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Yield and fibre characteristics of promising strains of upland cotton (*Gossypium hirsutum L.*) under rainfed conditions

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ABSTRACT : Sixteen promising strains of *Gossypium hirsutum* L. were evaluated under rainfed condition for seed cotton yield and fibre quality parameters and their further use in breeding programme. Analysis of data revealed the significant differences among the strains for these traits. The strains H 1236 (2199 kg/ha) and H 1442 (2053 kg/ha) were the highest seed cotton yield producer followed by strains H 1226 and H 1465. In general the strains *viz.,* H 1464, H 1465, H 1467, H 1454 and H 1439 were found to be the superior for fibre quality parameters, but no single strain was observed superior in all the characteristics. However, based on FQI and yield, the strains H 1465, H 1464, H 1454, H 1439, H 1236, H 1442 and H 1226 were at the top and may be utilized in future breeding program for the development of desirable varieties suitable for rain fed conditions with good fibre quality.

Key words : Cotton strain, micronaire, quality, rainfed, tenacity, yield

Cotton is a major cash crop and grown mainly in nine states of India for fibre production. Cotton fibre still is in more demand even with introduction of synthetic fibres because the apparel prepared by it, is socially and scientifically more comfortable to wear. Overall performance of cotton crop is assessed by its yield and fibre characteristics. A significant varietal differences for fibre properties has been observed in various strains of upland cotton. The quality of cotton fibres as they develop in the bolls depends upon the inherited characters of cotton seeds and the conditions of growth. The quality of cotton fibres has great importance in the textile industries as the quality of cloth and other textile materials is dependent upon the fibre length, fineness, maturity, strength and uniformity. Cotton quality also depends on boll size, boll weight and boll maturity. Under sized and immature bolls deteriorate the quality of fibres. Fibre quality is also deteriorated by pests and diseases. Environment may also play an important role in proper maturity of fibre. Continuous rains and cloudy weather will adversely affect the cotton fibre quality. The fibre properties play a vital role in assessing the quality of cotton used for preparation of blend for spinning in the textile mills. Available commercial cotton cultivars are limited in genetic variability for most of the fiber traits. Due to polygenic inheritance, of fibre traits are highly affected by the environmental factors which cause difficulties in breeding for improvement of these characters (Yuan *et al.,* 2005, Ali *et al.,* 2009). The creation and quantification of genetic variability is of vital importance (Hussain *et al.,* 2010). This information could direct the breeders for genetic upgrading of cotton genotypes with improved fiber quality characteristics in addition to high seed cotton yield. To identify suitable genotypes for moisture stress conditions an experiment was conducted at CCS Haryana Agricultural University, Hisar during *kharif* 2012-2013 under restricted irrigation condition. Keeping these objectives in mind above study was conducted.

Seventeen strains of upland cotton were grown in randomized block design with 3 replications. Sowing was done on 24.4.2012 keeping row to row distance of 67.5 cm and plants 30 cm apart. There were 4 rows of 6 m length of each strain. In the experimental plot only pre sowing irrigation was applied. After that no irrigation was applied during the entire crop

season. Two pickings were done, *i.e.* on 27.10.2012 and 21.11.2012. At the time of crop maturation, seed cotton samples were collected at random from second picking from each strain in each replication. The samples were ginned carefully in the laboratory and the lint samples were analysed for quality parameters by using standard methods (Sundaram *et al.,* 2002). The fibre characteristics namely 2.5 per cent span length, UR, micronaire value and bundle tenacity were examined. The seed cotton yield was recorded/plot of both pickings and total seed cotton yield/plot was converted into yield kg/ha, 5 well opened bolls were weighed in g and it was averaged indicating the boll weight and ginning percentage were also obtained as/ standard methods. The statistical analysis of the data was done. The fibre quality index (FQI), counts (C) and count strength product (CSP) were calculated by using the formulae :

$$(1) \quad FQI = \frac{LS}{M^{1/2}}$$

$$(2) \quad C = 0.196\ FQI - 16$$

$$(3) \quad CSP = 1.74\ FQI + 1600$$

Where L is 2.5 per cent span length (mm),

S is bundle tenacity (g/tex) at 3.2 mm gauge length and

M is micronaire value *i.e.* fibre fineness.

The perusal of data in Table 1 indicated significant differences among the strains for seed cotton yield. The strain H1236 had the highest seed cotton yield (2199 kg/ha) followed by the strains H1442 (2053 kg/ha), H1226 (2003 kg/ha), H1465 (1981 kg/ha) and H1463 (1958 kg/ha). Strains H1464, H1439, H1236, H1465, H1316 and H1454 were recorded maximum boll weight

Table 1. Seed cotton yield and fibre characteristics in upland cotton strains evaluated under rainfed conditions.

S. No.	Cotton Strains	Seed cotton yield (kg/ha)	Boll weight (g)	Ginning outturn (%)	2.5 per cent span length (mm)	Uniformity ratio	Micronaire value (µg/inch)	Bundle tenacity (g/tex)	Fibre quality index (FQI)	Counts (C)	CSP
1	H1469	1689	4.0	36.8*	-	-	-	-	-	-	-
2	H1300	1555	4.2	35.8*	27.0	52*	4.5	21.3	271	37	2072
3	H1316	1313	4.3	36.3*	27.4	49	4.4	20.6	269	37	2068
4	H1476	1538	3.9	35.4	27.6	51*	4.6	21.7	279	39	2085
5	H1463	1958*	4.2	36.2*	27.0	50*	4.4	21.1	272	37	2072
6	H1442	2053*	4.0	33.8	27.6	48	4.8	20.8	262	35	2056
7	H1454	1738	4.3*	35.7	27.3	50*	3.9*	22.7*	314*	46*	2146*
8	H1464	1672	4.5*	32.1	29.5*	49	4.4*	25.1*	353*	53*	2214*
9	H1465	1981*	4.3*	34.8	29.6*	48	3.9*	24.1*	361*	55*	2228*
10	H1226	2003*	3.0	33.6	25.9	49	4.5	20.4	249	33	2033
11	H1467	1162	4.1	33.5	28.8*	47	4.4*	24.2*	332*	49*	2178*
12	H1468	1715	4.0	32.9	28.1*	49	4.4*	22.0	295	42	2113
13	H1439	1771	4.5*	34.7	28.9*	47	4.5	22.6*	308*	44*	2136*
14	H1435	1516	4.2	33.6	26.2	48	4.7	19.9	240	31	2018
15	H1462	1475	3.0	34.8	26.9	48	4.5	20.6	261	35	2054
16	H1098	1565	3.9	35.6	27.8	50*	4.5	21.4	280	39	2087
17	H1236	2199*	4.4*	35.7*	28.0	45	4.6	20.1	262	35	2056
General Mean		1700	4.0	34.8	27.7	49	4.4	21.8	288	40	2101
SE ±		103	-	-	0.49	0.9	0.08	0.75	-	-	-
CD at 5%		322	-	-	1.42	2.5	0.23	2.17	-	-	-
CV (%)		11.05									

*values of top five strains.

whereas ginning outturn was observed highest for strains H1469, H1316, H1463, H1300, H1236 and H1454. Higher seed cotton yield is the prime objective of the cotton grower, along with good boll size. The ginner of cotton is interested in the varieties of higher ginning outturn. So considering all 3 parameters simultaneously, the strain H1236 seems to be most promising followed by the strains H1465 and H1463 under restricted irrigation facility. These strains deserve more attention and multi location testing to confirm findings of the present study.

In fibre quality characteristics the strains H1465, H1464, H1439, H1467 and H1468 were found superior in 2.5 per cent span length in comparison to rest of the strains however the strains H1465 and H1464 were emerged significantly different over other strains. All the strains categorized as excellent in length uniformity ratio except strains H1439, H1467 and H1236 which showed good to average UR. All the strains were classified into average micronaire value excluding strains H1454 and H1465 which were slightly fine category. Significant and maximum bundle tenacity was observed for strains H1464, H1465 and H1467 followed by H1454 and H1439 when compared to others. Out of 16 strains under study the strains H 1464, H 1465, H 1467, H 1454 and H 1439 were found to have best expression for quality parameters, but no single strain was found superior in all the characteristics. Some strains were superior for one character, while others emerged superior for other characters (Ali *et al.,* 2008). The correlation coefficient between seed cotton yield and fibre quality index was found negative. However, based on predicted values of FQI, CSP and counts, the strains H1465, H1464 and H1467 were at the top followed by H1454 and H1439. As per the CIRCOT norms for yarn quality, the strains H1465 (C= 55s, CSP = 2228) and H1464 (C= 53s, CSP = 2214) have predicted the values nearer to standard values (C = 50s, CSP = 2300). Similarly the strains H1467 (C= 49s, CSP = 2178) and H1454 (C= 46s, CSP = 2146) have predicted the values nearer to standard values (C = 40s, CSP = 2208) (Sundaram *et al.,* 2002). Thus, there is a need to breed a variety having combined superiority for all fibre characteristics in a single genotype along with high yielding capacity. From the foregoing discussion it may be concluded that the strains H 1465, H 1464, H 1454, H 1439, H 1236, H 1442 and H 1226 may be further utilized in such a breeding project for the development of desirable varieties under rainfed conditions.

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