SHORT COMMUNICATION

Evaluation of High Fibre Strength Strains of the American Cotton (*G. hirsutum* L.) Suitable for High Speed Spinning

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Cotton plays important role in Indian economy and provides principal raw material for Indian textile industry. Until late nineties fiber length was considered major fibre quality parameter. However, during nineties genetic improvement of fibre strength became top priority with the adoption of high speed rotor/open-end spinning by the textile industry. Six strains of *G. hirsutum* L., namely, P 56-2, P 56-4, P 56-6, C4-9-2-1-1, C4-9-2-2 and P 4515-1 were therefore evaluated for fibre strength and other important quality and economic traits at Indian Agricultural Research Institute, New Delhi during *kharif*-2003 and *kharif*-2004. Two strains, namely, P56-4 and P 56-6 showed high fibre strength of 28.1 g/tex and 27.3 g/tex, respectively. This is significant in the light of the fact that most of varieties released in North Zone have fibre strength ranging from 18 g/tex to 20 g/tex. These strains also showed desirable fibre length, micronaire value, uniformity and maturity and were found suitable for rotor/open-end spinning.

Key Words: American cotton, Fibre strength, Ginning percentage, Lint index, Genetic improvement

Cotton is an important commercial crop and plays a vital role in our economy. It provides principal raw material for Indian textile industry. Until late nineties, the genetic improvement for fibre quality was mainly confined to improvement of fibre length. A large number of improved varieties and hybrids were thus developed in different staple length categories from medium staple to extra long staple. These varieties were suitable for conventional ring spinning system. However, as part of modernization, the textile industry has adopted high speed rotor/open- end spinning system. This modern rotor/open-end spinning system require cotton cultivars with high fibre strength. Consequently genetic improvement of fibre strength has become the most important fibre quality trait, followed by fibre length, fibre fineness and maturity. The present investigation was therefore undertaken to identify/develop promising strains having high fibre strength.

Six American cotton (*G. hirsutum* L.) genotypes, namely, P 56-2, P 56-4, P 56-6, C4-9-2-1-1, C4-9-2-2 and P 4515-1 were evaluated against the local check Pusa 8-6 at the research farm of the Indian Agricultural Research Institute, New Delhi during *kharif* (rainy season) 2003 and 2004 in complete randomized block design with 3 replications. The inter-row and intra-row spacing was kept at 75 cm and 30 cm, respectively. Each genotype was grown in 5 row plots having row length of 4.2 m. Data were recorded on important characters like number of monopodial and sympodial branches per plant, plant height (cm), number of bolls per plant, boll weight (g), seed index (g), lint index (g) and ginning out-turn (%), lint yield (kg/ha) and seed cotton yield (kg/ha). Lint samples of 100 g from each entry were sent to Central Institute for Research on Cotton Technology (CIRCOT), Mumbai, for evaluation of the fibre quality. Data were subjected to statistical analysis and the parameters like mean, range, standard deviation and coefficient of variation were estimated using the procedure suggested by Johnson *et al.* (1955).

Data on seed cotton yield and important yield components during two years period 2003 and 2004 along with the mean for two years is given in the Table 1. Likewise, data on important fibre quality traits is given in Table 2. Strain C4-9212 showed the highest mean seed cotton yield of 1430 kg/ha as compared to 1175 kg/ha of the check Pusa 8-6. This was followed by strains C4-9211 and P 56-2 with seed cotton yield of 1314 kg/ha and 1246 kg/ha, respectively. Likewise, strain C4-9212 also showed highest lint yield of 456 kg/ha in comparison to 384 kg/ha of the check. Higher lint yield of 437 kg/ha in comparison to that of the check Pusa 8-6 was also observed in the strain C4-9211. The highest ginning percentage of 33.5% was observed in C4-9211. All other strains showed low ginning out turn ranging from 29.6% in P 56-4 to 32.6% in C4-9212. In comparison the check Pusa 8-6 showed 32.8% ginning out turn. Boll weight, an important yield component, ranged from 3.3 g to 4.5 g against 3.7 g of the check Pusa 8-6.

Table 1. Seed cotton yield and other important traits of promising strains during 2003 and 2004 at IARI, New Delhi

Strains	Seed Cotton Yield (Kg/ha)			Lint Yield (Kg/ha)			Ginning Outturn (%)			Boll Weight (g)		
	2003	2004	Mean	2003	2004	Mean	2003	2003	Mean	2003	2004	Mean
P 56-2	700	1791	1246	223	549	386	32	30.8	31.4	3.2	3.4	3.3
P 56-4	406	1586	996	121	463	292	30	29.2	29.6	3.5	3.8	3.7
P 56-6	730	1247	988	230	376	303	32	30.2	31.1	3.4	3.7	3.6
C 4-9211	708	1920	1314	239	634	437	34	33.1	33.5	3.9	3.9	3.9
C 4-9212	619	2242	1430	213	698	456	34	31.2	32.6	3.6	4.1	3.9
P 4515-1	558	1636	1097	181	498	339	32	30.5	31.2	4.5	4.4	4.5
P 8-6 (LC)	745	1604	1175	246	523	384	33	32.6	32.8	3.9	3.5	3.7

Table 2. Fibre quality traits of promising starins during 2003 and 2004 at IARI, New Delhi

Strains	2.5 Span length (mm)			Micronaire Value			Fibre Strength (g/tex)		
	2003	2004	Mean	2003	2004	Mean	2003	2003	Mean
P 56-2	26.7	26.2	26.5	4.4	4.6	4.5	24.3	22.6	23.5
P 56-4	28.6	28.5	28.6	3.7	3.8	3.8	29.4	26.7	28.1
P 56-6	27.4	27.3	27.3	4.2	4.4	4.3	29.2	25.3	27.3
C 4-9211	27.2	25.7	26.4	4.3	4.8	4.6	25.4	24.2	24.8
C 4-9212	26.8	27.0	26.9	4.4	4.5	4.5	25.3	23.7	24.5
P 4515-1	28.0	28.1	28.1	4.4	4.4	4.4	26.0	21.8	23.9
P 8-6 (LC)	28.0	26.3	27.2	4.7	4.7	4.7	24.2	24.3	24.3

Table 2 Contd.

Strains	Fibre Uniformity(%)			Elongation (%)			Short Fibre Content (%)		
	2003	2004	Mean	2003	2004	Mean	2003	2003	Mean
P 56-2	50.6	52.7	51.6	5.4	4.7	5.1	10.1	12.1	11.1
P 56-4	51.6	53.0	52.3	6.1	4.7	5.4	6.8	8.0	7.4
P 56-6	52.2	54.0	53.1	5.8	4.8	5.3	9.9	11.3	10.6
C 4-9211	50.5	53.0	51.7	5.7	4.8	5.3	9.8	12.0	10.9
C 4-9212	52.7	51.3	52.0	5.9	4.7	5.3	10.2	11.9	11.1
P 4515-1	51.0	48.7	49.9	5.2	4.1	4.7	8.5	9.0	8.8
P 8-6 (LC)	52.1	52.7	52.4	5.5	4.8	5.2	7.8	11.7	9.8

The performance of different genotypes for fibre quality traits, namely, 2.5% span length, fibre uniformity, fibre fineness (micronaire value), fibre strength, elongation and short fibre content (%) during the two year period is summarized in Table 2. Fibre length in terms of 2.5% span length ranged from 26.4 mm in C4-9211 to 28.6 mm in P 56-4. Genotypes P 4515-1 (28.1 mm) and P 56-6 (27.3 mm) also showed better fibre length as compared to the check P 8-6 (27.2 mm). All the genotypes showed very good fibre uniformity ranging from 49.9% in P 4515-1 to 53.1% in P 56-6. Likewise, micronaire value for fibre fineness ranged from 3.8 in P 56-4 to 4.7 in Pusa 8-6 and were thus within the desired range for the medium staple cottons.

Fibre strength which is now the number one priority in cotton breeding programme for genetic improvement of fibre quality, ranged from 23.5 g/tex in P 56-2 to 28.1 g/tex in P 56-4 on the basis of mean of two years (2003 and 2004). Two strains, namely, P56-4 (28.1 g/tex) and P 56-6 (27.3 g/tex) showed high fibre strength of 28.1 g/tex and 27.3 g/tex, respectively. The ratio of fibre strength to that of fibre length in respect of these 2 strains was found to be 0.98 and 1.00, respectively, which was very close to 1.0 and hence the most desired combination of fibre length and fibre strength. Breaking elongation of all the genotypes including check ranged from 4.7% to 5.5% and short fibre content (SFC) ranged from 7.4% in P 56-4 to 11.1% in C4-9212 and was thus relatively low.

It is thus evident that 3 genotypes, *viz.*, C4-9211, C4-9212 and P 56-2 showed higher seed cotton yield and lint yield over the check variety Pusa 8-6. Genotypes C4-9212 and C4-9211 in fact ranked number 1 and number 2, respectively, with regard to seed cotton and lint yield also showed relatively good ginning out turn and boll weight. Besides good performance for seed cotton yield and other traits, these 2 strains also showed good fibre strength of 24.5 g/tex and 24.8 g/tex, respectively, and desirable micronaire value and fibre uniformity. On the other hand,

two strains *i.e.* P 56-4 and P 56-6 were found promising for most of the fibre quality traits in general and fibre strength in particular. The mean fibre strength observed in P 56-4 and P 56-6 was 28.1 g/ tex and 27.3 g/tex, respectively. These strains also showed most acceptable ratio of fibre strength to fibre length which was 0.98 and a perfect 1.0, respectively. However their ginning percentage was very low at 29.6% and 31.1%, respectively. Meredith Jr. (1984) and Tang-Bing *et al.* (1996) also reported low ginning percentage in high fibre strength genotypes. Nonetheless, the fibre strength of the strains P 56-4 and P 56-6 was very superior as compared to most of varieties released in North Zone for most of which it ranged from 18 g/ tex to 20 g/ tex. It is thus needless to say that the fibre quality of the strains P 56-4 and P 56-6 is suitable for the high speed and very efficient rotor spinning. It is therefore suggested that these strains could be used as sources for genetic improvement of fibre strength, in addition to their use as one of the parents for development of hybrids with high fibre strength.

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