Promising Desi Cotton (*G. arboreum* L.) Germplasm for Fibre Quality Traits and Locule Retentivity

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The current interest in desi cotton (*Gossypium arboreum*) has stimulated research on several aspects of improvement for its fibre properties and locule retentivity. Five hundred and forty geographically and phenotypically diverse lines of *G. arboreum* L. were screened during 2001-2002 to 2003-2004. A wide range of variability for each parameter was observed. Eight lines PA 255, CISA 196, CISA 290, CISA 334, CISA 338, CISA 342, 6637 and AC 3088 were completely resistant to shattering. The cultivar CISA 290 also showed higher boll number and good yield potential. Five superior genotypes for 2.5 % span length (above 25.6 mm) were CISA 12 (27.5), DLSA 8 (26.8), PA 255 (26.5), 1789 (26.4) and AK 580 (25.6); for fibre fineness CISA 12 (5.0), 1789 (4.9) AK 60-2 (4.8), AKH 607 (4.6), AK 580 (4.6) and 6629 (4.5); for fibre strength AC 3370-1 (24.8), KWAN 3 (24.5), CISA 245 (24.1), 6629 (23.2) AND PA 255 (22.7); for ginning outturn AKH 592 (37.3), DLSA 8 (35.5), AK 580 (35.0), 6571 (35.0) and KWAN 3 (34.5); for lint index AK 580 (4.8), AKH 592 (4.3), 6612 (4.2), 6619 (4.1) and 7038 (4.0) and for yield potential AC 1374 (128.8), DLSA 8 (103.4), KWAN 3 (99.9), 7173 WL NLL (98.6) and 6586 (97.5). The genotypes exhibiting >0.9 strength length ratios were CISA 245 (1.05), KWAN 3 (1.02), 6629 (0.92), 6644 (0.91) and CISA 329 (0.90). In addition to superiority for strength-length ratio some genotypes were also noticed superior for other quality traits such as culture 6629 for fineness, strength and GOT; KWAN 3 for GOT and yield and CISA 245 for fibre strength and GOT. These levels can be used further in crop improvement programmes for desired traits.

Key words: Cotton, Crop improvement, Fibre properties, Germplasm, Locule retentivity

Cotton, the most important commercial crop of the country, is grown in 15,00,000 ha in North zone out of which desi cotton (*G. arboreum*) constitutes around 25% area. The desi cottons have very high yield potential along with resistance to biotic and abiotic stresses. The yield potential of some desi cotton varieties is noticed up to 40 q/ ha, which is even higher than *G. hirsutum* in certain cases. However, inferior fibre properties and poor locule retentivity are the major drawbacks in desi cotton. The seed cotton immediately after opening of boll falls down on the ground and as a result several types of impurities combine with lint, which deteriorate the lint quality. In addition several pickings are to be done in such cases which involves huge labour requirement. The problem is further aggravated due to adverse weather like high wind, rain and hail storm. Inferior fibre properties are also due to its coarse nature (micronnair around 7-8), short fibre length (around 16-18 mm) and low strength (16-18 g/tex) and thus the demand for desi fibre in textile industry is very less. Its demand is only limited to surgical industry and in rough cloth making sector. In all the varieties/hybrids released for cultivation under north zone these are the major problems which need immediate attention and solution. To bring the improvement in desi cotton for this zone, it is necessary to generate information on genetic variability in germplasm for its fibre quality and boll retentivity. In present investigation, 540 germplasm lines were evaluated for three years and superior genotypes are identified for each parameter based on their performance.

Material and Methods

Five hundred forty geographically and phenotypically diverse lines from gene pool of *G. arboreum* cotton maintained at Central Institute for Cotton Research (CIRCOT), Regional Station, Sirsa were evaluated for locule retentevity and fibre quality traits for three years from 2001-2002 to 2003-2004. Each cultivar was sown in 20 dibbles at 60 cm x 30 cm spacing adopting all recommended practices. Observations on percent locule retentivity by counting the retained bolls on plant at picking and 2.5% span length, uniformity ratio, fibre strength and fibre fineness were recorded through CIRCOT unit Sirsa. In addition to these the yield/plant, boll weight, bolls/plant, ginning outturn, seed index and lint index were also recorded. The data is pooled after testing the homogeneity of variance.

Results and Discussion

A wide range of variability for locule retentivity and fibre property traits was observed. Strength/ fibre length ratio is most important parameter to decide the fibre quality. Twenty-eight superior lines for this trait were selected

and are given in Table1 along with data on 2.5 % span length, uniformity ratio, fibre fineness, fibre strength, ginning outturn, lint index and yield potential. Out of these twenty eight lines, five superior genotypes for 2.5 % span length (above 25.6 mm) were CISA 12 (27.5), DLSA 8 (26.8), PA 255 (26.5), 1789 (26.4) and AK 580 (25.6); for fibre fineness (below 5) CISA 12 (5.0), 1789 (4.9) AK 60-2 (4.8), AKH 607 (4.6), AK 580 (4.6) and 6629 (4.5); for fibre strength (above 22) AC 3370-1 (24.8), KWAN 3 (24.5), CISA 245 (24.1), 6629 (23.2) AND PA 255 (22.7); for ginning outturn (above 34) AKH 592 (37.3), DLSA 8 (35.5), AK 580 (35.0), 6571 (35.0) and KWAN 3 (34.5) ; for lint index (above 4) AK 580 (4.8), AKH 592 (4.3), 6612 (4.2), 6619 (4.1) and 7038 (4.0); for yield potential (above 97 g per plant) AC 1374 (128.8), DLSA 8 (103.4), KWAN 3 (99.9), 7173 WL NLL (98.6) and 6586 (97.5) identified. Similarly variability among genotypes were recorded earlier by several workers (Singh 1984; Singh and Singh 1984, Siwach *et al.*, 1988, CICR, 1989; Balakrishna *et al.*, 1992, Meena *et al.*, 1992) for different parameters in the different cultivars used by them in their study in different climates.

The fibre strength -length ratio is an important fibre quality indicator in addition to fibre length alone and a ratio of >0.8 is considered as good. Fibre strength-length ratio has been stressed as an important parameter by the textile industry for modern spinning mills. Out of twenty-eight genotypes given in table number 1, the five superior genotypes were CISA 245 (1.05), KWAN 3 (1.02), 6629 (0.92), 6644 (0.91) and CISA 329 (0.90). In addition to high fibre strength- length ratio, some genotypes also showed superiority for other fibre traits and yield these were 6629 (0.92) showing superiority in fineness (4.5), strength (23.2) and GOT (31.3); KWAN 3 (1.02) for fibre strength (24.5 g/tex) and GOT (34.5) and CISA 245 (1.05) for fibre strength (24.1g/tex) and GOT (32.1). Based on this study the genotypes with desired strength-length ratio and having superior quality parameters with higher GOT are available, which can be successfully used for replacement of existing *G. arboreum* cultivars as well as their utilization in the crop improvement programs.

The locule retentivity is a serious problem in desi cotton. The *G. arboreum* genotypes grown at present in northern zone are of inferior quality and their lint cannot

Table 1. Superior genotypes for fibre property traits

Sr.No.	Accession	2.5% span length (mm)	Strength-length ratio	Uniformity ratio	Fineness micronair	Fibre strength g/tex	Yield per plant (g)	Lint index	Ginning outturn %
1.	AKA 60-2	26.0	0.87	52	4.8	22.6	67.00	2.6	30.4
2.	AKA580	25.5	0.84	51	5.7	21.4	96.00	4.3	35.0
3.	AKH592	24.0	0.86	50	5.5	20.6	95.70	3.0	37.3
4.	AKH607	25.5	0.83	45	4.6	21.2	47.25	3.3	31.2
5.	AK580	25.8	0.76	50	4.6	19.7	73.50	4.8	32.7
6.	AC3174	24.6	0.85	51	5.5	21.0	128.80	3.0	33.4
7.	AC3637	22.5	0.88	50	5.3	19.9	85.10	3.4	33.1
8.	CISA245	22.9	1.05	49	5.5	24.1	79.65	4.1	32.1
9.	7173WR NLL	25.1	0.88	45	5.8	22.0	98.55	3.8	32.4
10.	7038	23.3	0.82	47	5.4	19.2	50.35	4.0	31.9
11.	6576	23.7	0.89	52	5.1	21.1	93.75	3.2	32.5
12.	6612	23.6	0.85	49	5.6	20.0	44.10	4.2	34
13.	6619	24.0	0.85	47	5.3	20.3	70.35	4.1	32.9
14.	6629	25.3	0.92	46	4.5	23.2	64.00	2.9	31.3
15.	6644	21.8	0.91	49	5.4	19.8	74.25	3.2	30.8
16.	6676	22.6	0.86	49	5.8	19.4	79.80	3.9	31.9
17.	6678	25.9	0.82	53	5.3	21.2	92.30	3.1	33.2
18.	CISA329	21.8	0.90	51	5.1	19.7	85.05	3.0	32.5
19.	6571	22.8	0.86	47	5.8	19.7	71.40	3.7	35
20.	DLSA-8	26.8	0.82	50	5.9	22.1	103.40	3.3	35.5
21.	7038	25.2	0.88	50	5.3	22.2	63.80	3.7	31.9
22.	AC3370-1	25.6	0.97	45	6.0	24.8	59.40	3.2	31.3
23.	PA255	26.5	0.86	45	5.4	22.7	53.00	3.5	32.1
24.	KWAN-3	24.0	1.02	47	4.6	24.5	99.90	3.5	34.5
25.	6586	22.2	0.87	51	6.4	19.3	97.50	3.6	30.5
26.	AC 3370-2	23.7	0.87	51	5.7	20.6	75.40	2.8	32.3
27.	CISA 12	27.5	0.67	46	5.0	18.4	57.00	3.6	31.0
28.	1789	26.4	0.76	48	4.9	19.5	63.70	3.1	31.5

Table 2. Superior lines for locule retentivity

Sr. No	Name of Entries	Boll weight	Boll No.	Shattering percentage	Boll Retained	Total Yield
1.	PA255	2.1	37.0	0	37.0	77.7
2.	CISA196	2.3	39.5	0	39.5	90.9
3.	CISA290	2.5	45.5	0	45.5	113.8
4.	CISA334	2.0	23.5	0	23.5	47.0
5.	CISA338	2.3	33.0	0	33.0	75.9
6.	CISA342	2.4	35.5	0	35.5	85.2
7.	6637	2.1	34.5	0	34.5	72.5
8.	AC3088	2.3	24.5	0	24.5	56.4

be used for spinning purpose. Seed cotton from such genotypes fetches much lower price in the market (Rs 1600 to 1800/- per quintal as compared to Rs 2300 to 2500/- in *G. hirsutum*). Availability of varieties with superior quality and good locule retentivity can make *G. arboreums* even more popular than *G. hirsutum* because of their inherent strengths like tolerance to biotic and abiotic stresses. Genetics of locule retention and introgression of locule retention into bengalenses using cernum races in crosses have been reported by Singh *et al.* (1987) and Singh and Naranayan (1987).

The present study indicates a wide range of variability for locule retentivity in germplasm lines. Initially, sixty-nine genotypes with more than 80 % boll retention capacity were identified in the field. Out of which eight lines PA 255, CISA 196, CISA 290, CISA 334, CISA 338, CISA 342, 6637 and AC 3088 were observed completely resistant to shattering (Table 2). In addition to good locule retention capacity, the cultivar CISA 290 also showed higher boll number (45.5) and good yield potential (113.8 gm/plant) followed by cultivar CISA 196 (boll number 39.5, yield 90.9 gm/plant) and CISA 342 (boll number 35.5, yield 85.6gm) (Table 2). These lines can be utilized for incorporating better locule retentivity through breeding programs in desi cotton.

References

Anonymous (1989) *A Catalogue of Cotton Genetic Resources of India.* Central Institute for Cotton Research, Nagpur.

Balakrishna P, BM Khadi, MR Eshanna, BS Janagourdar and RB Naik (1992) Genetic Variability for Seed Characters in Cotton (*Gossypium herbaceum* L.). *Seed Res.* 20: 78-80.

Dhaliwal GS and R Arora (1996) *Principles of Insect Pest Management.* NATIC Ludhiana, 59p.

Meena RA, P Singh and RK Deshmukh (1992) Seed character in *Desi* and *Egyptian* cottons. *J. Cotton Res. Dev.* **6:** 58-60.

Singh P and SS Narayanan (1987) Interracial introgression for some economic characters in *Gossypium arboreum* Linn. *Indian J. Agri. Sci.* **57**: 628-630.

Singh P and Singh J (1984) Variability for some economic characters in the genetic stocks of *Gossypium arboreum* L. germplasm. *J. Cotton Dev.* 14: 15-17.

Singh VV (1984) Range of variability in *Gossypium herbaceum* L. germplasm. *J. Cotton Dev.* **14**: 45.

Singh VV and AK Singh (1984) Studies on genetic diversity in upland cotton. *J. Indian Soc. Cotton Improv.* **9**: 41-45.

Siwach SS, DP Singh and IP Singh (1988) Studies for some characters in germplasm of *Gossypium arboreum*. *J. Cotton Dev.* **2:** 70-72.