18.31 q/ha, respectively as against 15.15 q/ha of LRA 5166.

In the Preliminary Varietal Trial (Br. 03a), five entries were tested along with LRA 5166 and respective local checks at two locations. Entry GJHV 53 recorded highest seed cotton yield of 19.22 q/ha as against 9.31 q/ha of LRA 5166.

In the Coordinated Varietal Trial (Br. 04a), 11 entries were tested along with LRA 5166 and respective local checks. Entry GJHV -47 recorded the highest seed cotton yield of 20.96 q/ha as against 10.25 q/ha of LRA 5166 (cc) (**Table 7**).

Table 7 : Performance of G. hirsutum genotypes (Irrigated trial)

Br.02 a		Br. 03 a		Br. 04 a	
Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)
NH 572	18.83	GJHV 53	19.22	GJHV 47	20.96
GJHV 163	18.31	NH 545	17.04	GISV 86/58	19.71
AKH 8940	17.00	RCH 3194	16.13	GISC 25/1699	18.25
CNH 1012	16.82	CNH 1020	15.35	GJHV 34	17.75
RCH 994	16.28	RHC 1183	14.58	LC	16.68
LC	15.70	LC	13.56	LRA 5166 (cc)	10.25
LRA 5166 (cc)	15.15	LRA 5166 (cc)	9.31	-	-

RAINFED TRIAL :

In the Initial Evaluation Trial (Br.02 b), 24 entries were tested under rainfed conditions along with LRA 5166 and respective local checks, at three locations. Entry **KH** 119 (15.89 q/ha) recorded the highest mean seed cotton yield followed by **KH** 120 (15.70 q/ha) as against 9.69 q/ha of LRA 5166 (**Table 8**).

In the Preliminary Varietal Trial (Br.03 b), nine entries were tested along with LRA 5166 as common check and respective local checks. **KH** 117 (7.77 q/ha) recorded the highest mean seed cotton yield followed by **NH** 572 (7.17 q/ha of LRA 5166 (cc)).

In the Coordinated Varietal Trial (Br.04 b), 15 entries were tested along with LRA 5166 and respective local checks at seven locations. The entry NH 545 (9.91 q/ha) recorded the highest mean seed cotton yield as against 5.24 q/ha of LRA 5166 (cc).

Table 8 : Performance of *G. hirsutum* genotypes (Rainfed trials)

Br.02 b		Br. 03 b		Br. 04 b	
Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)
KH 119	15.89	KH 117	7.77	LC	10.61
KH 120	15.70	NH 572	7.17	NH 545	9.91
JLH 1894	15.20	KH 111	6.72	KH 113	9.51
GISV 78	14.81	PH 92/271	6.20	JLH 1492	9.48
GISV 61	14.60	AKH 8801	6.12	JLH 1294	8.70
Local check	13.37	Local check	4.74	LRA 5166 (cc)	5.24
LRA 5166 (CC)	9.69	LRA 5166 (cc)	3.14	-	-

Evaluation of G. arboreum genotypes

Twenty-one entries of *G. arboreum* were evaluated (Br.24) with AKA 5 as common check and local checks at four locations. The entry JLA 1093 recorded the highest mean seed cotton yield of 9.97 q/ha (**Table 9**).

Nine entries of Ms based desi hybrids were evaluated (Br. 25) at eight locations with AKA 8401 as the common check and with respective local checks. The entry ADCH 1 recorded the highest mean seed cotton yield of 11.78 q/ha.

Table 9 : Performance of *G. arboreum* genotypes

Br. 24		Br. 25	
Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)
JLA 1093	9.97	ADCH 1	11.78
AKA 5 (CC)	8.26	MDCH 222	10.80
AKA 94	7.43	MDCH 232	10.76
DLSa 17	7.12	Sandocot 111	10.70
AKA 9105	6.76	AKA 8401	8.82

Evaluation of G. herbaceum genotypes

In the Coordinated Varietal Trial (Br 34-1) on *G. herbaceum* (open boll type) genotypes, twenty four entries were evaluated at one location. The seed cotton yield of top five entries is furnished in **Table 10**.

Table 10 : Performance of *G. herbaceum* (open boll type) genotypes

S.No.	Culture	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)	Ginning Percentage
1.	G Bhv-179	20.10	5.56	42.0
2.	G Bhv 180	19.23	5.11	42.2
3.	Digvijay (c)	18.31	7.54	41.2
4.	G Shv-467/94	17.62	6.56	37.8
5.	RBDV 7	17.47	6.67	38.2

In the Coordinated Varietal Trial (Br.34-2) on *G. herbaceum* (closed boll type), 12 entries were evaluated at two locations. The seed cotton yield of top five entries is furnished in **Table 11**.

Table 11 : Performance of *G. herbaceum* (closed boll type) genotypes

S.No.	Culture	Seed Cotton Yield (Q/ha)	Lint Yield (Q/ha)
1.	G Chv-212	17.35	7.42
2.	G Chv-275	17.00	7.10
3.	G. Cot. 21 (cc)	16.90	6.70
4.	G Chv-158	16.55	7.13
5.	G Chv-249	16.33	6.98

IRRIGATED TRIALS

Evaluation of conventional hybrids

In the Preliminary Hybrid Trial (PHT), 22 entries were tested with NHH 44 and H 10 as common check and respective local checks at four locations. The entry KDCH 32 recorded the highest mean seed cotton yield of 21.12 q/ha followed by NHH 44 (20.22 q/ha).

In the Coordinated Hybrid Trial (CHT), 12 entries were tested with NHH 44 and H 10 as common check and respective local varietal checks at four locations. The entry SNSCH 46 recorded the highest mean seed cotton yield of 16.13 q/ha as against 13.13 q/ha of NHH 44 (**Table 12**).

Table 12 : Performance of conventional hybrids (Irrigated)

Br. 05 (a)-1 PHT		Br. 05 (a)-1 CHT	
Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)
KDCHH 32	21.12	SNSCH 46	16.13
NHH 44(CC)	20.22	L.C.	15.11

NCHH 145	19.44	AHH 133	14.93
SCHH 22	19.21	RHH 1394	14.74
RCH 120	18.80	VICH 5	13.38
H 10 (CC)	13.95	NHH 44 (CC)	13.13
		H 10 (CC)	10.84

Evaluation of MS based Hybrids

In the Preliminary Hybrid Trial (PHT), 17 entries were tested with CAHH 468 at two locations. The entry PSCH 801 recorded the highest mean seed cotton yield of 15.25 q/ha as against 10.28 q/ha of CAHH 468 (**Table 13**).

In the Coordinated Hybrid Trial (CHT), nine entries were tested with CAHH 468 at two locations. The entry Vasanta recorded the highest mean seed cotton yield of 18.15 q/ha as against 12.61 q/ha of CAHH 468.

Table 13 : Performance of MS based Hybrids (Irrigated)

Br. 05 (a)-2 PHT		Br. 05(a)-2 CHT	
Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)
PSCH 801	15.25	VASANTA	18.15
CAHH 148	14.89	ACHH 444	15.50
PAC 137	12.40	NFHH 19/506	15.09
NFHH 1470	12.33	PAC 138	14.80
ACHH 427	11.93	AH 131	13.55
CAHH 468 (CC)	10.28	CAHH 468 (CC)	12.61

RAINFED TRIALS

Evaluation of conventional hybrids

In the Preliminary Hybrid Trial, 18 entries were tested with NHH 44 and Ankur 651 as common check at four locations. The entry KDCHH 32 recorded the highest mean seed cotton yield of 16.71 q/ha (**Table 14**).

In the Coordinated Hybrids Trial, ten entries were tested with NHH 44 and Ankur 651 as checks at give locations. The entry MBRCH 210 recorded the highest mean seed cotton yield of 14.21 q/ha.

Table 14 : Performance of conventional hybrids (Rainfed)

Br. 05 (b) -1 PHT		Br. 05(b) -1 CHT	
Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)
KDCHH 32	16.71	MBRCH 210	14.21
NHH 44 (CC)	16.01	NHH 44 (CC)	14.04
PCHH 2	14.97	KHH 110	13.22
ANKUR 651 (CC)	14.68	ANKUR 651 (CC)	12.61
SANJU	14.62	AH 133	12.46

Evaluation of male sterile based hybrids

In the Preliminary Hybrid Trial, 15 entries were tested with CAHH 468, WHH 651 and H 10 as common checks at three locations. The entry NFHH 300 recorded the highest mean seed cotton yield of 16.36 q/ha (**Table 15**).

In the Coordinated Hybrid Trial, nine entries were tested with CAHH 468 and Ankur 651 as common checks at five locations. The entry Ankur 651 recorded the highest mean seed cotton yield of 13.28 q/ha.

Table 15 : Performance of MS based hybrids (Rainfed)

Br. 05 (b) -2 PHT		Br. 05(b) -2 CHT	
Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)
NFHH 300	16.36	ANKUR 651 (CC)	13.28
PAC 137	15.88	NFHH 35 / 464	12.77
PSCH 110	15.62	WHH 651 (G)	12.31
WHH 650	15.45	AH 101	11.72
ANKUR 651 (CC)	13.80	CAHH 468 (CC)	10.36
CAHH 468 (CC)	13.35	-	-
H 10 (CC)	11.96	-	-

SOUTH ZONE***Evaluation of G. hirsutum genotypes******IRRIGATED TRIALS***

In the Initial Evaluation Trial (Br.02a), thirty three genotypes were tested along with two common checks (LRA 5166 and MCU5 VT) and a respective local check at five locations viz., Coimbatore and Srivilliputhur in Tamil Nadu, Lam in Andhra Pradesh, Siruguppa and

Arabhavi in Karnataka. RAH 101 (12.10 q/ha) recorded the highest seed cotton yield and was superior to the best common check LRA 5166 (8.7 q/ha) by over 40 per cent. Culture CCH 18 recorded a mean seed cotton yield of 10.0 q/ha.

In the Preliminary Varietal Trial (Br.03a), eight cultures were tested with three checks at five locations viz., Coimbatore, Srivilliputhur, lam, Siruguppa and Arabhavi. Culture ARB 9701 recorded the highest yield (10.7 q/ha) and was superior to the best common check LRA 5166 (7.4 q/ha) by over 44 per cent.

In the Coordinated Varietal Trial (Br.04a), 12 cultures were tested with three checks in eight locations viz., Coimbatore, Srivilliputhur, KVK, Sandhiyur (Tamil Nadu) Lam, warangal (Andhra Pradesh), Siruguppa, Arabhavi and Raichur (Karnataka). Culture CWROK 165 recorded the highest yield (10.9 q/ha), followed by RAH 100 (10.6 q/ha) and ARB 8821/7 (10.2 q/ha). The common check LRA 5166 recorded 9.7 q/ha (**Table 16**).

Table 16 : Performance of *G. hirsutum* genotypes (Irrigated)

Br.02 a (I)		Br. 03 a (I)		Br. 04 a (I)	
Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)
RAH 101	12.10	ARB 9701	10.69	CWROK 165	10.85
Local check	10.50	NLHH 1650	9.88	RAH 100	10.57
CCH 18	10.00	RAH 111	9.43	ARB 8821-7	10.24
ARB 9801	9.75	Local Check	9.20	ARB 104	10.20
L740	9.59	NDLH 1078	9.07	Local Check	10.15
LRA 5166(c)	8.67	LRA 5166(c)	7.39	LRA 5166(c)	9.68

RAINFED TRIAL

In the Initial Evaluation Trial (Br.02b), 22 entries were tested with LRA 5166 (common check) and one local check at five locations viz., Dharwad and Raichur in Karnataka, Nandyal in Andhra Pradesh and Kovilpatti and Aruppukkottai in Tamil Nadu. Due to very poor yields, data from Raichur was not considered for analysis. Culture RAH 221 recorded the highest mean seed cotton yield (12.0 q/ha), followed by CPD 448 (11.8 q/ha) and were superior to the common check LRA 5166 (9.0 q/ha) by 34 and 31 per cent, respectively (**Table 17**).

In the Preliminary Varietal Trial (Br. 03b), nine cultures were tested with LRA 5166 and a common check at four locations viz., Dharwad, Nandyal, Kovilpatti and Aruppukkottai. Culture TKH 1175 recorded the highest yield (15.7q/ha) followed by NDLH 1584 (14.2 q/ha) and CPD 447 (13.0 q/ha). The yield increases over LRA 5166 (cc) were of the order of 41, 27 and 17 percent, respectively.

In the Coordinated Varietal Trial (Br. 04b), eight cultures were tested with LRA 5166

and a common check at five locations *viz.*, Dharwad, Raichur, KVK, Mudhol, Nandyal, Kovilpatti and Aruppukkottai. Due to poor yields, data from Raichur was not considered for analysis. Culture CNH 120 MB recorded the highest yield (13.36 q/ha) followed by NDH 1588 (12.94 q/ha) and the common check recorded 9.86 q/ha.

Table 17 : Performance of *G. hirsutum* genotypes (Rainfed)

Br.02b		Br.03b		Br.04b	
Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)
RAH 221	12.00	TKH 1175	15.70	CNH 120 ME	13.36
CPD 448	11.75	Local Check	14.57	Local Check	13.04
CPD 420	10.09	NDH 1584	14.20	NDH 1588	12.94
NDH 1728	10.56	CPD 447	13.04	Sahana	12.22
RAC 9561	10.41	NDH 1658	13.00	ICMF 31	11.70
LRA 5166 (cc)	8.97	LRA 5 166(cc)	11.15	LRA 5 I 66(cc)	9.86

Evaluation of *G. arboreum* genotypes

Twenty two *G. arboreum* genotypes developed at the Central Zone were tested at Dharwad in Karnataka and Kovilpatti in Tamil Nadu. Entries JLA 1093 (6.3 q/ha) and JLA 0794 (6.1 q/ha) were the best entries in the trial.

Evaluation of intra *hirsutum* hybrids

Irrigated trials

In the Preliminary Hybrid Trial, twenty three conventional hybrids were evaluated at seven locations *viz.*, CICR, Coimbatore, Rasi Seeds (Athur), SIMA (Udumalpet), Nuziveedu (Hyderabad), Warangal, Siruguppa and EID Parry (Dharwad) with Savita and NHH 44 as the common check hybrids. Among the hybrids tested, NFHH 145 recorded the highest mean seed cotton yield of 23.6 q/ha and was superior to the best check Savitha (18.8 q/ha) by over 26 per cent. The second best hybrid BCHH 6527 (20.8 q/ha) recorded 11 per cent increased seed cotton yield over Savita.

In the Coordinated Hybrid Trial, fourteen **conventional hybrids** were tested with two common checks at six locations *viz.*, Coimbatore, SPIC (Athur), Lam, Siruguppa, Arabhavi and Raichur. However, only VARCH 87 (15.6 q/ha) was marginally superior (6% increase) to the best common check NHH 44 (14.8 q/ha).

Nineteen **male sterile based hybrids** were tested in the Coordinated Hybrid Trial (Br.05(a)-2) with NHH 44 as the common check at six locations *viz.*, Coimbatore, SIMA (Udumalpet), Rasi Seeds (Athur), Lam, Arabhavi and MAHYCO (Ranebennur). Due to poor yields, data from Lam, Guntur was not considered for analysis. None of the male sterile based

hybrids out yielded the common check NHH 44 (14.0q/ha) significantly. However, Hybrid NFHH 1470 was on par with the check (**Table 18**).

Table 18 : Performance of *intra-hirsutum* hybrids (Irrigated)

Br.05-a-1 PHT		Br.05(a)-1 CHT		Br.05(a)-2 CHT	
Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (q/ha)
NFHH 145	23.59	VARCH 87	15.64	NFHH 1470	14.09
BCHH 6527	20.82	NHH 44(CC)	14.77	NHH 44 (CC)	13.95
NSPHH 5	20.21				
SELVAM 6	20.20				
VCHH 510	19.82				
SAYITA(CC)	18.83				
NHH 44(CC)	18.77				

RAINFED TRIALS

In the Preliminary Hybrid Trial, 19 **conventional hybrids** were tested under rainfed conditions at six locations *viz.*, Shimoga, Indo American Seeds (Dharwad), Kovilpatti, Nandyal, Adilabad and Sri Nagarjuna Seeds (Guntur). Only hybrid PRCHH 5 (14.01 q/ha) was found superior to the common check NHH 44 (13.2 q/ha).

In the Coordinated Hybrid Trial, 13 **conventional hybrids** were tested at five locations *viz.*, Dharwad, Raichur, Nandyal, Adilabad and Kovilpatti. The yield level at Raichur was very low and hence was not considered for analysis. Hybrid RAHH 438 recorded the highest seed cotton yield (16.6 q/ha) followed by PRC 31 (16.4 q/ha) and BCHH 6527 (16.3 q/ha). The common check NHH 44 recorded 13.3 q/ha. The yield increases over the common check in these cases were more than 20%.

As in the case of irrigated trial, none of the 14 **male sterile based hybrids** tested at seven locations under rainfed conditions *viz.*, Kovilpatti, Rasi Seeds (Athur), Nandyal, Warangal, Ankur Seeds (Kurnool), Dharwad and MAHYCO (Ranebennur) out yielded the common check NHH 44 (14.4 q/ha) in mean seed cotton yield (**Table 19**).

Table 19 : Performance of *intra-hirsutum* hybrids (Rainfed)

Br.05-(b)-1 PHT		Br.05(b)-1 CHT		Br.05(b)-2 CHT	
Entry	Mean Seed Cotton Yield (qlha)	Entry	Mean Seed Cotton Yield (q/ha)	Entry	Mean Seed Cotton Yield (qlha)
PRCHH 5	14.01	RAHH 438	16.64	NHH 44(CC)	14.37
NHH 44(CC)	13.21	PRC 31	16.43		

		BCHH 6527	16.28		
		VARCH 60	15.19		
		BCHH 6569	14.89		
		NHH 44(CC)	13.30		

Evaluation of interspecific (*G. hirsutum* x *G. barbadense*) hybrids

Nineteen interspecific hybrids were tested at seven locations viz., Coimbatore, SIMA (Udumalpet), Ankur Seeds (Kurnool), Siruguppa, Raichur, Shimoga and MAHYCO (Ranebennur). The trial at Kurnool in Andhra Pradesh failed. The data from other six centres were analysed. DHB 290 recorded the highest mean seed cotton yield of 11.1 q/ha, followed by NFHB 112 (10.7 q/ha), RAHB 115 (10.6 q/ha), SIMA HB 3 (10.3 q/ha) and NCHB 1332 (10.1 q/ha). The common check DHB 105 recorded only 9.8 q/ha.

AGRONOMY

NORTH ZONE

HISAR

Agro. 1 (a) : Agronomic studies on hirsutum genotypes in relation to planting pattern and spacing

Culture HS 182 recorded higher seed cotton yield than HS 6. The normal planting pattern of 67.5 x 30 cm gave higher seed cotton yield of 12.83 q/ha (16.3 % higher) as compared to 11.03 q/ha in 67.5 x 45 cm. spacing. Reduction in plant population by increasing plant spacing from 30 to 45 cm or skipping the row decreased the yield by 16 and 50%, respectively.

Agro. 2 (c) : Agronomic studies on arboreum hybrid (AAH 1) in relation to spacing and nitrogen levels

The seed cotton yield of desi hybrid AAH 1 was highest (5.66 q/ha). The plant spacing of 60 cm was superior to other spacing of 45 and 75 cm. The application of 100 kg N/ha increased the yield by 20.70% over 50 kg N/ha.

SRIGANGANAGAR

Agronomic studies on Leaf Curl resistant hirsutum varieties in relation to date of sowing

A field experiment was conducted to study the optimum date of sowing for the Leaf Curl resistant genotypes viz., LRA 5166, RS 810 and RS 875. Early sowing (15th April and 1st May) resulted in higher yields (21.41 and 21.49 q/ha), than delayed sowings (15th and 30th May) which recorded low yields (16.25 and 7.40 q/ha). Among the varieties, RS 810 was found to be significantly superior to other varieties with a yield of 19.14 q/ha.

Agro. (1a) : Agronomic studies on pre-release hirsutum genotypes in relation to planting pattern and spacings

RS 810 recorded “Significantly higher yield (17.29 q/ha) compared to Bikaneri Nerma (14.73 q/ha). Normal row spacing was better compared to skip row planting. Forty five cm intra row spacing resulted in lesser yield (15.0 q/ha) compared to 30 cm. intra row spacing (17.02 q/ha).

Agro. (2a) : Studies on weed management in cotton with special reference to control of *Trianthema* sp.

The herbicide Glufosinate (directed spray) was compared with the popular herbicides viz., Pendimethalin and Trifluralin in the control of *Trianthema* in cotton. The new herbicide Glufosinate ammonium was not superior to the popular herbicides viz. Pendimethalin and Trifluralin. Among the weed control treatments, manual weeding resulted in higher seed cotton yield (16.12 q/ha) followed by Pendimethalin and Trifluralin at 1.5 kg ai/ha as pre plant application followed by one hand hoeing at 35 days after sowing.

Agro. (6) : Comparative evaluation of cotton based sequence cropping systems

In cropping sequence experiments, eventhough *arboreum* cotton (RG 8) recorded better yield than the *hirsutum* cotton (RS 875), *hirsutum* cotton (RS 875) - mustard sequence gave higher net returns over the rest of the sequences. *Arboreum* cotton (RG 8) - wheat sequence was found to give less returns (Table 20).

Table 20: Crop yield, economics and B: C ratio of different cotton based crop sequence

S. No.	Treatment	Yield (Q/ha.)		Gross returns Rs./ha	Net returns Rs./ha	B:C ratio
	1996-97	Cotton	Mustard/ wheat			
1.	<i>Hirsutum</i> Cotton-Mustard	18.43	20.85	48,755	31,265	1.79
2.	<i>Arboreum</i> Cotton-Mustard	24.40	20.28	47,248	29,398	1.65
3.	<i>Hirsutum</i> Cotton-Wheat	19.12	38.04	50,461	30,156	1.49
4.	<i>Arboreum</i> Cotton-Wheat	24.85	38.32	49,020	28,355	1.37
	1997-98					
1.	<i>Hirsutum</i> Cotton-Mustard	14.50	10.20	46,241	28,991	1.68
2.	<i>Arboreum</i> Cotton-Mustard	16.80	10.00	44,420	26,870	1.53
3.	<i>Hirsutum</i> Cotton-Wheat	14.62	35.80	51,795	31,630	1.56
4.	<i>Arboreum</i> Cotton-Wheat	16.50	34.50	48,763	28,318	1.38

CENTRAL ZONE

BANSWARA

Agro (5a1) : Role of organic manure in maintaining the soil fertility and yield of hybrid cotton

The experiment was conducted to study the effect of green manure crops intercropped and incorporated *in situ* and the farm yard manure on sustaining the soil fertility and for increasing the cotton yield.

The results of experiments conducted for two years (1997-98 and 1998-99) revealed that intercropping of green manure crops such as greengram, cowpea and sunnhemp and their incorporation *in situ* decreased cotton yield significantly. Addition of FYM at 5 tons/ha + recommended level of nitrogen resulted in significantly higher yield of *kapas* compared to all other treatments (**Table 21**).

Table 21 : Role of organic manure and *in situ* green manuring in maintaining the soil fertility and yield of hybrid cotton

S.No	Treatments	Seed Cotton Yield (q/ha)		
		1997-98	1998-99	Mean
1.	Entire cotton with recommended dose of Nitrogen	9.51	18.20	13.90
2.	Entire cotton with 75% of recommended dose of Nitrogen	9.73	18.60	14.16
3.	<i>In situ</i> incorporation of greengram + recommended dose of Nitrogen	8.85	16.34	12.59
4.	<i>In situ</i> incorporation of greengram + 75% of recommended dose of Nitrogen	6.98	17.91	12.44
5.	<i>In situ</i> incorporation of cowpea + recommended dose of Nitrogen	7.70	16.35	12.02
6.	<i>In situ</i> incorporation of cowpea + 75% of recommended dose of Nitrogen	8.30	17.25	12.77
7.	<i>In situ</i> incorporation of sunnhemp + Recommended dose of Nitrogen	7.17	15.77	11.47
8.	<i>In situ</i> incorporation of sunnhemp + 75% of recommended dose of Nitrogen	6.73	14.91	10.82
9.	FYM @ 10 T ha ⁻¹ + recommended dose of Nitrogen	9.86	19.24	14.55
10.	FYM @ 20 T ha ⁻¹ + 75% of recommended dose of Nitrogen	9.40	19.60	14.50
11.	FYM @ 5 T ha ⁻¹ + recommended dose of Nitrogen	10.11	20.50	15.30
12.	FYM @ 5 T ha ⁻¹ + 75% of recommended dose of Nitrogen CD 5%	7.86 NS	20.30 2.20	14.08

Agro (5) : Efficacy of Argold (Cinemethylin) 10 EC on weeds in cotton field

The pre-emergence application of Argold (Cinemethylin) at 700 ml/ha and 1000 ml/ha resulted in a seed cotton yield of 14.45 and 13.93 q/ha, respectively, whereas the conventional hand weeding and inter cultivation resulted in higher yield of seed cotton (15.84 q/ha). The untreated control gave a seed cotton yield of 7.04 q/ha indicating a 50% yield reduction in unweeded check.

Agro (5) : Effect of Bio-mulches on cotton productivity under rainfed conditions

Cowpea and blackgram as live mulches resulted in higher seed cotton yield (16.19 and 16.45 q/ha, respectively) compared to the control (13.17 q/ha). The other live mulches such as soyabean, sunnhemp and greengram also improved the crop yields (**Table 22**).

Table 22 : Seed Cotton Yield and other characters as affected by the live mulches treatments

S.No.	Treatment	Seed Cotton Yield (q/ha)		Bolls/Plant		Boll Wt. (g)	
		1997-98	1998-99	1997-98	1998-99	1997-98	1998-99
1.	Control	4.94	13.17	9.0	16.0	1.8	3.4
2.	Live mulch with cowpea	7.05	16.19	9.9	15.6	1.8	3.4
3.	Live mulch with soyabean	5.98	15.13	10.0	15.2	1.8	3.3
4.	Live mulch with greengram	5.55	14.95	11.8	16.4	2.4	3.4
5.	Live mulch with blackgram	5.69	16.45	13.5	17.9	2.4	3.8
6.	Live mulch with sunnhemp	5.95	15.15	9.4	16.2	2.1	3.7
	CD 5%	NS	1.90				

SURAT

Agro 1 (a) : Agronomic requirements of pre and newly released hirsutum varieties in relation to plant densities, nitrogen and phosphorus levels

Production potential of promising strain GJHV 34 (1 1.81 q/ha) was higher than G.Cot.10 (9.24 q/ha). It has given significantly 21. 7% more seed cotton yield than G.Cot. 10. Crop sown at 120 x 30 cms spacing gave numerically 0.79 q/ha more seed cotton yield than 120 x 45 cms spacing. Application of nitrogen beyond 150 kg/ha was not found economical. Application of 80 kg P₂ O₅ was not found advantageous over no application of phosphorus.

Agro 2 (a) : Agronomic requirements of pre and newly released hirsutum hybrids in respect of graded levels of nitrogen and phosphorus

Promising hybrids G(T)HH-49 gave significantly higher seed cotton yield (21.98 q/ha) than CSHH- 1444 and G.Cot.Hy.10. Differences in seed cotton yield due to different nitrogen and phosphorus levels were found to be non-significant. None of the interactions was found to be significant.

Agro 5 (a) : Studies on phosphorus application in conjunction with green manuring and FYM in cotton G. Cot. Hy. 10.

Differences in seed cotton yield due to different treatments were found to be non-significant.

Agro. 7 : Studies on drip irrigation system on cotton G. Cot. Hy-6

Experiment was laid out with five treatments viz., 0.4 IW/CPE, 0.6 IW/CPE, 0.8 IW/CPE through drip, alternate furrow and flood irrigation. Differences in seed cotton yield due to different treatments were found to be non-significant. Treatment 0.6 IW/CPE gave numerically higher seed cotton yield (12.30 q/ha) than rest of the treatments. Alternate furrow irrigation gave numerically 1.27 q/ha more seed cotton yield than traditional method of irrigation.

TALOD

Agro. 2 (a) : Agronomic requirements of pre and newly released hirsutum hybrids to graded levels of nitrogen and phosphorus

Promising strain G(T) HH-49 gave significantly (1.12 q/ha) more seed cotton yield than G.Cot. Hy-10. Crop fertilized with 240 kg N/ha gave significantly 0.77 q/ha and 6.38 q/ha more seed cotton yield than the crop raised with 160 and 80 kg N/ha. respectively. Differences in seed cotton yield due to variation in P levels were found to be non-significant. Interaction effects were also non-significant.

INDORE

Agro. 2 (a) : Agronomic requirements of pre / newly released hirsutum hybrids to plant densities and fertility levels

Cotton hybrids WHH 09 was found superior in yield (16.92 q/ha), whereas WHH 1250 and JK Hy-2 were at par (15.80 q/ha). Closer planting at 60 x 60 cm and 90 x 60 cm proved superior over 90 x 90 cm spacing and recorded 11 % and 9.3% higher seed cotton yield as compared to wider spaced crop of 90 x 90 cm planting geometry. The fertilizer levels did not have any significant impact on yield of cotton in both the seasons.

Agro. 5 (a) : Effect of bio-mulches on cotton productivity under rainfed conditions

Mean seed cotton yield remained unaffected due to various live mulches. However, greengram, blackgram and daincha live mulches gave slightly higher mean kapas yield as compared to rest of the treatments. The fresh and dry biomass yields were very well reflected due to different live mulches; sunnhemp as live mulch proved superior in respect of fresh and dry forage yield when compared with rest of the treatments.

Agro 5 (b) : Use of bio-fertilizers in cotton variety Vikram

None of the bio-organic fertilizers alone had any significant effect on yield and yield attributes of cotton. Significant reduction in yield of cotton was noticed due to lone application of bio-organic manures. Application of 100% N displayed the highest mean seed cotton yield of 18.83 q/ha followed by 15.10 q/ha due to seed treatment with azotobacter + 50% N. The application of 50% N and its combinations with bio-organic fertilizers was found effective, when compared with lone application of bio-organic fertilizers. Similar trend in yield components prevailed.

BADNAWAR

Agro. 5 (a) : Bio-mulches for enhancing cotton productivity under rainfed conditions

Highest seed cotton yield (8.07 q/ha) was recorded in Daincha live mulch treatment and was significantly higher over all live mulch treatments except Sunnhemp (7.67 q/ha) (Table 23).

Table 23 : Effect of live mulch on seed cotton yield

Treatments	1996-97	1997-98	1998-99	Average
Control	3.41	11.26	4.62	6.43
Live mulch with Cowpea	4.86	11.78	5.55	7.40
Live mulch with Soyabean	6.08	13.14	6.11	8.44
Live mulch with greengram	5.86	14.49	7.10	9.15
Live mulch with blackgram	6.67	14.30	7.09	9.35
Live mulch with sunnhemp	6.50	14.03	7.67	9.40
Live mulch with Daincha	7.49	15.48	8.07	10.35
S.E.	0.72	0.81	0.27	
C.D. @ 5%	2.14	2.40	0.80	

Agro. 12: Studies on the effect of intercropping on cotton yield

The method of sowing did not show any significant effect on seed cotton yield. Planting of intercrops influenced seed cotton yield significantly. Maximum seed cotton yield was recorded from Cotton + Groundnut var. JL 24 (13.86 q/ha). Lowest seed cotton yield was

recorded from control plot (6.38 q/ha). Intercrop variety Urid T-9 recorded highest *urid* yield (6.62 q/ha), whereas lowest yield was recorded by *mung* M.1. 7-21 (4.17 q/ha).

KHANDWA

Agro. 2(a): Agronomic requirements of promising pre-release cotton hybrids (intra-hirsutum) in relation to plant density and fertility levels

Hybrids KHH 110 and KHH 111 yielded significantly more over JK Hy.2. Performance of hybrids was better under wider spacings. Use of Nitrogen at 160 kg/ha enhanced the seed cotton yield over 80 kg/ha application.

Agro. 5 (a) : Use of bio-mulches in rainfed cotton

Use of different bio mulches enhanced the seed cotton yield except in the case of live mulch with sunnhemp and daincha. Maximum seed cotton yield was received from the live mulch with blackgram (4.27 q/ha).

Agro. V: Effect of weedicides on cotton crop yield

Among different weedicides tested, God 101 gave the highest seed cotton yield at 150g a.i./ha (11.87 q/ha), followed by Monsanto @ 3.60 kg a.i./ha (11.63 q/ha) and Argold @ 100g a.i./ha (10.61 q/ha).

AKOLA

Agro. 1 (b) : Agronomic requirements of pre-released desi cotton variety AKA 7

The newly released *desi* cotton variety AKA 7 recorded maximum seed cotton yield of 8.82 q/ha at 60 x 15 cm spacing. Seed cotton yield progressively increased with increase in the nitrogen levels from 15 to 45 kg N/ha. However, the differences between 30 and 45 kg N/ha levels were not significant.

Agro.2 (a) : Agronomic requirements of new hirsutum hybrids in relation to their plant densities and fertilizer levels

The pooled data for three years indicated that cotton hybrids planted at a closer spacing of 60 x 60 cm recorded 17.2 per cent more seed cotton yield than a wider spacing of 60 x 90 cm under rainfed conditions. Seed cotton yield was similar in all the hybrids. Seed cotton yield was significantly increased by 16.5 and 24.3 per cent with the application of 50:25:25: and 75:37.5:37.5 kg NPK/ha over a low fertilizer level of 25: 12.5: 12.5 kg NPK/ha.

Hence, it is recommended that a spacing of 60 x 60 cm and a fertilizer dose of 75:37.5:37.5 kg NPK/ha are suitable for getting maximum yield from the new cotton hybrids *viz.*, WHH 09 and WHH 1250 under rainfed conditions.

AKOLA

Agro. 1 (b) : Agronomic requirements of pre-released desi cotton variety AKA 7

The newly released *desi* cotton variety AKA 7 recorded maximum seed cotton yield of 8.82 q/ha at 60 x 15 cm spacing. Seed cotton yield progressively increased with increase in the nitrogen levels from 15 to 45 kg N/ha. However, the differences between 30 and 45 kg N/ha levels were not significant.

Agro.2 (a) : Agronomic requirements of new hirsutum hybrids in relation to their plant densities and fertilizer levels

The pooled data for three years indicated that cotton hybrids planted at a closer spacing of 60 x 60 cm recorded 17.2 per cent more seed cotton yield than a wider spacing of 60 x 90 cm under rainfed conditions. Seed cotton yield was similar in all the hybrids. Seed cotton yield was significantly increased by 16.5 and 24.3 per cent with the application of 50:25:25: and 75:37.5:37.5 kg NPK/ha over a low fertilizer level of 25: 12.5: 12.5 kg NPK/ha.

Hence, it is recommended that a spacing of 60 x 60 cm and a fertilizer dose of 75:37.5:37.5 kg NPK/ha are suitable for getting maximum yield from the new cotton hybrids *viz.*, WHH 09 and WHH 1250 under rainfed conditions.

Agro. 2 (c): Agronomic requirements of new desi cotton hybrid AKDH 7

The *desi* cotton hybrid AKDH 7 produced maximum seed cotton yield (7.68 q/ha) at a closer spacing of 60x45 cm. Highest seed cotton yield of 6.9 q/ha was obtained with a fertilizer dose of 75 kg N/ha and recorded 7.1, 10.7 and 21.0 per cent significantly increased seed cotton yield over 50,25 and 0 kg N/ha, respectively.

Agro. V: Studies on weed management in cotton

Weed free treatment recorded a maximum seed cotton yield (6.1 q/ha) and was on par with the farmer's practice of 3 weedings and 3 hoeings. Unweeded control was lowest in yield. Only application of herbicides recorded 40.6% more yield of seed cotton than unweeded check.

Agro. 12 : Studies on the effect of intercropping on seed cotton yield of hirsutum genotype

In an intercropping study, it was observed that single row planting at 90 x 10 cm recorded significantly 14.1 % more seed cotton yield than 60x15 cm spacing. Seed cotton yield of an early and dwarf cotton genotype AKH 081 was maximum as sole crop and significantly reduced by 18.6, 28.1 and 33.2 per cent when intercropped with blackgram, greengram and soybean, respectively. However, gross monetary returns were statistically on par in all the intercropping systems studied.

NANDED

Agro. 2 (a) : Agronomic requirement of newly released / pre-release genotypes in relation to plant density and fertility levels

Yields under closer spacing *viz.*, 60x60 cm (8.61 *q/ha*) and 90x60 cm (8.42 *q/ha*) were at par and significantly higher than wider spacing of 90x90 cm. (6.42 *q/ha*). Seed cotton yields under higher fertilizer levels of 100:50:50 and 80:40:40 NPK kg/ha were at par with each other and significantly higher than lower fertilizer levels *i.e.*, 60:30:30: NPK *kg/ha* .. The differences in yield of seed cotton due to different *intra-hirsutum* hybrids were not significant. The interaction effect was not evident.

Agro. 1 (b) : Agronomic requirement of desi cotton genotype in relation to plant density and fertilizer levels

The differences in yield of seed cotton due to various spacings were not significant. Both the fertilizer levels (50:25:25: and 80:40:40: NPK kg/ha) were at par with each other and enhanced the seed cotton yield significantly over control. Pre-released *arboreum* genotype PA 255 recorded significantly higher seed cotton yield than PA 183 (5.24 *q/ha*).

Agro. 5 (a) -1 : Integrated nutrient management for production of organic cotton under rainfed condition

Desi variety PA 141 recorded significantly higher seed cotton yield (6.27 *q/ha*) over the American variety NH 452 and hybrid NHH 44 and was found at par with American hybrid PHH 316. Application of recommended dose of fertilizer (F₇) recorded significantly higher seed cotton yield (5.70 *q/ha*) over F₁, F₂ and F₅) and was found at par with F₃, F₄ and F₆. Application of neem cake @ 2.0 t/ha (F₃) recorded significantly higher seed cotton yield (5.48 *q/ha*) than application of only FYM @ 10 t/ha,(F₁) and Azotobacter @ 3 kg/ha soil application + FYM 7.5 t/ha (F₂) treatment and was at par with azotobacter @ 3 kg/ha as soil application + neem cake 1.5 t/ha (F₄), Azotobacter @ 3 kg/ha as soil application+neem cake 1.0 t/ha + 5.0 t/ha FYM and FYM 7.5 t/ha + neem cake 1.5 t/ha (F₆) (**Table 24**).

Table 24 : Cotton production (Q/ha) under Integrated Nutrient Management

Treatments (Varieties/Hybrids)	1997-98	1998-99
NHH 44	4.27	4.32
PHH 316	4.21	5.24
NH 452	4.66	4.63
PA 141	4.28	6.27
C.D.@ 5%	0.41	1.12
FYM 10 t/ha'	3.71	4.64
Azotobacter @ 3 kg soil application/ha+ 7.5 t/ha FYM	3.61	4.73
Neem cakes 2 t/ha	4.54	5.48

Azotobacter @ 3 kg/ha as soil application+neem cake 1.5 t/ha	3.64	5.31
Azotobacter @ 3 kg/ha as soil application+neem cake 1 t/ha	4.31	5.07
FYM 7.5 t/ha + neem cake @ 1.5 t/ha	5.25	5.24
Recommended fertilizer dose for hybrid / varieties	5.44	5.70
C.D. @ 5%	0.38	0.60

RAHURI

Agro. 5 (c) : Package of practices for Eco-friendly organic cotton

The yield of seed cotton obtained due to 50% N through FYM and 50% N through fertilizers (T₃) was significantly more (20.60 q/ha) and it was on par with that of T₄ (18.84 q/ha) where green manuring of daincha, seed treatment of Azoculture supplemented with 30 kg N, 37.5 kg P₂O₅ and 50 kg K₂O per hectare as a basal dose were used. The lowest seed cotton yield was obtained in the treatment T₁ and T₂ where only organic sources were used (i.e., FYM and Vermi compost). However, the substitution of inorganic fertilizers with organic matter to the extent of 75% could not help to increase the yield. Similar is the trend in respect of growth and yield attributing characters (**Table 25**).

Table 25 : Seed Cotton Yield under different organic treatments

Treatments		Seed Cotton Yield (q/ha)
T ₁	FYM@ 7.5 t/ha + Azotobacter and Azospirillum + Phosphorus solubilizing bacteria + Green manuring of Daincha 3 t dry/ha	11.61
T ₂	Vermicompost 7.5 t/ha + Azotobacter and Azospirillum + PSB + Green manuring of Daincha 3t dry/ha	13.78
T ₃	FYM 5 t/ha + Azotobacter and Azospirillum+ Phosphate solubilising bacteria + 50 kg N in two split-	20.61
T ₄	10t FYM + Azotobacter and Azospirillum + 30 kg N + 50 kg P ₂ O ₅ + 50 kg K ₂ O/ha	18.85
T ₅	10t FYM/ha + Azotobacter and Azospirillum + Phosphate solubilising bacteria + 25 kg N through urea at sowing	15.45
T ₆	100 kg N + 50 kg P ₂ O ₅ + 50 kg K ₂ O/ha	17.41
	S.E.	0.79
	C.D. @ 5%	2.38

Agro. 1 (a): Response of G. hirsutum varieties to different fertility regimes

The variety RHC 1190 had shown numerically better performance in respect of seed cotton yield over JLH 168. However, the differences were not significant. As regards fertilizer levels, it was observed that significantly highest yield (27 q/ha) was obtained due to the treatment where yield target was 30 quintals of seed cotton per hectare (169:97:89 kg NPK/ha). The lowest seed cotton yield (17 q/ha) was obtained due to application of recommended dose of chemical fertilizers.

The gross and net returns increased as the dose of fertilizers increased. The Net monetary return and cost benefit ratio were more in the treatment (Rs. 34,278; 2.36) where fertilizer dose was applied for targetted yield of 30 q/ha of seed cotton yield.

Agro. 2 (a): Response of cotton hybrids to different fertility regimes

RHH 390 is significantly superior over NHH 44 in respect of yield. Application of highest doses of fertilizer resulted in the production of more seed cotton yield. However, the cost benefit ratio was more (2.20) where fertilizer was applied (211: 118: 115 kg NPK/ha) as per the yield target of 35 q/ha. The net monetary return was Rs. 31 ,860/- per ha.

Agro. 1 (b) : Studies on the sowing dates of G. arboreum (desi) cotton varieties

Early sowing of *G. arboreum* varieties viz. PA 141, PA 183, PA 255 and Y-1 led to more seed cotton yield over rest of delayed sowing treatments. Subsequent delay in sowing resulted in reducing the seed cotton yield of *G. arboreum* varieties. In respect of varieties, there were no significant differences in seed cotton yield.

Agro. 5 (a) : Effect of vermicompost alone and in combination with chemical fertilizers on the yield and quality of cotton

Application of 5 ton vermicompost per hectare + 100:50:50 kg N, P₂O₅ and K₂O per hectare resulted in the production of more seed cotton yield (21.3 q/ha) than that observed in other treatments. However, it was at par with the treatment in which 1/2 the vermicompost and 1/2 the recommended dose of fertilizer was administered (19.4 q/ha).

PADEGAON

Agro. 7: Effect of liquid fertilizers through drip irrigation on growth and yield of cotton

Application of 125% recommended dose with drip irrigation either in solid (27.64 q/ha) or liquid (29.38 q/ha) form gives significantly superior seed cotton yield over the conventional method (24.38 q/ha). Increased levels of fertilizers increased the seed cotton yields in both ways i.e., fertilizers as solid or liquid.

Agro. 12: Tillage and nutrient management for cotton preceded by sugarcane

Seed cotton yield obtained were statistically significant. However, the differences due to tillage and interaction of tillage and application of fertilizers were non significant. Preparatory tillage has given slightly higher yields with increased levels of fertilizer than no preparatory tillage which is numerically higher in all treatments. There is increase in seed cotton yield with increased levels of fertilizers in both with and without preparatory tillage. These differences were at par with each other.

SOUTH ZONE

GUNTUR

Agro. 5 (a) : Integrated nutrient management in cotton

Among the treatments tried, FYM 10 t/ha + 100% recommended dose of fertilizer gave the highest kapas yield of 10.05 q/ha (**Table 26**).

Treatments	Kapas yield (q/ha)
, T I : 90:45:45: kg NPK/ha (R.D.)	9.32
T2: FYM 10 t/ha	7.00
T3 : Vermi compost 2.5 t + FYM 5 t/ha	7.24
T4 : Crop residues + FYM 6.5 t/ha	8.04
T5 : T2 + 75% recommended dose	9.45
T6 : T3 + 75% recommended dose	8.88
T7 : T4 + 75% recommended dose	9.00
T8 : T2 + 100% recommended dose	10.05
T9 : T3 + 100% recommended dose	9.49
T10 : T4 + 100% recommended dose	8.80
CD @ 5%	1.53

Agro. 1 (a): Agronomic requirements of new varieties in relation to their plant densities and nitrogen

The results indicated that variety L 605 recorded maximum kapas yield of 10.34 q/ha followed by CWROK 165 (10.17 q/ha) and significantly superior over the check MCU 5 (6.69 q/ha). The differences in kapas yield due to spacing, nitrogen levels and interaction were found non significant.

Agro. 2(a): Agronomic requirements of new hybrids in relation to their plant densities and nitrogen levels

It was found that the differences in seed cotton yield due to varieties were significant, whereas the spacing and nitrogen levels were found non-significant. The hybrid LAHH 6 produced more yield of 10.22 q/ha and was significantly superior over the check hybrid Savitha (9.51 q/ha). 120x60 cm spacing gave higher kapas yield of 10.42 q/ha. Among the nitrogen levels tested, 120 kg N/ha, produced maximum kapas yield of 10.18 q/ha. The interaction levels were non-significant.

DHARWAD

Agro. 1 (a & b): Agronomic requirements of the promising pre-released hirsutum variety and intra-hirsutum hybrids under assured rainfall conditions

DHH 11 (15.38 q/ha) followed by DHH 509 (14.96 q/ha) were better than the genotype CPD 431 (13.51 q/ha) under rainfed conditions.

DHH 11 gave highest yield of 18.71 q/ha with 80:40:40 NPK kg/ha at 60 x 30 cm spacing as compared to other treatment combinations.

Increase in the fertilizer level from 40:20:20 (15.14 q/ha) to 80:40:40 (17.30 q/ha) NPK kg/ha has increased the yield by 12.5%. Differences in yield due to spacings at 40:20:20 NPK kg/ha were not much. But at 80:40:40 NPK kg/ha, highest yields were obtained with 60x30 cm (17.25 q/ha), 60x60 cm (17.49 q/ha) and 90x30 cm (17.37 q/ha) spacings as compared to 90x60 cm (16.0 q/ha).

Agro. 5 (a) -1: Studies on the integrated nutrient management practices for sustainable production in cotton based cropping system

Organic manures have produced almost same or little less yield as compared with Recommended Dosage of Fertilizer (RDF) alone. Further, combinations of organic manures and RDF have improved the yield of all the crops to greater extent. Among the organic manures, FYM application was more promising during first year and effects of FYM, CR, VC and their combinations were more or less same during second year. However, only crop residue application had little adverse effect on the yield of groundnut only during second year. And the highest yield of cotton (12.08 q/ha), groundnut (10.15 q/ha) and Rabi Jowar (28.16 q/ha) were harvested with the application FYM 10t/ha, FYM 5t+ VC 1.25 t/ha and crop residues 5t/ha alongwith 100% RDF, respectively.

Agro. 12: Intercropping of red gram in cotton

Two years results clearly indicated that net returns as well as B:C ratio obtained from sole cotton (Rs. 14,880/- and 2.01) and cotton + redgram at 6:2 RP with 100% + 50% PP (Rs. 13,995/- and 1.85) were almost similar and higher than the other cropping systems (Rs. 9,773 to 12,260/- and 1.60 to 1.75). Yields of sole cotton and redgram were superior than the yields

recorded with respective crops in the intercropping system. However, LER was higher with intercropping systems and it was maximum (1.13) when cotton and redgram were intercropped with 6:2 RP at 100 + 50% PP.

Agro. V-1: Comparative performance of herbicides on control of weeds and yield of rainfed cotton

Two years results clearly indicated that IWM practice with PE application of Diuron @ 1.25 kg/ha + one HW + one IC (11.98 q/ha) as well as Pre-emergence application of Lasco @ 4.0 l t/ha + POE application of Round up @ 2.5 l t/ha (11.92 q/ha) have produced almost same yield as obtained with weed free plot (11.81 q/ha).

Agro. V-2: Evaluation of Roundup 41% SL against annual and perennial weeds

The results indicated that POE application of herbicides Glycel or Paraquat coupled with one hand weeding and interculturing as well as application of Gesso + POE application of Roundup were most effective methods of weed control in cotton and they gave higher yields (11.03 to 11.42 q/ha) than weed free plot (10.30 q/ha).

Agro. 8 (1) : Studies on dry seeding and rain water harvesting in cotton

Cotton sowing in dry soil (16.05 q/ha) before onset of regular rains has produced 10 per cent more yield than the normal time of sowing (14.57 q/ha) i.e., after receipt of regular rains and when the soil is having optimum soil moisture for sowing. And treatment of seeds with Ash+Dung (farmer's practice) has recorded slightly higher yield (15.59 q/ha) than chemical seed treatment (15.02 q/ha). Flat (17.60 q/ha) and plough sole (17.48 q/ha) methods of sowing in dry soil gave higher yields when seeds were treated with ash + dung as compared to other treatment combinations.

SIRUGUPPA

Agro. 2 (a) : Agronomic requirement of the pre-released promising intra-hirsutum hybrids under irrigated conditions

Intra-hirsutum hybrids were studied at two levels of fertilizers and three levels of spacings under irrigated conditions. VCHH 32 recorded significantly more yield (12.35 q/ha), about 15 to 21 per cent over DHH 12 (10.71 q/ha) and DHH 11 (10.20 q/ha) respectively. Further application of higher dose of fertilizer has no significant effect on the yield. Among the spacing, 90 x 30 cm significantly improved the cotton yield (11.70 q/ha) by 7 to 10 per cent over other spacings.

Agro. 2 (b) : Agronomic requirement of the pre-released promising interspecific hybrids under irrigated conditions

Among the hybrids, there was no significant difference in the yield. However, NFHB 101 (20.03 q/ha) has recorded highest yield as compared to other hybrids. Application of higher

dose of fertilizer (150:75:75 NPK kg/ha) has recorded significantly highest yield (20.06 q/ha) over 100:50:50 NPK kg/ha (17.55 q/ha) and it was on par with 200: 1 00: 100 NPK kg/ha. The spacing of 90 x 60 cm has recorded significantly highest yield (19.72 q/ha) as compared to 120 x 60 cm (18.47 q/ha) and it was on par with 90 x 90 cm spacing (19.10 q/ha). The yield increase was about 7 per cent over 120x60 cm spacing. Interaction effects between hybrids and fertilizers indicated that the NFHB 101 has recorded highest yield of 22.82 q/ha with 100:50:50 kg NPK/ha whereas DHB 290 and DHB 105 performed well with 150:75:75 NPK kg per ha.

Agro. 5 (a-I): Studies on the integrated nutrient management practices for sustainable production in cotton based cropping system

The results of the experiment indicated that the application of FYM @ 10 t/ha has recorded significantly highest yield (11.29 q/ha) over crop residue @ 5 t/ha (9.54 q/ha) and Vermi compost @ 2.5 t/ha (9.67 q/ha) and it was on par with rest of the treatments. The yield increase was about 17 to 18 per cent over Vemu compost (9.67 q/ha) and crop residues (9.54 q/ha) respectively.

KOVILPATTI

Agro. 2: Studies on agronomic requirements for pre-release cultures of cotton under rainfed conditions

Culture TKH 1175 recorded the highest mean seed cotton yield (8.4 q/ha). There was no significant effect influenced by the spacing on seed cotton yield. Increasing the fertilizer level had significantly increased the seed cotton yield and the maximum yield of 8.58 q/ha was obtained with a fertiliser dose of 60:20:20 kg NPK/ha.

Agro-V : Integrated Weed Management practice for higher cotton productivity

Significantly higher seed cotton yield was recorded either by the treatment of pre-emergence application of Butachlor @ 2.0 lit/ha (8.83 q/ha) or by pre-emergence application of Butachlor @ 2.0 lit/ha + one hand weeding on 40 DAS (9.25 q/ha).

COIMBATORE

Agro. I (a): Agronomic requirements of new cotton varieties / pre-release cultures in relation to plant density and fertilizer requirement

The highest kapas yield of 13.79 q/ha was obtained in the culture TCH-1569 but it was on par with the variety MCU 5 (13.71 q/ha). Closer spacing of 75 x 30 cm (44,444 plant/ha) recorded higher kapas yield (14.67 q/ha) than the wider spacing of 75 x 45 cm (29,630 plant/ha) which registered 11.43 q/ha. Among the fertilizer levels tested, the highest kapas yield of 14.27 q/ha was obtained under 120:60:60 kg NPK/ha but it was on par with that of 80:40:40 kg NPK/ha.

Agro. 2 (b): Agronomic requirements of new inter-specific cotton hybrids in relation to their plant density and fertilizer levels

Among the four hybrids tested, NFHB 101 registered the highest kapas yield of 14.42 q/ha which was on par with that of TCHB 213 (13.80 q/ha) and TCHB 2510 (13.35 q/ha). Closer spacing of 120 x 60 cm recorded 14.20 q/ha as against 12.80 q/ha under wider spacing of 120 x 75 cm. Among the four fertilizer levels, 150:75:75 kg NPK/ha yielded the highest kapas yield of 14.30 q/ha which was on par with that of 120:60:60 kg NPK/ha.

Agro. 3: Effect of split application of NPK on yield of cotton

The highest kapas yield of 18.21 q/ha was obtained by application of recommended dose of 80:40:40 kg NPK/ha in two splits on 45 and 60 DAS, without any basal dose. The increase in kapas yield in this treatment was 34.4 per cent and 23.6 per cent respectively, over control and recommended practice. This indicated that there was a good response for P and K when applied in two split doses alongwith N in this crop.

PLANT PHYSIOLOGY

HISAR

Six *arboreum* genotypes viz. HD 415, HD 260, HD 417, HD 413, HD 326 and HD 416 exhibited more than 60% germination in chloride-dominated saline water of 8 dS/m out of 28 genotypes tested. In general, germination percentage declined with increasing levels of salinity stress.

BANSWARA

Phy 2 (a): Source sink manipulation on yield of hybrid cotton

Studies on the effect of removal of flowers at different periods during the flowering phase on the boll set and yield of cotton indicated that the removal of first and second flushes of flowers i.e. removal of flowers upto 100 days after sowing enhanced the boll set at the later periods and resulted in higher seed cotton yield in G.Cot.Hy.6.

Phy 3 (a) : Leaf reddening studies in cotton hybrid.

Three years data conclusively indicated that foliar spray of MgSO₄ and FeSO₄ were found superior in managing the leaf reddening disease and in securing higher yields in G.Cot.Hy.6. It was found that the combination spray of 1.5% DAP + 1 % MgSO₄ gave significantly higher seed cotton yield (16.27 q/ha) followed by 0.5% MgSO₄ + 0.5% FeSO₄ (15.80 q/ha). The yield increase was mainly due to bigger bolls and better boll opening (**Table 27**).

Table 27: Effect of Micronutrients on seed cotton yield and its components in Hybrid cotton

S.No.	Treatment	Seed Cotton Yield (q/ha)	Fruiting Points/Plt	No. of Bolls per Plant	Boll weigh (g)
1.	MgSO ₄ 1 % at 90 DAS	15.54	73.1	15.0	3.6
2.	FeSO ₄ 1 % at 90 DAS	14.95	36.1	13.4	3.2
3.	MgSO ₄ + FeSO ₄ 0.5% each at 90 DAS	15.80	68.2	17.3	3.6
4.	MgSO ₄ 0.5%+FeSO ₄ 0.5% + DAP 1.5% at 90 DAS	15.60	64.2	15.6	3.2
5.	DAP 2% at 90 DAS	14.95	64.9	14.1	3.3
6.	DAP 1.5%+MgSO ₄ 1% at 90 DAS	16.27	64.9	18.3	3.8
7.	DAP 1.5% + FeSO ₄ 1 % at 90 DAS	14.99	56.3	14.9	3.2
8.	Control	14.60	63.4	11.8	2.9
	CD @ 5%	0.79			
	CV%	15.50			

KHANDWA

Studies on desinking by removal of squares for thirty days revealed the beneficial effect on yield and yield attributes. There was significant increase in boll weight as compared to control. Culture KH-1 03 was identified as tolerant to moisture stress with better morphophysiological attributes.

PARBHANI

Pre-sowing seed soaking treatments like hydration with 100 ppm KNO₃ for 12 hours and hydration for six hours brought about positive trends on speed of emergence, seedling vigour and yield. Two sprays or nutrients *viz.*, 0.2% MgSO₄, 0.5% FeSO₄ and combination of 0.5% FeSO₄, 0.5% Boron and 0.5% ZnSO₄ resulted in 20, 17 and 13% higher seed cotton yield over unsprayed control, respectively. The total chlorophyll content in leaves was significantly enhanced due to 0.2% MgSO₄ spray at various stages of growth (**Table 28**).

Table 28 : Total Chlorophyll content in leaves of cotton hybrid PHH 316

Treatments	Total Chlorophyll content (mg/g)		
	90	105	120
DAS			
T1-0.2% MgSO ₄	2.862	2.354	1.539
T2-0.5% FeSO ₄	2.245	2.046	1.467
T3-0.5% Boron	2.336	1.883	1.448
T4-0.5% ZnSO ₄	2.010	1.739	1.430
T5-T2+ T3+ T4	2.191	1.974	1.467
Control	1.667	1.576	1.320
CD 5%	0.302	0.204	0.217

The genotypes AC-318, PHH 316, NHH 302, NH 452 and BN-1 were characterised to possess higher photosynthetic rate. The per cent relative humidity showed positive significant correlation with physiological square and boll shedding among *hirsutum* genotypes.

SURAT

The genotypes G.Cot.Hy.8, G.Cot. DH7 and Dhumad registered increased root volume and plant dry weight at 4-8 E.C. levels of salinity as compared to control. The mean salinity index was more in G.Cot. 13 and Dhumad indicating their better tolerance. The genotype GISV 69 recorded highest dry matter production and LAI, while GISV-25 exhibited better translocation efficiency resulting in higher yield and better harvest index. Studies on storability of seeds revealed that the delinted seed appeared to be pervious to changes in ambient conditions as moisture content varied compared to fuzzy seeds. The seed treatments like turmeric powder, neem leaf powder, hydron, etc. did not exhibit any influence on the germination parameters even after 8 months of storage.

DHARWAD

In a study on drought tolerance, the rate of transpiration was observed less in high yielding genotypes, indicating the adaptive nature under moisture situations. Application of micronutrients for the control of leaf reddening led to enhanced yields over control due to increased number of bolls (**Table 29**).

The treatment combination of ZnSO₄ (0.5%) + NAA (10 ppm) + Lihocin (2000 ppm) + MgSO₄ (1%) resulted in highest seed cotton yield in hybrid DHB 105. Similar effect was, however, observed due to spray of MgSO₄ (1 %) or Lihocin 2000 ppm alone with regard to seed cotton yield.

Treatments	Kapas yield (kg/ha)	No. of days for 50 % flowering
Mg SO ₄ (1 %)	716.4	73
Fe SO ₄ (1 %)	608.6	73
Mg SO ₄ + Fe SO ₄ @ 0.5%	625.6	73
Mg SO ₄ + Fe SO ₄ + DAP @ 0.5% each	617.8	72
DAP @ 2%	489.6	70
DAP @ 2% + MgSO ₄ @ 1%	476.5	70
DAP @ 2% + FeSO ₄ @ 1%	594.0	75
Control	446.2	75
C.D.5%	160	2

GUNTUR

Screening of cotton genotypes for drought tolerance helped in classifying genotypes on the basis of Chlorophyll stability index, specific leaf weight and relative water content. The entry 8361 possessed these desirable physiological traits with better drought tolerance. The mean salinity index of seedling survival was found more in genotypes RAH 100, ARB 8821-1 and CPD 446 indicating their capacity to survive under saline conditions. It was seen that the var. Krishna recorded highest harvest index, while maximum crop growth rate was seen in NA 1325, MCU 5 and JK 276-4 .

BIOCHEMISTRY

HISAR

The seed quality evaluation of thirty genotypes of *G.arboreum* revealed a range of 17-25% for protein, 20-26% for oil and 2.9-8.8 mg/g for gossypol. The genotypes HD 417/98 had maximum seed index, while HD 269/98 possessed maximum oil content of 26.09%. The protein banding pattern exhibited the inherent variability existing among different genotypes with bands of R_f (0.75) and R_f (0.85) being common to many genotypes. As regards the effect of cotton leaf curl virus on biochemical constituents of leaf, it was seen that affected leaves had higher sugar content, while leaves of healthy plants possessed more chlorophyll (0.8 mg/g), carotenoids (2.6 mg/g), phenols (2.42%) and protein (22%). Leaves of susceptible plants had more sugars and lesser amount of phenols.

SURAT

Significant variability was observed for oil, phenol, free fatty acid and gossypol content among different genotypes evaluated. The variety G.Cot. 16 was characterised with high oil content and low free fatty acid content. The genotypes G.Cot DH-7 and Dhumad possessed higher nitrate reductase activity and carotenoids and exhibited saline tolerance. An increase in gossypol and phenol contents was evident with increase in gland density in leaves ($r = 0.57$) with a negative correlation ($r = -0.18$) to square damage.

DHARWAD

Bollworm tolerant genotypes viz. SCHH-2, Sahana and CPD-428 possessed higher tannin, phenols and orthodihydroxy pheonls. *G. arboreum* line 30815 had higher tannin content and lower reducing sugar and exhibited immune reaction to bacterial blight and grey mildew. Highest seed oil content was recorded in A-82-1-1 (25.5%), followed by **DHB** 105 (25.2%) and DHH-11 (24.7%).

COIMBATORE (CICR, RS)

Drought tolerant genotypes could overcome the possible damage to membranes by H_2O_2 with enhanced peroxidase activity. The drought tolerant germplasm lines possessed higher Glutamine Synthetase and Glutamate dehydrogenase activities with moderate increase in

hydrolytic enzymes, as compared to susceptible genotypes. Salinity stress brought about significant decrease in protein content (30-45%), sugar content (30-40%) and peroxidase activity. There was a quantum enhancement in RNase, acid and alkaline phosphatase activities, leading to disturbances in structural framework of subcellular organelles under stress.

The bollworm tolerant genotypes *viz.* BRS 5, BRS 21 and BRS 23 possessed lesser protein and sugar in squares compared to susceptible checks. The tolerant lines were characterised with higher levels of condensed tannin and gossypol, total and orthodihydroxy phenolics in squares. *Verticillium* tolerant lines like VRS 7, VRS 9 and AVTH had higher constitutive tannin and less sugar content than susceptible checks. The impact of growth stimulating activity of fungicides like Propiconazole, Carbendazim and Prochloraz was evident in enhancing the activity of Nitrate Reductase and secondary metabolites possessing antibiotic activity.

ENTOMOLOGY

NORTH ZONE

LUDHIANA

Ent. 1 (a): Screening of breeding materials for their reaction to key insect pests

A total of 109 entries from different trials were screened for their reaction to cotton jassid and bollworm under unprotected conditions. In IET entries F1867, RS 2094, BN., H. 1226, CA 149, LH 1918, RS 2098, CNH 1018, RS 2907, RS 2095 and CH 159 were tolerant to jassid (injury grade II). In PVT, LH 1913 alone recorded tolerant reaction to jassid. In the CVT, the entry RS 992 alone recorded tolerant reaction to jassid. Among the hybrids, HHH 223, LHH 752 and LHH 144 showed tolerant reaction. With regard to bollworm, all the entries showed susceptible reaction and the bollworm damage on boll basis ranged from 54.9% to 88.4%.

Ent. 2 : Population dynamics of major pests of cotton

Jassid population was more (7 to 10/plant) during the month of July-August. Among the bollworms, the spotted bollworm density was high and a maximum of 2-3 per plant was recorded during October-November. Similarly *Helicoverpa armigera* was high during October-November (0.4 to 0.7 per plant).

Ent. 3 (a): Management of cotton bollworms particularly H.armigera using I.G.R (Insect Growth Regulators)

Among the two moult inhibitors (RH 2485 and lufenuron) tested, RH 2485 recorded less bollworm damage and both the chemicals remained on par with the conventional insecticide quinalphos. The IGR significantly recorded high seed cotton yield (7.57 to 11.67 q/ha) as compared to untreated check (4.34 q/ha).

Expt. 3b: Identification of new molecules for management of bollworm complex

Among the 12 insecticides tested, Spinosad and Bulldock recorded less bollworm damage (17.4 to 19.6%) and remained on par with conventional insecticide quinalphos (21.1%). All the chemicals tested were superior to untreated check (56.2%) in reducing the bollworm damage. With regard to seed cotton yield, Spinosad at 75 g/ha recorded the maximum yield of 13.45 q/ha as compared to 4.05 q/ha in untreated check.

Expt. 3c: Testing new molecules for the control of sucking pests of cotton

Imidacloprid at 109/kg of seed and thiomethoxam 4.3 g/kg of seed reduced the jassid and whitefly population upto 75 DAS. Among the sprayable formulations (imidacloprid, thiomethoxam, acetamiprid) and Polo, all the chemicals tested were effective in reducing the jassid population. The new molecules recorded a jassid population of 0.0 to 3.0/15 leaves as compared to 8.7 in standard check (Marshal) and 43.0 in untreated check.

Expt. 3d: Relative efficacy of certain insecticides against cotton whitefly

Among the insecticides tested, Polo (moult inhibitor) at 400 and 500g ai/ha was effective, by recording a population of 23.3 and 21.7 adults/15 leaves as compared to 56.7 and 166 in standard check and untreated control.

Ent. 4 : Studies on Integrated Pest Management

In this experiment, recommended insecticide spray schedule was compared with IPM module. The IPM module consisted of seed treatment with imidacloprid, monitoring pest infestation, removal of spotted bollworms infested parts, spraying neem, H.a. NPV and three insecticides (endosulfan, fenvalerate and triazophos). The IPM module was compared with non-IPM, which involves only insecticidal spraying at ten days interval. The jassid injury grade and bollworm infestation was less in IPM module. IPM field recorded a bollworm infestation of 40.2% on boll basis as compared to 43.9% in non IPM field. The IPM field recorded a seed cotton yield of 12.6 q/ha as compared to 9.7 q/ha in non IPM field.

HISAR

Ent (1a): Preliminary screening of breeding materials for their reaction to insect pests of cotton

Screening of breeding material of *G. hirsutum* has revealed that RS 2095, CNH 1018, CA 149, H 1224, Pusa 325, CA 1397, H 1123, H 1185 and F 1794 were tolerant to insect pests. Amongst the hybrids, LHH 899, LHH 1028, Raj HH 469, CS HH 78, LHH 935 were tolerant to pests.

Ent 2 : Population dynamics of key pests of cotton

Spotted bollworm incidence was higher this year than previous years, particularly on

arboreum cotton also. On *hirsutum* cotton, *H. armigera*, spotted bollworm, leafhopper and whitefly were the major pests. *H. armigera* incidence persisted throughout the boll development period and caused significant damage.

Ent 3: Chemical control of cotton pests

Imidacloprid, thiomethoxam and carbosulfan proved good seed dressers for the control of early sucking pests upto 80 days. Foliar application of imidacloprid, thiomethoxam, carbosulfan and acetamiprid were effective in controlling sucking pests of cotton. The insecticides RH 2485, match, bulldock, decis and alanycarb were effective for the control of bollworm. Studies on IPM have revealed that seed treatment with imidacloprid is a useful component of IPM, particularly in CLCuV prone areas. Based on pest monitoring, the use of specific insecticides has yielded better than other IPM modules.

SRIGANGANAGAR

Ent. 1 (a): Screening breeding materials of G. hirsutum for their resistance to key pests

Thirty genotypes were screened for their reaction to jassid and whitefly. The entry RS 810 recorded resistant reaction to jassid and LH 1769 recorded tolerant reaction to whitefly. The entry Pus a 317, PIL 3 showed resistant reaction to jassid. With regard to bollworm damage, the entries RS 2013, RS 2114, LH 1836 and the local check RST 9 recorded less boll damage. The cultures F 1854, Pusa 317, Pusa 321, F 1734 and CH 899 recorded tolerant reaction to whitefly.

Among the hybrids. the entries LHH 752 and RAJHH 465 showed resistant reaction to jassid. Bollworm incidence was low in FHH 88 (17.4% on boll and 7.7% on locule basis) and HHH 223 (20.7 and 5.3%) as compared to 52.2 and 18.6% in Maruvikas (LC).

Ent. 2: Studies Oil populioll dynamics of key pests of cotton

Jassid appeared from the early stage of crop growth and was active upto the end of September. Population was high during July-August. Whitefly infestation appeared in the first week of July and high population was recorded during September-October. Among the bollworms, spotted bollworm intensity was prominent during this year as compared to American bollworm. Very high temperature and precipitation that prevailed during the early crop growth. favoured the rapid multiplication of pests.

Ent. 3 (a): Testing new insecticides against sucking pests of cotton

Seed treatment with imidacloprid and thiomethoxam were found most effective in keeping the population of jassid and whitefly under check for about 60 days after sowing. The foliar spray of imidacloprid, thiomethoxam and acetamiprid were most effective in controlling the jassid as compared to the standard check carbosulfan. Seed cotton yield was significantly higher in acetamiprid (13.18 q/ha). thiomethoxam (8.84) and imidacloprid (9.11 q/ha) treated plots as compared to standard insecticide carbosulfan (4.48 q/ha) treated plot.

Ent. 3 (b) : Testing new molecules for the control of whitefly vis-a-vis cotton leaf curl virus

Five new insecticides (imidacloprid, acetamiprid, thiomethoxam, diafenthuran and cartap hydrochloride) were tested and compared with standard check carbosulfan. At vegetative phase, whitefly population was less in diafenthuran (130.3 adults/15 leaves) followed by acetamiprid (134.8) and imidacloprid (139.5). In general, all the insecticides recorded higher whitefly population than the untreated check.

Ent. 4 (a): Testing of insect growth regulators (IGR) for the control of Bollworm (*Helicoverpa armigera*)

Among the four IGR tested, RH 2485 used @ 250g a.i/ha recorded minimum boll damage (6:5%) and locule (2.7%) damage and remained on par with lufenuran @ 60 g (12.8% and 4.8%) and novalurn @ 50g (12.7% and 4.8%) as compared to 17.9% boll damage and 6.9% locule damage in untreated check.

Ent. 4 (b): Testing new molecules of insecticides for the control of bollworms

Among the six molecules tested, spinosad at 75 g recorded lowest locule damage (2.1) and highest seed cotton yield (14.8 q/ha). The other effective chemicals were cyfluthrin and indoxacarb producing a mean seed cotton yield of 13.82 and 13.79 q/ha., respectively.

CENTRAL ZONE

KHANDWA

Ent. 1 (a): Preliminary screening of breeding materials for resistance to insect pests

As jassid population was moderate, 21 entries were found to record resistant reaction. With regard to bollworm, 6 entries viz., AH 133, KHH 111, DHH 231, JLH 1492 and KH 113 recorded less bollworm (9-15%)damage. Among the 23 *arboreum* entries screened, four entries, DLSA 17, JLA 1093, JLA 0794 and AKA 5 recorded less than 15% damage and were observed to be tolerant to bollworm.

Ent. 2: Population dynamics of key pests of cotton

In general, insect pest was at moderate level. The high rainfall received during September-October reduced the intensities of the pest. However, peak activity of jassid was recorded in the month of August-September. During the same period the predators chrysopa and ladybird beetle were noticed. This year, unusually high incidence of spotted bollworm to an extent of 33% was recorded during September. The damage due to *Heliothis* was high (28%) during November. During the same period, pink bollworm activity was at peak (34%).

Ent. 3(a) : Management of cotton bollworm (*h. armigera*) using IGR

RH 2485 and lufenuron were tested and compared with standard check

(chlorpyrifos). Significantly lowest (9.7%) damage of green bolls was recorded in lufenuron and it remained on par with RH 2485 and they were superior to the standard check. With regard to seed cotton yield, maximum of 10.65 q/ha was recorded in RH 2485 at 250g ai/ha and it remained on par with lufenuron at both the doses. Both the moulting inhibitors significantly recorded high seed cotton yield than the standard check (8.49 q/ha).

Ent. 3 (b) : Efficacy of new molecules against bollworm complex

On the basis of effectiveness in reducing the bollworm damage and recording higher yield, alanycarb, tatarfen, bulldock, spinosad and indoxacarb performed better as compared to other insecticides.

Ent. 3 (c) : Efficacy of certain chemicals against sucking pests of cotton

The seed treatment of imidacloprid and thiomethoxam were effective in reducing jassid, aphid and whitefly upto 50 days. The spray of thiomethoxam, imidacloprid, acetamiprid and Polo were effective in reducing jassid and aphids. Seed treatment of thiomethoxam at 2.8 and 4.3 g/kg of seed recorded the maximum yield of 11.57 and 10.59 q/ha, respectively and remained superior to other treatments. Among the spray formulations, acetamiprid at 15g recorded the maximum yield of 9.18 q/ha and remained on par with all the new insecticides but superior to standard checks.

Ent. 4 : Integrated management of cotton pests

On the basis of population of sucking pests, bollworm damage on square and green bolls, IPM plots were found to be the best in comparison to bio-control block and chemical control block. The IPM block recorded a yield of 6.08 q/ha as compared to 3.17 and 4.41 q/ha in Bio-control and normal blocks, respectively.

INDORE

Ent. 1 : Studies on population dynamics of insect pests of cotton

Jassid and the American bollworm *H. armigera* were the key pests. Jassid infestation was recorded in the early seedling stage and continued to remain throughout the crop period. *H. armigera*, though observed throughout the season, the intensity of attack was moderate.

Ent. 2 : Preliminary screening of G. hirsutum and G. arboreum for their reaction to key pests of cotton

Twenty five entries were evaluated for their reaction to jassid and bollworm. None of the entries showed resistant reaction (Grade I) to jassid. However, the entries AKH 9015, GISV 69, KH 121, JLH 1294 and PH 92/260 showed tolerant reaction (injury grade II). With regard to bollworm damage on locule basis, all the entries recorded more than 20% damage and the percentage infestation varied from 23.1 % (GJHS 52) to 60.6% (AKH 8740). Among the entries evaluated for their yield potential under unprotected condition, the entries JLH 1894 (4.44 g/ha),

IH 63 (4.62 g/ha), KH 115 (4.6g/ha), NH 573 (4.25 g/ha) and KH 121 (6.66 g/ha) recorded more than 4.0 g/ha. Under Br.04 (b), the entry KH 112 recorded the maximum yield of 4.07 g/ha as compared to the minimum of 0.92 g/ha in NH 452. Under Br. 05(b-1), the entry KH 110 recorded the maximum yield of 8.52 g/ha and the entries KH 111, MERCH 210 recorded 5.55 g/ha and 5.92 g/ha as compared to 1.66 g/ha in NHH 44 under unprotected condition.

Among the desi hybrid, MDCH 222 recorded the maximum yield of 4.63 g/ha as compared to 0.74 g/ha only in MDCH 232. All the *desi* cotton hybrids, except MDCH 222 (18.8%), recorded more than 25% locule damage due to bollworm.

SURAT

Ent. 1 (a): Screening of breeding materials for the reaction to key pests of cotton

Out of 81 entries tested, nine entries were found to be tolerant to jassids. Eleven entries recorded less than 5 per cent bollworm damage on green bolls.

Ent. 3 (a) : Studies on population dynamics of key pests of cotton

Aphids appeared from last week of July and its maximum population was during third week of August, November and December. The Jassid was observed from last week of July and continued throughout the crop period and its maximum population was recorded during October. The whitefly population was very low throughout the crop period. The incidence of *H. annigera* appeared from second week of August and its maximum intensity was observed between September to November end.

Ent. 4 (a): Chemical control of cotton bollworm

Among the insecticides tested, spinosad @ 75 g ai/ha was found significantly superior in reducing the bollworm damage and recorded high seed cotton yield. The other chemical decis, bull dock and amitraz were also as effective as spinosad.

Ent. 4 (b) : Management of cotton bollworm (*H.armigera*) using IGR

Significantly minimum bollworm damage was recorded in Rimon at 100 g ai/ha and it also recorded maximum seed cotton yield. The treatment RH 2485 at 300 g ai/ha was also found to be effective in reducing the bollworm damage.

NANDED

Ent. 1 (a): Preliminary screening of breeding materials for resistance to sucking pests

The population density of jassid and whitefly was very low throughout the season. However, there was high aphid population and two entries CAHH 468 and KHH 111 recorded the lowest population of less than 30 aphids per 3 leaves. Forty-three entries were screened for their reaction to bollworm. None of the entries recorded less than 5% damage. Under unprotected

condition, the entries AH 133, KHH 111. KHH 110 and NFHH 351 gave significantly high seed cotton yield of above 250 g/5 plants.

Ent. 2a: To test the efficacy of new insecticides against sucking pests of cotton

The treatment thiomethoxam @ 50g ai/ha recorded lowest population of jassid (1.1/3 leaves) and aphid (2.5/3 leaves). With regard to whitefly, there was no significant difference among the treatments. With regard to seed cotton yield, imidacloprid @ 100 ml/ha recorded the maximum yield of 14.34 q/ha and it remained on par with other chemicals except difenthran @ 400g ai/ha.

Ent. 2 (b): To test the efficacy of insect growth regulators (IGR) against bollworm particularly H. armigera

The chemicals RH 2485 and lufenuran were tested and compared with NSKE 5% and cypermethrin. All the chemicals were found significantly superior in minimising the bollworm infestation and increasing the kapas yield over control. The treatment RH 2485 at 200g ai/ha recorded the minimum infestation of 13.9% on squares and flowers and remained on par with all other chemicals. With regard to yield, RH 2485 at 300g recorded the highest yield of 15.32 q/ha, and remained on par with other treatments.

Ent. 2 (c) : To test the efficacy of new molecules against cotton bollworm

All the treatments were found significantly superior over control in minimising the bollworm infestation in squares, flowers, and green bolls. Among the new chemical, spinosad at 75 g recorded the lowest damage of 13.2% on green bolls and remained on par with all the treatments. Bulldock at 12.5 g recorded the highest seed cotton yield of 18.95 q/ha and found significantly superior over decis tablet, endosulfan, quinalphos and cypermethrin.

AKOLA

Ent. 1 (a) : Preliminary screening of breeding materials against key pests of cotton

Forty one lines were screened for jassid and bollworm tolerance. Four strains viz., KH 109, NH 529, JLH 1594 and JLH 1494 from Br.04 showed resistant reaction to jassid. With regard to bollworm, all the lines showed susceptible reaction and the bollworm damage in open bolls ranged from 80.0 to 93.3%.

Ent. 3 : Studies on the population dynamics of key pests of cotton

Aphid infestation appeared in July and continued to remain throughout the cropping season. Peak aphid infestation ranging from 23 to 76/plant was observed in December-January. Jassid infestation also appeared in July with lower level throughout the cropping season except in September. During this period, the jassid population ranged from 6 to 7/plant. During this year, the infestation of spotted bollworm was high in squares and flowers as well as in green bolls. Highest infestation of 16-20% on squares and 38-58% in green bolls were recorded during

October. The infestation of *H. annigera* appeared during August and remained up to November. In general, the incidence of *H. armigera* was at low level and a maximum infestation of 12.8% was recorded in the first week of November. The incidence of pink bollworm was observed to occur during the middle of October and remained throughout the cropping season. A maximum of 40% on bolls was recorded during the first week of January.

Ent. 4 : Chemical control of cotton bollworm

The treatment spinosad 75g and bulldock 18g were observed to record less bollworm damage on green bolls and open bolls as compared to other treatments. With regard to seed cotton yield, maximum of 10.8 q/ha was recorded in bulldock and it remained on par with decis. The plots treated with decis, bulldock and tatafen were observed to record high incidence of whitefly.

Ent. 6 (b): Efficacy of new insecticides against sucking pests of cotton

Population of jassid remained less in seed treatment of thiomethoxam and imidacloprid upto 45 DAS. At 60 DAS, minimum population of jassids (2.00/plant) was recorded in thiomethoxam spray and it remained statistically at par with acetamiprid spray and imidacloprid seed treatment @ 10g/kg of seed. Maximum yield of 8.98 q/ha was recorded in imidacloprid (10g) seed treatment and it remained on par with imidacloprid 7.5g.

Ent. 7 : Studies on the Integrated Management of cotton pests

Three modules viz., Bio-intensive module (M1), Adaptable module (M2) and Recommended package of Practices module (M3) were evaluated for the management of cotton pest. In all the three modules, imposition of treatment was based on ETL except release of parasites. The Cost - Benefit ratio in M1, M2 and M3 were seen to be 2.21, 4.74 and 3.86 respectively, indicating that adaptable module gave more cost benefit ratio (**Table 30**).

Table 30: Population of cotton pest under different schedules of plant protection and other parameters

Parameters	Module - 1	Module - 2	Module - 3
Jassids / plant	0.98	1.01	4.57
Thrips / plant	9.09	8.83	5.23
Whitefly / plant	0.84	0.99	1.17
Chrysopa	0.85	1.23	0.85
Coccinellids	0.76	1.42	2.22
<i>H. armigera</i> larvae / plant	0.16	0.14	0.11
Bollworm damage on green bolls	4.47	3.75	4.03
Seed cotton yield (q/ha)	7.26	8.30	7.52
Net income (Rs.)	10,496	14,396	12,543
Cost benefit ratio	1:2.21	1:4.74	1 :3.86

Joint collaborative large scale validation of IPM technology in cotton

A similar large scale IPM module was adopted at Nanded centre in the village Murali in an area of 422 acres in collaboration with the National Centre for Integrated Pest Management, New Delhi. On the other hand, the farmers' practice (control plot) was adopted in 80 acres.

The following technologies were followed in the IPM module-

- 1) Clean up campaign in the month of April
- 2) Seed treatment with imidacloprid
- 3) Intercropping with maize + cowpea
- 4) Two releases of *T. chilonis*
- 5) Two sprayings of NSKE 5%
- 6) Spraying of H NPV and
- 7) Hand collection of larvae and erection of pheromone trap

Farmer's practice involved on an average 5 sprays of insecticides.

Table 31 : Comparative evaluation of IPM module and Farmers' practice

Parameters	IPM module	Farmers' practice
Jassids	2.05	1.82
Aphids	6.99	30.83
Thrips	0.67	0.91
Bollworm damage on fruiting bodies	4.71	8.04
Bollworm damage on green bolls	3.89	7.79
Chrysopa	0.64	0.28
Ladybird beetle	3.66	0.92
Yield (q/ha)	9.63	5.93
Cost of treatment	1,325	1,600
Profit (Rs.)	17,935	10,200
Cost benefit ratio	1:13.53	1 :6.41

The IPM Module resulted in less usage of pesticides and gave more profit than the Farmer's practice.

SOUTH ZONE

GUNTUR

Ent. 1: Screening of breeding materials against major insect pests of cotton

Fifty three entries from different varietal trials were screened against major pests of cotton. In Br. 04, the entries L 613, RAH 100, ARB 8908 and CNH 120 MB recorded resistant reaction to jassid by recording jassid injury Grade I. In Br. 05 (a-I), the entries SNSCH 96 and NHH 44 and Br. 05(a-2) trial, the entries NFHH 1470, DAC 135 and Nimhar showed resistance to jassid. Very low aphid infestation was recorded in entries L 613, SCS 27, Kasturi and ARB HH 5. With regard to bollworm, the entry CNH 120 MB recorded minimum bollworm damage of 7.8 as compared to 24.1 in CWROK. The entry CNH 120 MB recorded the maximum seed cotton yield of 15.87 q/ha. The entries SNSCH 96, DHH 543, RAHH 151 and LAHH 11 recorded less than 5% bollworm damage. The entries DHH 543 (15.07 q/ha), RAHH 150 (17.46 q/ha), LAHH 11 (10.31 q/ha), ARBHH 5 (10.71 q/ha) and VARCH 87 (11.90 q/ha) recorded more than 10 q/ha. The entries DMSHH 60 and Nimkar 911 recorded less than 5% bollworm damage. In Br. 05, the entries ARCHH 1242, PBCH 28, KDCMH 14, AMCH 28 and RCH 2 recorded more than 10.0 q of seed cotton in unprotected condition.

Ent. 3: Studies on the population dynamics of key pests of cotton

Jassids, *H. armigera* and pink bollworm were observed as key pests in cotton eco-system. Jassids appeared in the end of July and remained low during the entire cropping season. Peak activity was observed in January on rejuvenated crop. The bollworm *H. armigera* could not successfully establish due to incessant high precipitation received till the middle of October. A maximum damage of 29% was recorded during the middle of December. The pink bollworm assumed importance during this season and peak activity was recorded during January and remained at high level till the middle of February.

Ent. 4 : New insecticide trial - Effect of new insecticides against cotton bollworm

Among the new insecticides evaluated, the insecticide spinosad (7.2%), bulldock (7.2%) and amitraz (6.2%) recorded less bollworm damage on squares as compared to untreated check (22.2%). Both the insecticides also recorded less boll damage and locule damage. Maximum yield of 16.76 q/ha was recorded in spinosad 75g and it remained on par with indoxacarb, decis tablet and tatafen but superior to alanycarb and standard check chlorpyrifos.

DHARWAD

Ent 1. : Screening of breeding materials against major insect pests of cotton

Fifty three entries were screened for their reaction to sucking pest and bollworm. None of the entries showed resistant reaction to jassid. Nine entries recorded less than 10% boll damage as compared to the maximum of 27.5%.

Ent 2. : Population dynamics of cotton pests

Maximum thrips incidence was observed in the last week of August. Jassids was high during August-September. The natural enemy population was low throughout the season. Maximum bollworm damage of 30% was recorded during the third week of September. There were three peaks of *H. armigera*. The first peak was in the first week of September and the second and third were during October and December, respectively.

Ent 3a.: Evaluation of IGR against cotton bollworm particularly to H. armigera

The bollworm damage ranged from 20.9 to 25.6%. The minimum being in Novaluran 75g which remained on par with RH 2485 at 250, 300 and Lufenuran 30 and 60 g a.i./ha. Novaluran at 75g recorded minimum *H. armigera* larval population of 0.36/plant as compared to 0.75 in untreated check and 0.49 in insecticide treatment. All the IGRs significantly recorded high seed cotton yield compared to insecticide treatment and untreated check.

Ent 3b: Evaluation of new molecules of insecticides against cotton bollworm

Bulldock at both the dosages recorded significantly less bollworm damage and resulted in increased seed cotton yield of 3417 kg/ha as compared to 1015 kg in untreated check. Decis tablet formulation was as effective as EC formulation.

Ent 3c: Evaluation of new molecules against sucking pests

Imidacloprid (10g) and thiomethoxam (4.3g) at higher dosages were effective against aphids and jassids upto 35 days. Among the spray able formulations, thiomethoxam at 50g, imidacloprid 100ml and diafenthiuron at 400g a.i./ha were significantly superior to other insecticides against jassid and aphids.

COIMBATORE (TNAU)

Ent. 1: Preliminary screening of breeding materials for resistance to insect pests

About 120 lines from different experiments were screened for their reaction to jassid and bollworm. The entries CHH 15, RAC 13, CPD 612, TCH 1569, VRS 19, RACH 2 and DMSH 459 recorded less than 5 jassid/plant.

In general, the bollworm infestation was very low. Most of the entries recorded less than 10% bollworm infestation. Under Br.02(a), the entries CN 47-94, BWR 39, CNH 1025, CCH 16, CCH 1071 and CCH 18 recorded less than 5% bollworm infestation as compared to 23.7 in ARB 9801.

Under Br. 03 (a), the entries NDH 1078, RAH 111 and ARB 9701 recorded less than 5%. Under Br. 04(a), the entries L 613, RAH 100, and CPD 446 recorded less than 5% damage as compared to SCS 27 which recorded 15.9% bollworm damage. The entries SNSCH 96, SCHH 3, VARCH 67, RACH 2 and DHH 200 recorded less than 5% damage.

Ent. 3 (a) : Management of cotton bollworm (*R. armigera*) using IGR

RH 2485 at 200g ai/ha recorded the lowest mean bollworm damage of 2.64% and it remained on par with all the treatments except untreated check which recorded 12.92% damage. No significant difference was noticed in yield which varied from 600 to 867 kg/ha.

Ent. 3 (a) (ii): Testing of new molecules for bollworm complex

With regard to bollworm damage, all the insecticide treatments remained on par with each other. No yield differences could be noticed in this trial.

Ent. 3 (b): To evaluate the bio-efficacy of insecticide against jassid on cotton

Observations taken on 60 DAS indicated that imidocloprid, thiomethoxam and polo recorded less jassid population .

KOVILPATTI

Ent. 1: Preliminary screening of breeding materials for resistance to insect pests

Sixty-six entries from different trials were screened against cotton jassids and bollworms under rainfed condition.

The entries CNH 120 MB, L 605, BCHH 6527, PCHH2, PRC 31, BCHH 6566, SCHH 86, .NHH 44, PAC 140, VCHH 510 and Kasturi recorded resistant reaction to jassid. Under unprotected condition, M5 KD 26, NDH 1588, CWROK 165 recorded more than 7 q/ha under Br. 04 (b) CVT trial. Under Br. 05 (b) trial, the entry DHH 543 recorded the maximum yield of 10.88 q/ha as compared to 6.71 q/ha in NHH 44.

COIMBATORE (CICR, RS)

Effect of moult inhibitors against cotton bollworm with special reference to *Helicoverpa armigera*

Four moult inhibitors were tested for their effectiveness against cotton bollworm particularly to *H. armigera*. Three sprayings were given on 80, 95 and 120 days after sowing. Jassid infestation was controlled by spraying methyl-o-demeton. Observations were taken on bollworm damage, larvae/ 10 plants, locule damage, larval damage on shed squares and yield.

In general, bollworm damage was less. Observations taken over six periods on bollworm damage indicated that RH 2485 at 300g a.i./ha recorded the minimum bollworm damage of 5.65% and it remained on par with flufenoxuron 100g, lufenuron 60g and novaluron 75g a.i./ha, but superior to the conventional insecticide endosulfan. All the treatments were superior to untreated check. Minimum *H. armigera* larvae of 2.08 / 10 plants was recorded in lufenuron at 60g and it remained on par with all the treatments except RH 2485 at 200g and endosulfan. With regard to damage to shed squares, minimum damage of 8.23 was recorded in

novaluron 75g and it remained on par with all treatments except flufenoxuron at 75g a.i./ha. With regard to locule damage, minimum damage of 12.6 was recorded in lufenuron 60g and it remained on par with all the treatments except RH 2485 at 200g, novaluron at 50g and 75/ha. With regard to seed cotton yield, all the treatments remained on par but superior to untreated check by recording 1833 to 2217 kg/ha in different treatments as compared to 1713 kg/ha in untreated check.

Ent. 2a : Effect of seed treatment of certain insecticides against sucking pests of cotton

The new seed treating insecticides viz., imidacloprid and thiomethoxam were evaluated against jassid, aphid and thrips.

All the seed treatments were effective in reducing the jassid and thrips upto 60 days after sowing. However with regard to aphid, there was increasing trend of population after 50 days in most of the seed treatments. This may be due to luxuriant growth observed due to seed treatment. The increasing population trend was significant in carbosulfan, which recorded 5.1 aphid per leaf as compared to 1.50 in untreated check. *With regard to seed cotton yield, maximum seed cotton yield of 19.75 q/ha was recorded in imidacloprid seed treatment at 10g/kg of seed, which remained on par with all the seed treatments.* All the insecticide treatments significantly recorded higher yield than the untreated check.

Ent. 2b : Effect of certain new insecticides (spray) against sucking pests of cotton

The insecticides acetamiprid, diafenturon, thiomethoxam and imidacloprid were evaluated against jassids, aphids and thrips. Three sprayings were given on 25, 35 and 50 days after sowing and observations were taken on sucking pest and seed cotton yield.

With regard to jassid, observation taken over 5 periods indicated that minimum population of 0.48 per three leaves was recorded in acetamiprid at 15g a.i./ha and it remained on par with all the treatments. All the treatments were superior to untreated check. A similar trend was observed with aphids. Minimum population of 1.3 per three leaf was recorded in acetamiprid at 10g, which remained on par with all the insecticidal treatments including the standard check methyl-o-demeton. Minimum thrips population was recorded in acetamiprid at 15g and it remained on par with acetamiprid 10g, diafenturon 300g and imidacloprid spray but superior to other treatments including the standard check methyl-o-demeton. *With regard to yield, maximum seed cotton yield of 21.97 q/ha was recorded in acetamiprid and it remained on par with all the insecticidal treatments.*

Ent. 3. : Evaluation of new molecules for bollworm complex

Five rounds of sprayings were given on 72, 86, 96, 111 and 120 days after sowing. The results indicated that the new insecticide Alpha cypermethrin recorded minimum bollworm damage of 11.1 % and it remained on par with Beta cyfluthrin, lamda-cyhalothrin and cypermethrin. With regard to yield, there was no significant difference between the treatment; however, indoxacarb at 100g recorded the maximum yield of 23.49 q/ha as compared to 17.68 q/ha in untreated control.

Ent. 4.: Evaluation of combination products against cotton pests

Eleven combination products were tested. A total of five rounds of spray were given. With regard to bollworm damage, cypermethrin + triazophos recorded the minimum damage of 7.33% and it remained on par with cypermethrin + chlorpyrifos, cypermethrin + ethion, deltamethrin + endosulfan and cypermethrin + phosalone as compared to 20.13% boll damage in untreated check. With regard to seed cotton yield, a maximum of 23 q/ha was recorded in cypermethrin + phosalone treatment and it remained on par with chlorpyrifos + alphacypermethrin, cypermethrin + ethion, cypermethrin + triazophos, acephate + fenvalerate, flufenoxuron + alphamethrin and cypermethrin + chlorpyrifos. Untreated check recorded a minimum yield of 13.79 q/ha.

PLANT PATHOLOGY

NORTH ZONE

LUDHIANA

Disease situation: Seedling mortality, bacterial blight and leaf curl virus disease were the most prominent diseases on *G.hirsutum*. Leaf curl virus disease was observed throughout the cotton belt but the incidence was less during the year. The low incidence may be due to timely removal of alternate weed hosts like pedibuti, low population of whitefly in the early season, negligible area of *G. hirsutum* cotton in citrus orchards and cultivation of *G.arboreum* cotton in endemic areas of leaf curl virus.

Screening for resistance to Bacterial blight and Leaf Curl Virus:

The following lines were found to be resistant shown against each.

Bacterial blight - RS 2098

Leaf Curl Virus - RS 875, RS 2094, RS 2096, LHH 1028, LHH 899,

(under green House) LHH 910, LHH 144, FHH 93, Raj HH 468 and CSHH 85

HISAR

Disease situation: Due to the dry weather in the early season, the progress of Bacterial blight was slow. The intensity of cotton leaf curl virus disease was low but the area under this virus has increased. New occurrence of leaf curl virus was observed in the villages of Bhiwani, Hisar and Jind districts. Sudden wilting at boiling stage and root rot has been observed in more places. Due to heavy rains, high intensity of boll rot was observed. Heavy incidence of Alternaria leaf spot was observed wherever pyrethroids have been used indiscriminately.

Screening for resistance: Nine entries of *hirsutum* lines resistant to Myrothecium leaf spot and 60 entries to Alternaria leaf spot were identified.

CENTRAL ZONE

SURAT

Disease situation: Bacterial blight incidence was observed in Surat, Velda, Nizar and Kunbhari tehsils of Surat. Grey mildew incidence was observed in Bharuch on desi as well as hirsutum cotton during October to January. Alternaria leaf spot was observed to the tune of 15 per cent at Velda and Nizar area during December-Januray.

Disease in relation to weather factors: Bacterial leaf blight (BLB) appeared during the third week of August. The normal sown crop recorded maximum intensity of the disease. The disease progressed up to second week of October and then declined. None of the weather factors had any significant influence with the disease development.

Screening against diseases: Eight entries of intra *hirsutum* hybrids viz., PHS 316 PHS 32 I, NHH 44, SCHH 22, CZHS 606, CAHH 98, CAHH 146 and CAHH 147 were found resistant to BLB. All the *herbaceum* lines were free from the diseases.

Biological control: Both the treatments of bio agents and chemical treatments significantly reduced the BLB intensity but there was no significant difference in yield.

KHANDWA

Disease sitution: Grey mildew and Bacterial blight were the major diseases observed during the season.

Disease progress in relation to weather: The incidence of Bacterial blight was first noticed in the first fortnight of August and the highest incidence (56%) was observed in the early part Of November. The Grey mildew incidence was first observed in November and maximum incidence (35%) was observed during December.

Screening for disease resistance: With Bacterial blight incidence ranging from 5% to 70%, no variety was found resistant. Thirteen entries were found free from the Grey mildew incidence.

G. hirsutum : CJHS-52, KH 107, JLH 1494, KH 101, KH 112, KH 113, CAHH 468
Intra hirsutum hybrids: AH 133, VICH 9, Kasturi-44, PHH 231, AH 101, Ankur 651.

Chemical control of Grey mildew:

Propiconazole has been found to effectively reduce the incidence of Grey mildew than Carbendazim, Dithane M-45 and Chloroneb.

RAHURI

Disease situation: Bacterial blight and Alternaria leaf spot were observed at boll development stage.

Disease progress in relation to weather: Bacterial blight and Alternaria leaf spot appeared in the 26th meteorological week with relative humidity ranging from 67.5 to 88.3 per cent. Grey mildew appeared in the 24th meteorological week with humidity ranging from 53.7 to 85.1 per cent.

Screening for disease resistance: Eight entries have been found to have combined resistance to bacterial blight and Alternaria leaf spot viz., AKH 8940, CNH 7-94, GJHV-47, CNH 151, GSHV-14, PHH 316, DHH 542 and AHH 133. Three entries were found to have resistance to grey mildew-AHH 133, AH 131 and CNH 7 -94.

Biological control of Alternaria leaf blight of cotton: Spraying with the bio-agent *Trichoderma viride* significantly reduced the intensity of Alternaria disease (PDI 32.96) as compared to *Aspergillus niger* (PDI 44.20) or check (54.20). However, the chemical treatment of Copper oxychloride + Streptocycline has shown less intensity of Alternaria (PDI 25.92) and higher seed cotton yield (2693 kg/ha) than other treatments.

NANDED

Disease situation: Bacterial blight incidence was seen in almost all the fields and the maximum intensity of grade-IV was observed. Grey mildew incidence was upto 28% on *hirsutum* cottons whereas *arboresum* registered only 20%.

Disease progress in relation to weather factors: The time of sowing had no influence on the development of the disease. But the relative humidity coupled with good rainfall had an effective role in the appearance and further development of disease and maximum disease intensity of Bacterial blight, Alternaria leaf spot and Grey mildew were observed for both the dates of sowing i.e., 26th June and 11th July. However, the late sown cotton showed reduced yield.

Screening against diseases: The following genotypes have been found to be resistant against diseases,

Bacterial Blight : EPCH 2, NFHH 35/464, Ankur 651, KH 120 and GISV 161

Alternaria leaf spot: KH 110, PAC 104, GISV 61, CJHS 52 and KH 112

Estimation of yield loss due to Grey mildew:

Yield loss of 26.6 per cent was observed due to grey mildew disease.

AKOLA

Disease situation: Severe incidence of grey mildew was observed on *hirsutum* and *arboresum* cottons with *arboresum*s registering higher intensity than *hirsutum*s. Severe incidence of Bacterial blight was noticed on all *hirsutum*s (LRA 5166, NHH 44, PKV Rajat, PKV Hy.2, PKV Hy.4, H 10, Ankur 651, Ankur 09 and Indo American hybrid) leading to boll rot stage at certain locations.

Disease progress in relation to weather factors: The maximum disease intensity of Bacterial blight (9.66) was observed during the 47th Meteorological week (19-25, November) in the normal sown crop.

Screening for Bacterial blight: None of the *hirsutum* lines was found to be resistant to Bacterial blight. However, all *Desi* varieties were tolerant.

Management of Bacterial blight through bio-control agents:

The spraying of *Aeromonas* sp. recorded less disease intensity (PDI 8.36) than the check (20.47). However, the yield was on par with Streptocycline 100ppm + copper oxychloride 0.25% (3.88 and 3.95 q/ha respectively).

Estimation of yield loss due to grey mildew:

Sixty three percent loss of seed cotton yield in plots artificially infected and 47% loss in naturally infected plots was observed due to Grey mildew disease on cotton variety AKH 4.

PUNE

Of the 178 *desi* entries screened for *Fusarium* wilt, 25 entries (13 from Bharuch, eight from Surat, two each from Jalgaon and Dharwad and one from Viramgam) were found to be resistant.

SOUTH ZONE

COIMBATORE (TNAU)

Disease situation: Bacterial blight, Grey mildew and Alternaria leaf spot were the major diseases observed during the boll development stage and beyond. The hybrids RCH 2 and TCHB 213 had higher incidence of Bacterial blight with PDI ranging from 11.0 to 34.0. Grey mildew incidence was at a PDI of 32.0-39.0.

Disease progress in relation to weather factors: In the crops raised in two different dates in August, '98 and September, '98 with 12 days interval, Alternaria blight and Grey mildew were the major diseases observed. Alternaria blight was observed from 52nd Meteorological week (1998) to second Meteorological week (1999) and maximum incidence was observed during 4th to 6th meteorological week.

Regarding Grey mildew, the first appearance was noticed during the 51st meteorological week and gradually increased upto 5th meteorological week (1999) with PDI range of 8.0 to 50.0.

Screening for resistance: As the Grey mildew disease was severe, none of the entries showed resistance to Grey mildew and the disease grade ranged from 2 to 4.

Chemical control of foliar diseases: Prochloraz @ 500 ai/ha and Propiconazole (0.1 %) gave significant control of grey mildew over the check. However, no significant differences were found for yield of seed cotton among treatments.

COIMBATORE (CICR, RS)

Testing of new fungicides against cotton diseases

Two new fungicides viz., Benzothiodiazole at three doses and Prochloraz at the recommended dose were tested in separate trials against grey mildew and Alternaria leaf spot. Three rounds of sprays were given at ten day intervals, immediately after the onset of the disease(s). The disease incidence was recorded ten days after the last spray.

Against grey mildew, Benzothiodiazole at three doses (20, 30 and 40 g a.i./ha) and Prochloraz were as effective as the standards (Carbendazim & Propiconazole) and the bioagents *Trichodenna harzianum*, *T. viride* and *Pseudomonas flourescens*-CHAO.

Against Alternaria leaf spot, the two fungicides tested gave better control than the standards (Copper oxychloride and Propiconazole) and were as effective as bioagents.

DHARWAD

Disease situation: Grey mildew and Alternaria leaf blight affected the leaves and young bolls of desi cotton leading to severe defoliation. Severe incidence of Bacterial blight was observed at Dharwad, Kalghatgi, Indi, Hungund and Chintamani blocks leading to boll rot and black arm symptoms.

Disease progress in relation to weather factor: The incidence of all the three diseases viz., Bacterial blight, Alternaria blight and Grey mildew were found in higher intensity in all the dates of sowing.

Screening against diseases: The following genotypes have been found resistant to various diseases noted against each.

Bacterial blight: CNH 7094, CNH 301, RAC 9561, NDLH 1658, CWROK 165, VRS 16, PAC 135, ACHH 430 and all *herbaceum* and *arboreum* varieties.

Grey mildew: Sanju, RCH 13.

BREEDER SEED PRODUCTION

During 1998-99, the total breeder seeds produced at various centres was of the order of 151.13 q, as against a total indent of 177.55 q. Breeder seed production in respect of the parents of hybrids was quite satisfactory with a surplus of 15.3 q. There were no major mismatches in indent and production. However, in the case of Varieties, as against a total indent of 168.57 q, the actual production was only 126.83 q. The short fall in production was mainly

from the North Zone states, especially Punjab due to crop damages by excess rainfall. The breeder seed indent for the year 1999-2000 is 139.31 q. Variety and Centre wise details are furnished below.

Breeder Seed Production Figures for 1198-99 and Indent for 1999-2000

(I) HYBRIDS
Quintals

Figures in

S.No.	Name of Hybrid/Variety	Producing Centre	1998-99		1999-2000
			Indent	Production	Indent
1	Raj HH-16 Maru Vikas (F) Maru vikas (M)	RAU, Sriganaganagar	0.10	-	NIL
		RAU, Sriganaganagar	0.04	-	NIL
2	HHH-81 (F) (M)	CCS HAD, Hisar	0.10	0.16	NIL
		CCS HAD, Hisar	0.04	0.18	NIL
3	LHH 144(Ajit) (F) (M)	PAD, Ludhiana	-	-	0.12
		PAD, Ludhiana	-	-	0.06
4	Fateh LH 660 (F) Suman (M)	PAD, Ludhiana	0.02	-	NIL
		PAD, Ludhiana	0.01	-	NIL
5	H4 G 67 A. Nectariless	GAD, Surat	NIL	NIL	0.01
		GAD, Surat	NIL	NIL	0.01
6	H6 G.Cot 100 (F) G.Cot 10 (M)	GAD, Surat	0.39	2.00	0.21
		GAD, Surat	0.28	1.00	0.09
7	H8 G.Cot 10 (F) Surat Dwarf(M)	GAU, Surat	0.36	1.00	0.40
		GAU, Surat	0.29	1.00	0.23
8.	H-10 BC-68-2 (F) LRA - 5166	GAU, Surat	0.28	2.00	0.44
		GAU, Surat	0.14	2.00	0.18
9	JKHY-I Khandwa-2(MP) REBA B 50	JNKVV, Khandwa	0.50	0.20	0.36
		JNKVV, Khandwa	0.31	0.30	0.20

10	PKHY-2 AK - 32 (F) DHY 286 (M)	PDKV, Akola PDKV, Akola	0.61 0.42	3.54 1.17	0.46 0.25
11	NHH 44 BN - 1 (F) AC -738 (M)	MAU, Nanded MAU, Nanded	1.27 0.71	4.00 2.60	1.19 0.61
12	NHH 390 (F) (M)	MAU, Nanded MAU, Nanded	NIL NIL	NIL NIL	0.05 0.02
13	DCH 32 DS-28 (F) SB-425 YF(M)	UAS, Dharwad UAS, Dharwad	1.12 0.65	1.12 0.65	0.91 0.67
14	Varalaxmi Laxmi SB-289-E	UAS, Dharwad UAS, Dharwad	0.30 0.23	0.30 0.23	0.50 0.39
15	DHH 11 (F) (M)	UAS, Dharwad UAS, Dharwad	NIL NIL	NIL NIL	0.13 0.05
16	Savita T-7 M-12	CICR, Coimbatore CICR, Coimbatore	0.53 0.28	1.00 0.50	0.51 0.30
17	HB 224 (F) (M)	CICR, Coimbatore CICR, Coimbatore	NIL NIL	NIL NIL	0.02 0.02

Breeder Seed Production Figures for 1998-99 and Indent for 1999-2000

Figures in

Quintals

II. VARIETIES			1998-99		1999-2000
S.No.	Name of Variety	Producing Centre	Indent	Production	Indent
1	B.Nerma	RAU, Sriganaganagar	7.85	2.00	7.55
2	RST-9	RAU, Sriganaganagar	10.97	8.00	12.72
3	RS-875	RAU, Sriganaganagar	3.90	11.00	5.40
4	G.Ageti	RAU, Sriganaganagar	2.35	0.40	2.90
5	RG-8	RAU, Sriganaganagar	13.09	18.00	11.95

6	F-505	PAU, Ludhiana	5.05	0.10	3.75
7	F-846	PAU, Ludhiana	22.05	8.00	16.10
8	F-1378	PAU, Ludhiana	16.70	1.06	9.50
9	LH-900	PAU, Ludhiana	0.90	0.80	1.46
10	LH-1566	PAU, Ludhiana	8.60	2.37	7.40
11	LD-327	PAU, Ludhiana	6.90	3.50	7.05
12	LD 491	PAU, Ludhiana	NIL	NIL	0.34
13	H-777	CCS HAU, Hisar	4.78	1.50	3.04
14	HS-6	CCS HAU, Hisar	7.50	7.00	3.55
15	Pusa 8-6	IARI, New Delhi	1.33	NR	0.80
16	Vikas	CSAUAT, Kanpur	2.00	2.00	1.30
17	Vikram	JNKVV, Khandwa	0.04	0.20	0.25
18	Tapti	JNKVV, Khandwa	NIL	NIL	1.50
19	Khandwa-2	JNKVV, Khandwa	0.04	0.00	1.00
20	NH 452(Renuka)	MAU, Nanded	C47	3.00	NIL
21	DHY-286	PDKV, Akola	5.72	3.94	0.70
22	Rajat	PDKV, Akola	2.30	6.26	3.35
23	AKH-081	PDKV, Akola	2.75	2.65	NIL
24	AKA-5	PDKV, Akola	9.35	12.14	NIL
25	AKA-8401	PDKV, Akola	4.70	0.62	NIL
26	LRA 5166	CICR, Coimbatore	14.34	14.55	14.76
27	LRK-516(Anjali)	CICR, Coimbatore	9.16	9.20	9.12
28	MCU-5 VT	CICR, Coimbatore	2.15	2.00	2.80
29	Surabhi	CICR, Coimbatore	1.05	5.00	0.50
30	MCU-5	TNAU, Coimbatore	0.99	1.00	1.01
31	Abhadita	UAS, Dharwad	0.54	0.54	0.65
32	LK861	ANGRAU, Guntur	NIL	NIL	0.31
33	L 389	ANGRAU, Guntur	NIL	NIL	0.16
		Hybrids Total	8.98	24.30	8.39
		Varieties Total	168.57	126.83	130.92
		GRAND TOTAL	177.55	151.13	139.31

FRONT LINE DEMONSTRATION

Cotton Front Line Demonstrations were conducted for highlighting the usefulness of latest improved cotton production and protection technologies to the farmers in different areas of cotton growing states in the country during 1998-99, with a budgetary outlay of Rs. 20.00 lakhs sanctioned by the Ministry of Agriculture, Government of India. The details of the demonstrations were formulated during the Annual Workshop meeting of AICCIP held at Tamil Nadu Agricultural University, Coimbatore during April, 1998.

CENTRE	No. of trials	Technologies demonstrated
NORTH ZONE		
PAU, Ludhiana	74	Demonstration of new varieties/hybrids-LRA 5166, Anjali, LH 1556, F 1054, LHH 491, LD 491 and LD 327
CCS HAU, Hisar	75	Popularisation of new varieties/hybrids-HS 1812, GK 151, LHH 144, RG 8, HS 6, HD 107 & HD 123 under Cotton-Wheat and Cotton-Sorghum cropping system
CICR, Sirsa	25	Demonstration of CLCuV resistant variety/hybrid Om Shankar, LRA 5166 & Anjali against HS 6, RST 9, RS 875 & 1098
RAU, Sriganganagar	60	Demonstration of improved variety/hybrid LRA 5166, RS 875 & LHH 144 against RST 9 and BN
CENTRAL ZONE		
GAU, Surat	70	IPM technology, Demonstration of improved variety/hybrids like G.Cot. Hy-6, G.Cot.Hy-8, G.Cot.Hy-10, Digvijay, G.Cot.16 and G.Cot.17
JNKVV, Khandwa	25	Demonstration of the benefit of biopesticides, bioagents and use of Pheromone trap in controlling sucking pests and <i>Heliothis</i>
OUAT, Orissa	10	Hybrid Savita was tested against local cultivars
PDKV, 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, drip irrigation and intercropping with groundnut

MAU, Nanded	30	Demonstration of improved package of practices over local practice both under irrigated and rainfed conditions
CICR, Nagpur	35	Bio-control of cotton pests and Integrated Nutrient Management
SOUTH ZONE ANGRAU, Guntu	25	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	1. Demonstration of newly released hybrid DHB 105 against popular hybrid DCH 32 and DHH 11 against NHH 44 2. Use of Bhendi as trap crop 3. Use of <i>Trichogramma</i> and NPV under IPM module
CICR, Coimbatore thro' Dept.of Agri., Tamil Nadu	58	Popularisation of Surabhi and Anjali in Rice fallow system; Anjali in Banana-cotton relay cropping system and Popularisation of Hybrid Savita
TNAU, Coimbatore	60	Demonstration of yield potential of newly released variety/hybrids-TCHB 213, Savita, KC 2, SVPR 2 and K11

Front Line Demonstrations have conclusively proved that adoption of Integrated Crop Management Technologies with special emphasis on IPM, new hybrids and varieties increased the yield by 15 to 30%. The FLD has also aided in faster spread of hybrids *DHB 105*, *PK Hy. 3* and *G. Cot. Hy. 10* and varieties *Anjali* (LRK 516) and *RS 875*. The IPM practices have been appropriately highlighted in many of the Front Line Demonstrations.

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RETIREMENT OF EMINENT COTTON SCIENTISTS

Dr. Harjeet Singh Kalsy, an outstanding Cotton Breeder and Zonal Coordinator (North Zone - AICCIP) retired from service in February, 1998. As a team leader of cotton group, he is instrumental in formulation and implementation of cotton research programme in North zone and PAD, Ludhiana. He has played a significant role in the development and release of high yielding cotton varieties like F 414, F 286, F 505, F 846, F 1054, F 1378 and hybrids Fateh and LHH 144. The release of F 414 added a new dimension to agricultural economy of Punjab by way of adoption of cotton-wheat rotation.

He has been bestowed with awards like NICTMA award, Silver Jubilee of AICCIP Award, Baba Farid Award, Hexamar Award and Best Teacher Award of PAD. He has also guided several students. He has more than 115 publications to his credit. The AICCIP gratefully remembers him for his yeoman service to cotton and wishes him a happy retired life.

Dr. Rajendra Prasad Bhardwaj, an able Cotton Breeder of Rajasthan Agricultural University, Sriganaganagar, retired from service in July, 1999. He is associated with the development of many high yielding cotton varieties G. Ageti, RST-9, RS-875, RS-810, RG 8, RG 18 and hybrid Maruvikas. Known for his outstanding abilities in Cotton Breeding, he has won many recognitions like Certificate of Honour from Cotton Research and Development Association, Cash Prize from EICA, Mumbai, Award during the Centenary Celebration of Main Cotton Station, Surat.

He is the recipient of First Trophy from NSC, New Delhi for excellent services in Cotton Breeding. As a fellow of many Professional Societies and Vice-President of Journal of Cotton Research & Development, he has evaluated number of Research Projects, Papers, Theses and many technical documents related to Cotton Research & Development. He has authored more than 100 research papers, popular articles and guided five Ph.D. students. The AICCIP expresses its gratitude to him for being a resource person and wishes him a pleasant retired life.

AICCIP BUDGET

Budgetary details regarding the allotment of funds to different centres of AICCIP during 1998-99 are indicated below.

S.No.	Name of the Centre	1998 - 1999		
		ICAR Share	State share	Total
1.	FARIDKOT	10.65	3.55	14.20
2.	HISAR	18.07	6.03	24.10
3.	SRIGANGANAGAR	14.85	4.95	19.80
4.	SURAT	20.77	6.93	27.70
5.	KHANDWA	11.10	3.70	14.80
6.	AKOLA	9.90	3.30	13.20
7.	NANDED	13.12	4.38	17.50
8.	RAHURI	9.15	3.05	12.20
9.	DHARWAD	17.55	5.85	23.40
10.	GUNTUR	12.07	4.03	16.10
11.	COIMBATORE	12.90	4.30	17.20
12.	LUDHIANA	16.40	5.40	21.80
13.	BANSWARA	4.20	1.40	5.60
14.	MATHURA	4.20	1.40	5.60
15.	JUNAGADH	3.97	1.33	5.30
16.	INDORE	6.45	2.15	8.60
17.	PUNE	5.47	1.83	7.30
18.	SIRUGUPPA	2.70	0.90	3.60
19.	SRIVILLIPUTHUR	10.87	3.63	14.50
20.	NANDYAL	5.17	1.73	6.90
21.	TALOD	3.22	1.08	4.30
22.	CHARODI	3.22	1.08	4.30
23.	BADNAWAR	4.20	1.40	5.60
24.	PADEGAON	4.95	1.65	6.60
25.	ARABHAVI	3.45	1.15	4.60
26.	KOVILPATTI	8.17	2.73	10.90
	ZONAL COORDINATOR			
27.	i. KHANDWA	0.35	-	0.35
28.	ii. DHARWAD	0.35	-	0.35
29.	iii. LUDHIANA	0.35	-	0.35
	TOTAL	237.82	78.93	316.75