

MM 1.1: Development of diploid cotton cultivars with high fibre quality

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Target & Achievement

Target	Achievement
Identification of high fibre length and high strength <i>G.arboreum</i> types from <i>germplasm</i> and breeding material coupled with high yield	The strain like PAIG-8/1,AH-65 and MDL-2582 having high yield potential, 2.5% span length ranging from 26.92 to 27.82 mm, fibre strength ranging from 22.12 to 22.62 g/tex, micronaire ranging from 4.88 to 4.93 and short fibre content ranging from 8.8 to 12% have been identified. The strains, viz. JLA-2199,CINA-318,CINA-316,CINA-343,CINA-344 and MDL-2483 have been sponsored to AICCIP
Evaluation of genotypes having combination of desirable character like superior fibre length and strength derived from germ plasm and introgressed material	The strains like PA-605 and PA-405 from Parbhani having better combination of fibre traits and yield potential and DELA-2 from Dharwad having excellent fibre qualities Superior than <i>hirsutum</i> s have been identified. The strains like PAIG-29, AH-65, AH-1 and AH-11 developed through introgression have been sponsored to AICCIP during 2005-06
Breeding desi cotton for low gossypol gland, naked seeded strains suitable for reducing, manufacturing cost of edible oil	The strain like PA-646 and PA-8 with low gossypol gland in seed and combinations of higher yield, ginning outturn (above 38%) and staple length (above 26 mm) have been identified
Identification of <i>G.herbaceum</i> types having superior fibre properties derived from breeding material	The strains like RBDV-21 and DDHC-35 have been identified
Identification of <i>herbaceum x herbaceum</i> and <i>herbaceum x arboreum</i> hybrids	The activity have been discontinued as per suggestion of Dr. P. Singh, Former Director, CICR, Nagpur
Testing of early generation material developed through conventional and introgressed breeding material	1622 cultures were evaluated and more than 2500 single plant selection were made. The quality characters like fibre length have been evaluated from 20.0 mm to 31.6 mm, fibre strength from 18 g/tex to 26.1 g/tex, micronaire from 5.5 to 3.5% and ginning outturn maximum upto 43.43% at par even superior than varieties and hybrids of <i>hirsutum</i> cotton

❖ Identification of long fibre length and high strength *G. arboreum* from germplasm and breeding material coupled with high yield

The object of this activity is to test the performance of quality *arboreum* derived from breeding material and germplasm in comparison with *hirsutum* varieties in multilocation trials. Accordingly 25 genotypes sponsored by different centers were tested along with common *arboreum* check, PA-255; local *arboreum* as well as *hirsutum* checks of respective centers at 13 locations during 2004-2005.

The results were statistically significant for seed cotton yield at all locations. The trial conducted at Rahuri was vitiated.

Seed Cotton Yield (Kg/ha)

Central Zone :

At Parbhani nine strains viz., PAIG-29, PAIG-8/1, PAIG-8/3, AH-65, MDL-2463, MDL-2582, HD-424, TKA-332 and CISA-6 recorded significant superiority for seed cotton yield over both *arboreum* check, PA-255 and *hirsutum* check, NH-545. The strain PAIG-29 recorded significant superiority over all the checks viz. PA-255 (*G. arboreum*) and *hirsutum* check, NH-545 (*G. hirsutum*) and HxH hybrid Bunny .

At Nagpur eight strains recorded significant superiority over all the three checks viz., PA-255, (CC), local *arboreum* check, AKA-8401 and local *hirsutum* check, CINA-36. The strain JLA-9122 recorded highest seed cotton yield (1276 Kg/ha) followed by HD-446 (1208Kg/ha) and CINA-306 (1189 Kg/ha).

As many as six strains viz., G. Cot-15, TKA-32, AKA-8, AKA-314, AKA-315 and JLA-9122 recorded significant superiority over common *arboreum* check PA-255, local *arboreum* check AKA-8401 and local *hirsutum* check PKV Rajat at Akola.

At Bharuch, only one strain i.e. AH-65 recorded significant superiority over common check PA-255, whereas none of the strains recorded significant superiority over local *hirsutum* check, G.Cot-16. Two strains viz., G. cot-19 (1012 Kg/ha and MLD-2582 (814 Kg/ha) recorded superiority supply for seed cotton yield over local *arboreum* check, Jawahar Tapti, local *hirsutum* check K2 and common *arboreum* check PA-255 at Khandwa.

South Zone:

At Mudhol, none of the strains recorded significant superiority over local *arboreum* check veena whereas only one and two strains recorded significant superiority over local *hirsutum* check, Narsimha and common *arboreum* check, PA-255, respectively. None of the strain recorded significant superiority for seed cotton yield over local *hirsutum* check Sahana at Dharwad. Whereas two strains viz., CINA-306 (1638 Kg/ha) and JLA-2199 (1817 Kg/ha) were significantly superior for seed cotton yield over local *arboreum* check DLSA -17.

North Zone :

At Banswara, none of the strain significantly out yielded over common *arboreum* check PA-255. At Sirsa none of the strain significantly out yielded over, local *arboreum* check RG-8, whereas all the stains except

KWA-N-4 recorded significant superiority over common *arboreum* check PA-255.

At Sriganganagar all the strains except PAIG 8/3, MDL-2582, AKA-8, AKA-313, AKA-314, AKA-315, MDL-2601 and DELA-2 were significantly superior for seed cotton yield over common *arboreum* check PA-255 where as none of the strains significantly out yielded local *hirsutum* check RS-2013 and two strains viz, HD-424 and CISA-6 were significantly superior over local *arboreum* check RG-8.

In general on the basis of mean ranking performance of the strains, PAIG-8/1 (Parbhani), G. cot-15 (Bharuch), CISA-6 (Sirsa) , AH-65 (Parbhani) and MDL-2585 (Mudhol) was promising for seed cotton yield (Table 1.1.1)

Mean ginning outturn (%) : The mean ginning outturn ranged from 31.62 (KWAN-3) to 37.66 per cent (AKA-8) amongst the strains under study. Amongst the top five ranking strains, the highest ginning outturn was recorded by CISA-6 (36.69%) followed by G. cot-15 (35.46%), PAIG 8/1 (34.83 %), AH-65 (34.18%) and MDL-2582 (34.14%).

Fiber quality parameters

2.5 per cent span length (mm) : Amongst the strains under study, the mean 2.5 % span length ranged from 22.03 (HD-446) to 30.10 mm (KWAN-3). Amongst the top five ranking strains the highest 2.5 per cent span length was

recorded by MDL-2582 (27.82 mm) followed by AH-65 (26.64 mm) , PAIG 8/1 (26.29 mm), G.cot-15 (25.10 mm) and CISA-6 (22.46 mm).

Table 1.1.1 Five top ranking strains for Seed cotton yield at various locations.

Locations	I	II	III	IV	V
Parbhani	PAIG-29	HD-424	AH-65	PAIG-8/3	CISA-6
	1513	1432	1404	1389	1382
Nagpur	JLA-9122	HD-446	CINA-306	AH-65	G.Cot-15
	1276	1208	1189	1141	1062
Akola	JLA-9122	AKA-315	G.Cot-15	AKA-8	TKA-332
	889	826	809	798	786
Mudhol	JLA-9122	MDL-2582	AH-65	MDL-2601	PAIG-8/1
	1166	1065	1029	1006	914
Dharwad	JLA-9122	CINA-306	G.cot-19	AKA-314	AKA-315
	1817	1638	1391	1321	1291
Kovilpatti	AKA-314	MDI-2582	TKA-332	G.Cot-15	PAIG-8/1
	1235	1144	991	951	915
Bharuch	AH-65	PAIG-8/3	G.Cot-15	TKA-332	G.cot-19
	1857	1798	1753	1677	1655
banswara	MDL-2601	PAIG-29	JLA-9122	AH-65	PAIG-8/1
	1574	1528	1481	1417	1389
Khandwa	G.cot-19	MDI-2582	PAIG-8/1	AKA-315	MDL-2601
	1012	814	595	592	583
Hisar	HD-424	AH-65	AKA-314	AKA-315	DELA-2
	1148	466	455	325	204
Sirsa	PAIG-29	G.Cot-15	PAIG-8/1	KWA-N-4	
	1829	1806	1692	1669	
Snagar	CISA-6	HD-424	CINA-306	RG-369	JLA-9122
	926	895	617	524	463
MEAN *	PAIG-8/1	G.Cot-15	CISA-6	AH-65	MDL-2582
	1043	1021	995	968	952

* Only those strains which were tested on minimum nine locations covering Central, South and North Zones were considered for mean ranking.

Fiber strength (g/tex) : The mean fiber strength ranged from 15.88 g/tex (RG-369) to 23.57 g/tex (KWA-N-6/2). Amongst the higher yielding strains, the highest fiber strength was observed in the strain PAIG-8/1 (22.62 g/tex) followed by AH-65 (22.1 g/tex), G.cot-15 (20.84 g/tex), MDL-2582 (20.3 g/tex) and CISA-6 (17.36 g/tex).

Uniformity ratio : The mean uniformity ratio ranged from 42.67 (TKA-332) to 51.00 (KWAN-4). Amongst the top five ranking strains, the higher uniformity ratio

was recorded by CISA-6 (50.33) followed by G. Cot 15 (49.50), AH-65 (48.83), PAIG-8/1 (48.67) and MDL-2582 (47.25).

Micronaire value : The micronaire values ranged from 4.33 (KWAN-3) to 6.28 (CISA-6). Amongst the top five ranking strains, the lowest micronaire value recorded in PAIG 8/1, MDL-2582 (4.88) followed by AH-65 (4.93), G. cot-15 (5.37) and CISA-6 (6.28).

Elongation % : The mean elongation percentage ranged from 5.15 (DELA-2) to 7.18 per cent (HD-446). Amongst the top five ranking strains the longest elongation was observed in CISA-6 (7.00 %) followed by G-Cot 15 (6.07 %), AH-65 (5.93 %), PAIG-8/1 (5.85 %) and MDL-2582 (5.4%).

Short fiber content (SFC) (%) : The mean short fibre content ranged from 7.5 (KWAN-3) to 29.2 per cent (MDL-2601). Amongst the top five ranking strains, the lowest short fibre content was observed in PAIG 8/1 (8.8) followed by AH-65 (12.45) and G. Cot-15 (14.9) where as the fourth and fifth top ranking strains (CISA-6 and MDL-2582) recorded highest values for short fibre context (above 22%). Ginning out turn and fibre properties of five top ranking strains have been presented in Table 1.1.2.

In general performance of introgressed strains PAIG 8/1 and AH-65 was promising for seed cotton yield (1043 and 968 Kg/ha) 2.5% span length (26.29 and 26.64 mm), fiber strength (22.62 and 22.1 g/tex), micronaire (4.88 and 4.93) and SFC (8.8 and 12.4 %) than rest of the top ranking strains. Similar performance with 27.82mm 2.5% span length was depicted by MDL-2582 but the strain had very high short fiber context (28.55%). The performance of the strain G. cot-15 was average and that of CISA-6 was inferior for fiber traits.

❖ Large scale testing of quality *arboreum* developed through conventional and introgression breeding method

The object of this activity was to test the performance of productive genotypes having good combination of desired traits. Accordingly twelve, six and seven genotypes were tested at Parbhani, Dharwad and Khandwa respectively, alongwith common *arboreum* check PA-255, local *hirsutum* check and local H x H hybrid of respective centers.

Table 1.1.2 Ginning out turn and fibre properties of five top ranking strains

Strains	PAIG-8/1	G.cot-15	CISA-6	AH-65	MDL-2582
Ginning outturn (%)					
Mean	34.83	35.46	36.89	34.18	34.14
Range	32.3-38.9	33.5-38.9	32.4-40	31.6-38	33-37.9
2.5% span length (mm)					
Mean	26.29	25.10	22.46	26.64	27.82
Range	24.3-30.4	23.5-26.5	20.5-22.7	24.9-28.2	26.6-30.3
Uniform ratio					
Mean	48.67	49.50	51	49	47.25
Range	47.51	48.51	46-53	47-50	46-50
Strength (g/tex)					
Mean	22.62	20.84	17.36	22.1	20.3
Range	21.2-25.4	19.5-22.8	14.3-20.6	20.7-23.2	19.8-20.3
Micro. Value					
Mean	4.88	5.37	6.28	4.93	4.88
Range	4.5-5.5	4.8-6.2	5.9-6.6	4.8-5.2	4.6-5.3
Elongation (%)					
Mean	5.85	6.07	7.00	5.93	5.40
Range	4.5-6.7	5.7-6.6	6.7-7.5	5.3-6.2	4.7-5.8
SFC (%)					
Mean	8.8	14.9	22.5	12.45	28.55
Range	7.2-10.4	14.9	18.3-26.8	8.7-16.2	11.1-46

Parbhani

Seed cotton yield (kg/ha) : Four strains viz. AH-11, PA-605, PA-304 & PA-405 recorded significant superiority over arboreum checks, PA-255, PA-402 and hirsutum check NH-545. None of the strains was significantly superior over the hybrid check, Bunny. However the strain AH-11 (2531 kg/ha) recorded numerical superiority with 7.01 per cent enhanced seed cotton yield over hybrid Bunny.

Ginning outturn (%) : A range of 35.34 (PA-605) to 39.17 per cent (PA-603) was observed for ginning outturn amongst the strains under testing. Amongst the higher yielding strains, two strains AH-11 (38.08%) and PA-603 (39.17%) recorded better ginning outturn above 38 per cent.

Fibre traits

A range of 25.0 mm (PA-603) to 29.5 mm (DELA-2) was observed for 2.5% span length. Amongst the higher yielding strain, the strain PA-605 (27.8 mm) recorded longest 2.5% span length followed by PA-405 (27.1 mm) and PA-304.

The strain PA-605 (4.2%) depicted better micronaire than rest of the higher yielding strains. The fibre strength of AH-11 (22.1 g/tex) was highest followed by PA-405 (22.0 g/tex) and PA-304 (21.2 g/tex).

In general performance of the strain PA-405 and PA-605 was quite better for seed cotton yield and combination of fibre traits.

Dharwad

Seed cotton yield (kg/ha) : Results were statistically non significant for seed cotton yield. The strain PA-304 (1667 kg/ha) recorded highest yield with 9.31 and 20.62 per cent enhanced seed cotton yield over the common check PA-255 (1525 kg/ha) and local arboreum check DLSA-17 (1382 kg/ha). None of the strain could out yield the local hirsutum check Sahana (1925 kg/ha).

Ginning outturn (%) : Range of 35.3 (PA-605) to 37.7 per cent (PA-304) was observed for ginning outturn amongst the strains under testing. The higher yielding strain PA-304 (37.7%) recorded highest ginning outturn followed by DESA-2 (36.91) and DELA-2(36.81)

Fibre traits

The strains DELA-2 (29.5 mm) recorded longest 2.5% span length followed by PA-304 (27.2 mm). The strain DELA-2 depicted better micronaire (3.6%) and strength (24.4 g/text) in addition to longer 2.5% span length.

In general the strain DELA-2 had excellent fibre qualities quite superior than all the arboreum strains and hirsutum check, Sahana.

Khandwa

Seed cotton yield (Kg/ha) : Results were statistically significant for seed cotton yield. The strain JLA-9122 (1215 kg/ha) recorded significant superiority over common arboreum check PA-255, local check, J.Tapti and local hirsutum check, K-2. The next best strain was DLSA-2 (1003 kg/ha) having significant superiority over the hirsutum check, K-2 (940 kg/ha).

Ginning outturn (%) : Most of the strains were low ginner. The ginning outturn ranged from 32.0 (JLA-4122) to 35.3% (PA-611).

❖ Breeding desi cotton for low gossypol gland naked seeded strains suitable for reducing manufacturing cost of edible oil

Location : Parbhani

Seed cotton yield : Three strains, viz., PA-646 (1241 Kg/ha), PA-8 (1136 Kg/ha) and PA-562 (1132 Kg/ha) recorded significant superiority over both the checks, PA-255 and PA-402.

Ginning outturn (%) : A range of 32.39 (PA-644) to 40.22 per cent (PA-646) was observed for ginning outturn amongst the strains under testing. All the higher yielding strains, viz., PA-646 (40.22%), PA-562 (38.65%) and PA-8 (38.10%) recorded better ginning outturn above 38 per cent and were at par with check, PA-255 (38.01) and superior than the check, PA-402.

Staple length : All the naked seeded strains except PA-596 depicted better staple length above 25.0 mm. The strain PA-519 (28.4 mm) recorded longest staple length followed by PA-646 (28.10 mm) and PA-621 (27.55 mm). Amongst the higher yielding strains, a strain PA-646 (28.10 mm) recorded better staple length followed by PA-8 (26.42 mm).

In general, performance of the strains PA-646 and PA-8 was promising for combination of yield, ginning outturn and staple length.

❖ Identification of *G. herbaceum* types having superior fibre properties derived from breeding material

The object of this activity is to identify productive *herbaceum* types having superior fibre properties. Accordingly three separate trials were conducted at Dharwad, Banswara (Rajasthan) and Bharuch (Gujrat). Results were statistically significant for seed cotton yield at Banswara and Bharuch, whereas non significant at Dharwad.

Seed cotton yield (Kg/ha) : On an average of three locations, the strain RBDV-21 recorded highest seed cotton yield (1229 Kg/ha) followed by DDhc-35 (1161 Kg/ha) and GBhv-229 (1159 kg/ha). At Banswara, five strains viz., GBhv-220, GBhv-226, GBhv-228, RBDV-21 and RBDV-17 recorded significant superiority for seed cotton yield over *herbaceum* check Jaydhar. At Bharuch, none of the strain recorded significant superiority over *herbaceum* check, Jaydhar.

The fiber data was not available from all three centers.

❖ Testing of early generation material developed through conventional and introgression breeding.

During 2004-05, one thousand six hundred and twenty two cultures in early generation were evaluated over 10 centers of the project. The details are as follows :

Center	No. of cultures evaluated
Parbhani	236
Nagpur	41
Akola	178
Dharwad	85
Khandwa	82
Mudhol	512
Banswara	12
Hisar	15
Sirsa	163
Shriganganagar	298
Total	1622

1622 genotypes in early generation (F2-F5) were evaluated and more than 2500 selection were made at various centres to creat desirable variability to enhance genetic improvement of diploid cotton. The quality characters like fibre length have been evaluated from 20.0 mm to 31.6 mm (Line No 2001 from Mudhol), fibre strength from 18 g/tex to 26.1 g/tex (Line No. 2001 from Mudhol), Micronaire from 5.5 to 3.5% (Line No. 2000 from Mudhol) and ginning outturn maximum upto 43.43% (Line No-17 from Parbhani) at par even over superior than varieties and hybrids of *hirsutum* cotton.

On the basis of these testing as many as nine strains, viz. PAIG-29, AH-65, AH-11, AH-1 (from Parbhani), CINA-318, CINA-316, CINA-343 and CINA-344 (from Nagpur) and JLA-2199 (Jalgaon) have been sponsored to All India Co-ordinated Cotton Improvement Project (AICCIP) for testing during 2005-2006.