Screening of American Cotton (*Gossypium hirsutum* L.) and *Desi* Cotton (*G. arboreum*) for Fibre Quality Traits, Seed Cotton Yield and Important Yield Components

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In *G. hirsutum* 1199 geographically and phenotypically diverse lines and in *G. arboreum* 540 lines maintained at CICR, Regional Station Sirsa were evaluated for fibre quality traits for three years from 2001-02 to 2003-04. In *G. hirsutum*, 10 superior accession with long fibre (29.0 mm and above) were identified. The fibre fineness in these accession ranged between 3.5 to 4.6 micronaire. Except accession DP 45 A(y) and AC 130 in which the fibre fineness was 3.5 and 3.7 micronaire respectively, the fibre fineness in remaining accessions was as per accepted fibre quality norms. Among these 10 lines, five accessions namely SCC 113, NA 1375, DP 45A (y), Cotton 5 and AC-130 showed high fibre strength ranging from 25.1 g/tex to 27.1 g/tex Accessions SCC 113, Cotton 5 and Cotton 17 showed good uniformity (more than 50%). Some accessions like MC 86, JKCL 702 and Cotton 5 Showed good ginning outturn (more than 34.7%). In *G. arboreum* also the superior ten accession for fibre length more than 25.4 mm were identified. The fibre fineness in these cultivars ranged from 4.1 to 6.0 micronaire and was below 5.0 micronaire in accessions AC 3196, DCB 5, AKA 60-2, AC 3535, 1789, CISA 12 and DCB 11. Accessions AC 3722 and AKA 60-2 showed good fibre strength (above 22 g/tex) and Accessions DCB 11 and DCB 5 showed good ginning outturn (35 percent or above). Accession SCC 113 and Cotton 5 of *G. Hirsutum* and DCB 11 and AC 3196 of *G. arboreum* exhibited a combination of superior fibre quality traits and higher yield.

Key words: *Gossypium hirsutum, G. arboreum,* Fibre property, Germplasm

Cotton is a major fibre crop of global importance and has high commercial value. The recent technological advancement in textile industry demand that the cotton research should lay emphasis on improvement of fibre quality i.e. fibre length, fineness, strength and maturity. The quality of raw material plays a vital role on yarn quality. The appearance and durability of the yarn and fabric is also dependent on fibre properties. Presently cultivated American cotton (*Gossypium hirsutum*) cultivars in north zone belong to medium staple category and have low strength. On the contrary, high speed rotor spinning used by textile mills require cotton with high fibre strength. Similarly desi cottons (*G. arboreum* L.) cultivated in this zone possess short fibre length (around 16-18 mm) with coarse nature (micronnaire around 7-8) and low strength (16-18 g/tex). These are the major draw backs and are the main reasons for poor demand of desi cottons grown in north zone in textile industry. Although, in addition to inherent resistance against insect pests, diseases and moisture stress, the yield potential of desi cotton in north zone is much higher than American cotton cultivars but due to poor demand and low market price the area under this cotton has stagnated at around 25% of total cotton area of the zone. The improvement in fibre quality is a serious constraint in both the American and desi cottons cultivated in north zone and need immediate attention. Plant genetic resources are the foundation of any crop improvement programme. The improvement in the status of cotton of this zone can be possible by screening of available genetic resources of both the species to identify superior fibre quality lines and their utilization in breeding programme (Meena *et al.*, 2001). Several reports on variability for economic traits in *G. hirsutum* and *G. arboreum* cotton are available (Anon. 1989, Singh and Narayanan, 1987 and Siwach *et al.*, 1988) but the information on sources of superior fibre properties is meager. Keeping in mind the future need, an attempt has been made to screen germplasm available at CICR, Regional Station, Sirsa for fibre quality traits as well as for seed cotton yield and important yield components.

Material and Methods

Eleven hundred and ninety nine *G. hirsutum* and 540 *G. arboreum* geographically and phenotypically diverse lines from the gene pool of cotton maintained at CICR, Regional Station Sirsa, were evaluated for fibre quality traits, yield and important yield components for three years from 2001-02 to 2003-04. Each accession was sown in 20 dibbles at 67.5 cm x 30 cm spacing. Recommended agronomic and plant protection practices were followed. Observations on yield/plant, boll weight, bolls/plant, ginning outturn, seed index, lint index were recorded. The data on fibre length, fibre strength, uniformity ratio and fibre fineness were recorded through Central Institute for Research on Cotton Technology (RIRCOT), Sirsa.

Mean data for 3 years for each parameter were considered for analysis.

Results and Discussion

To improve the fibre length in north zone, 10 superior accessions of *G. hirsutum* which have fibre length of 29.0 mm or more are identifed from gene pool and are given in Table 1. The maximum fibre length was observed in accession SSC 113 (31.6 mm) followed by JKCL 702 (30.2 mm) and NA 1375 (30.2 mm). The fibre fineness which is also important fibre property trait ranged between 3.5 to 4.6 micronaire in the above selected ten superior accessions for fibre length. In all the accessions the fibre fineness was between 3.8 to 4.6 micronaire which is in accepted norms of the textile industry except accession DP 45 A(y) and AC 130 in which it was 3.5 and 3.7 micronaire respectively. A large quantity of the long staple cotton (28mm to 32mm) would be required in future which is presently being imported from China, Australia etc. (Sreenivasan, 2004). Some other North Zone cultures such as P 56-2, P 56-6, C 4-9-2-1-1, C4-9-2-1-1-2 and P 4515-1 showing good micronaire were earlier reported by Singh *et al.* (2004).

Among 10 superior lines for fibre length, the accessions AC 130, Cotton 5, NA 1375, DP 45A(y) and SCC 113 possess fibre strength more than 25 g/tex which is a most desired fibre property trait for modern textile industry. Maximum fibre strength was noticed in accession AC 130 (27.1 g/tex) followed by Cotton 5 (26.4 g/tex) and NA 1375 (25.9 g/tex). The minimum 48% uniformity ratio as per the CIRCOT norms is considered good. In these selected accessions the uniformity ratio was more than 50 % in Cotton 5 (51%). Uniformity ratio was 50% in SCC 113 and Cotton 17. The ginning outturn more than 34.7% was observed in Cotton 5 (37.1%) followed by JKCL 702 (36.2%) and MC 86 (34.7%).

Among the superior accessions for fibre length, the accession DP 45A (y), AC 130, Cotton 5, Cotton 17 and SCC 113 showed high yield (more than 100 g per plant); Accessions DP 45 A(y), SA 733 and SCC 113 showed good boll weight of more than 3 gm; Accessions AC 130, Cotton 17, SCC 113 and Cotton 5 showed high boll number (more than 36.8); Accessions MC 86, SCC 113, JKCL 702 and Cotton 5 showed high seed index (more than 10 g). The accession SCC 113 was found to have superior fibre length, fibre fineness, uniformity ratio, fibre strength, boll weight and yield. Similarly accession Cotton 5 showed superiority for fibre length, fibre fineness, uniformity ratio, fibre strength, ginning outturn and yield. The superior accession for both fibre quality as well as yield contributing traits can be utilized for improvement of desired traits.

The fibre length in desi cotton is most important fibre quality trait . In general the fibre length of cultivars of desi cotton in north zone is below 20 mm. In genetic stock of *G. arboreum* evaluated at this station, a wide range of variability for fibre length was noticed. In addition to already known source of fibre length in *G. arboreum* cultivars of central and south zone, i.e. DLSA 17, PA 255, PA 204 and MDL 2463 (Rajendran and Jain 2004, Meena *et al.*, 2005), ten superior accessions, which have fibre length more than 25.4 mm under north zone conditions were identified and are presented in Table 2. The maximum fibre length was observed in accession AC 3535 (28.8 mm) followed by CISA 12 (27.5 mm)

Table 1. Superior accessions for fibre properties in *G. hirsutum* cotton (mean of 3 years)

S. No.	Accession name	2.5% Span length (mm)	Fineness micronaire (10^{-6} g/in)	Fibre strength (g/tex)	Uniformity (gm) ratio (%)	Ginning out-turn (%)	Yield plant (gm)	Boll weight (gm)	Boll number (gm)	Seed index
1	SCC 113	31.6	3.9	25.1	50	32.8	161.9	3.8	42.5	10.3
2	JKCL 702	30.2	4.0	23.1	43	36.2	37.5	2.8	13.5	10.8
3	NA 1375	30.2	3.8	25.9	45	32.8	96.0	2.9	33.0	9.0
4	Cotton 5	29.6	4.6	26.4	51	37.1	120.1	2.6	45.5	12.1
5	AC 130	29.3	3.7	27.1	47	30.9	100.9	2.8	36.8	8.0
6	DP 45 A (y)	29.3	3.5	25.9	43	31.5	100.1	3.0	32.5	9.0
7	SA 733	29.2	4.1	23.4	48	31.9	68.0	3.4	26.0	9.9
8	MC 86	29.1	4.5	21.6	46	34.7	60.3	2.9	20.5	10.4
9	SA 881	29.1	4.5	23.4	47	31.1	63.4	2.9	22.0	9.6
10	Cotton 17	29.0	4.5	22.1	50	31.0	130.0	2.9	40.1	9.1
	CD at 5%	1.1	0.9	2.6	2.3	3.4	12.2	0.18	3.6	0.8

Table 2. Superior accessions for fibre properties in *G. arboreum cotton* (mean of 3 years)

S. No.	Accession name	2.5% Span length (mm)	Fineness micronaire (10^{-6} g/in)	Fibre strength (g/tex)	Uniformity (gm) ratio (%)	Ginning outturn (%)	Yield plant (gm)	Boll weight (gm)	Boll number	Seed index (gm)
1	AC 3535	28.8	4.9	20.8	50	27.0	53.7	2.90	18.5	6.7
2	CISA 12	27.5	5.0	18.4	40	31.0	54.6	2.25	24.3	8.0
3	DCB 11	27.3	5.0	21.0	46	36.3	89.1	2.70	33.0	7.2
4	1789	26.4	4.9	19.5	48	32.6	70.6	2.60	27.2	7.2
5	AC 3196	26.3	4.1	21.3	51	32.5	77.6	2.20	35.3	6.4
6	AC 3722	26.2	4.5	22.9	46	31.0	41.1	2.35	17.5	6.8
7	6637	26.1	6.0	21.1	52	31.9	49.7	2.20	22.6	6.8
8	AKA 60-2	26.0	4.8	22.6	52	30.8	43.6	2.32	18.8	6.3
9	DCB 5	25.7	4.6	18.3	47	35.1	86.5	2.60	33.8	5.6
10	CISA 21	25.4	5.1	17.3	49	30.8	75.2	2.60	29.5	7.5
	CD at 5%	1.3	0.4	1.5	4.3	2.4	5.2	0.12	2.8	0.5

and DC B 11 (27.3 mm). Some of desi cotton cultures of this zone with fibre length up to 23.6 mm were earlier reported by Gumber *et al.* (2004). The coarse nature of fibre in desi cot ton is a major problem. Among these ten accessions, the miconaire value ranged from 4.1 to 6.0. in Accessions AC 3535, CISA 12, DCB 11, 1789 AC 3196, AC 3722, AKA 60-2 and DCB 5, the micronaire was below 5.0 micronaire and as per accepted norms of the industry. The superior accessions for fibre fineness were AC 3196 (4.1) followed by AC 3722 (4.5) and DCB 5, the micronaire was below 5.0 micronaire and as per accepted norms of the industry. The superior accessions for fibre fineness were AC 3196 (4.1) followed by AC 3722 (4.5) and DCB 5 (4.6). These can be utilized for improvement in ginning outturn in addition to fibre length.

Along with more fibre length the superior accessions for yield per plant were DCB 11 (89.1 gm) followed by DCB 5 (86.5 gm) and AC 3196 (77.6 gm); for boll number per plant AC 3196 (35.3) followed by DCB 5 (33.8) and DCB 11; for boll weight AC 3535 (2.9 gm) followed by DCB 11 (2.70 gm), 1789 (7.2 gm) were found superior. Accessions DCB 11, AC 3196 exhibited a combination of higher yield, superior fibre properties and high ginning outturn. These are the useful source for fibre length as well yield and can be used for improvement in desired traits.

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