



Original Research Article

Comparative study for fiber quality parameters in cotton (*Gossypium sp. L.*)

G.P.Koli, D.V.Patil and A.B.Bagade*

Department of Agricultural Botany, College of Agriculture,
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani 431 402 (MS), India

*Corresponding author

A B S T R A C T

Based on different genetic backgrounds, sixteen cotton (*Gossypium sp. L.*) genotypes were screened for fiber length, fiber fineness, fiber strength, fiber uniformity, fiber elongation, maturity ratio and short fiber index. Analysis of variance depicted considerable variation in these seven main fiber quality traits among sixteen cotton genotypes. Fiber length ranged from 19.70 mm to 33.50 mm with mean value of 26.16 mm. Fiber fineness was variable with average micronaire reading 3.6. Differences in fiber strength also ranged from 18.76 to 29.80 g/tex. Uniformity ratio ranged from 42 to 58. Differences in fiber elongation were also observed which ranged from 4.8 to 6.8. Maturity ratio ranged from 0.76 to 0.86. The character short fiber index showed wide variation ranged from 6.2 to 18.2. On the basis of fiber analysis for quality traits three cotton genotypes viz., PA-255, DCH-32 and RHCb-001 can be used in future breeding programme for the improvement of fiber quality traits.

Keywords

Fiber quality traits,
Cotton

Introduction

India occupies the first place in area and second place in production after China in the world. During 2011–12, India's cotton cultivated area was 121.91 lakh hectares with production of 356 lakh bales and lint productivity was 496 kg/ha. Maharashtra ranks first in area and second in production. During 2011–12, total cultivated area under cotton cultivation in Maharashtra state was 40.95 lakh hectares with production of 85.00 lakh bales and lint productivity was 353 kg/ha (Anonymous, 2011). Marathwada region of Maharashtra is one of the major growing tracks of cotton. The export of raw cotton, yarn, textiles, garments, cotton seed

cake, oil and other byproducts earns valuable foreign exchange. Export of cotton and others textiles during 1997–98 realized foreign exchange worth Rs. 40000/- crores which was over 30 percent of the total foreign exchange earnings of the country, Out of the total Indian export, cotton and other textiles account for almost one third and nearly 60 million people depend directly or indirectly on cotton production, processing, marketing and trade.

Cotton fiber quality is defined by the physical properties that relate to its spin ability into yarn and contribute to textile

performance and quality. The most important of these properties are those associated with the length, strength and fineness (micronaire) of the fiber. One of the most important aspects of cotton fiber quality is fiber or staple length. Fiber length is the normal length of a typical portion of the fibers of a cotton sample. Longer fibers can be processed at greater efficiencies and produce finer and stronger yarns by allowing fibers to twist around each other more times, while shorter fiber require increased twisting during spinning, causing low-strength and poor-quality yarns. Fiber fineness is another important component of fiber quality because of its direct impact on processing performance and the quality of end product. Fiber strength is important because the inherent breaking strength of individual cotton fiber is considered to be the most important factor in determining the strength of the yarn spun from those fibers.

The present research work was conducted to analyze the fiber quality parameters of some cotton genotypes for the selection of superior genotypes for further breeding programme.

Materials and Methods

The experiment was conducted at experimental farm at Department of Agricultural Botany, College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra). Sixteen cotton genotypes i.e. four *Gossypium arborium*, three genotypes of *Gossypium hirsutum*, two apomictic lines, one intra specific and one inter specific hybrid along with their parents and one inter specific hybrid check was sown during *Kharif* 2011. The pedigree of the genotypes is presented in Table 1. Above genotypes were sown in randomized block design with three replications. Each row length was 5 m

as per DUS guidelines. Recommended spacing and cultural practices were adopted throughout the growing period. The observations were recorded on five randomly selected plants from each line in each replication. Fiber length, fiber strength, micronaire value, short fiber index (SFI), maturity ratio, fiber elongation and fiber uniformity were measured with high volume instruments (HVI) P-ART system. Lint of these cotton genotypes were analyzed at Central Institute for Research on Cotton Technology (CIRCOT), Agricultural Farm, Athwa, Surat, India.

Fischer's method of analysis of variance was applied for the analysis of the data and interpretation of results are worked out by Panse and Sukhatme (1967). The level of significance used in 'F' and 't' test was $P=0.05$. Critical difference (CD) values were calculated at 5 per cent probability level, wherever 'F' test was significant.

Results and Discussion

Analysis of variance for fiber quality traits revealed significant variation varieties for all the five characters under study (Table 2). Among the genotypes 2.5 per cent span length was ranged from 19.70 to 33.50 mm with a general mean of 26.16 mm (Table 3). The highest value for 2.5 per cent span length was recorded in DCH-32 (33.50 mm) while lowest value was recorded in RHC 004 (19.70 mm). Staple length directly contributes to the quality of yarn.

Fiber strength ranged from 18.76 to 29.80 g/tex with a general mean of 22.63 g/tex. The highest value for fiber strength was recorded in DCH-32, while lowest value recorded in RHC 004. Fiber strength is an important parameter in determining yarn spinning value. High fiber strength is difficult to obtain without sacrificing yield.

Uniformity ratio ranged from 42 to 58 with a general mean of 50.18. The highest value for uniformity ratio was recorded by line RHC 004 (58), while lowest value was recorded by line Phule 492 (42).

Micronaire value was ranged from 2.5 to 5.2 with a general mean of 3.6 (Fig. 3). The highest value for micronaire was recorded by line Y-1 (5.2), while the lowest value was recorded by line DCH-32 (2.5). Fiber fineness is associated with diameter of the

fiber and the thickness of the fiber wall. The micronaire value determines the spinning quality of cotton varieties.

The character fiber elongation exhibited wide variation which ranged from 4.8 to 6.8 with a general mean 5.81. The highest value of fiber elongation was recorded in line DCH-32 (6.8) while, the lowest value was recorded in the line Phule 492 (4.8).

Table.1 Pedigree of cotton genotypes used in study

Sr. No.	Genotypes	Pedigree
A) <i>Gossypium arboreum</i>		
1.	PA 255	(CJ 73 x NA 39) x (CJ 73 x A4)
2.	PA 402	Developed by selection
3.	Y - 1	Introduction
4.	GMS - 1 (MPKV)	GMS <i>Arboreum</i> line
B) <i>Gossypium hirsutum</i>		
1.	LRA 5166	Laxmi x (Reba-B50 x AC 122)
2.	NH 615	NH 545 x JLH 1495
3.	PH 348	Hybrid derivative
C) Apomictic lines		
1.	IS 181-7-1-19	Selection from interspecific cross
2.	IS-244-43-5-1-1-1-1	Selection from interspecific cross
D) Intra specific hybrids (H x H)		
1.	Phule 492	RHC-003 x RHC-004
2.	RHC 003 (Female)	Female parent of Phule 492
3.	RHC 004 (Male)	Male parent of Phule 492
E) Interspecific hybrids (H x B)		
1.	Phule 388	RHC 006 x RHCb0-01
2.	RHCb 001 (Male)	Male parent of Phule 388
3.	RHC 006 (Female)	Female parent of Phule 388
F) Standard check		
1.	DCH - 32	DS 58 x SB 425 YF

Table.2 Analysis of variance for fiber quality characters in Cotton genotypes

Source of variation	d.f.	Fiber quality character						
		2.5% span length (mm)	Micronaire value (10 ⁻⁶ g/inch)	Fiber strength (g/tex)	Uniformity ratio	Maturity ratio	Fiber elongation	Short fiber index
1	2	3	4	5	6	7	8	9
Replication	2	0.122	0.0175	0.0758	4.1875	0.0009	0.0243	0.302
Treatment	15	47.468**	2.5480**	35.784**	49.688**	0.0024**	1.3195**	41.70**
Error	30	0.052	0.0135	0.0573	1.3875	0.000046	0.0090	0.021

* and ** showing significance at 5% and 1% levels, respectively.

Table.3 Mena performance of cotton genotypes for fiber quality characters

Sr. No.	Genotypes	Fiber quality character						
		2.5% span length (mm)	Micronaire value (10 ⁻⁶ g/inch)	Fiber strength (g/tex)	Uniformity ratio	Maturity ratio	Fiber elongation	Short fiber index
1	2	3	4	5	6	7	8	9
1	IS-181-7-1-19	27.40	2.8	25.60	47	0.81	5.80	11.40
2	IS-244-4-3-5-1-1-1-1	25.40	2.6	20.20	48	0.77	5.10	13.40
3	NH 615	26.60	3.3	22.30	48	0.81	5.60	11.90
4	PH 348	24.80	4.4	20.50	48	0.83	5.50	14.20
5	PA 255	29.10	3.6	27.60	51	0.84	6.70	7.00
6	PA 402	25.10	5.0	23.50	52	0.86	6.50	10.30
7	LRA 5166	20.30	3.8	19.60	56	0.81	5.20	16.00
8	Phule 492	25.80	2.7	19.30	42	0.76	4.80	18.20
9	RHC 003	22.70	3.6	19.40	51	0.80	5.30	15.60
10	RHC 004	19.70	3.9	18.76	58	0.82	5.40	15.80
11	RHC 006	22.70	3.6	20.80	52	0.81	5.10	14.30
12	RHCb-001	32.40	2.8	25.86	55	0.80	6.30	7.50
13	Phule 388	31.56	2.7	26.80	47	0.80	6.70	7.00
14	Y -1	24.80	5.2	20.40	50	0.85	5.80	1310
15	MPKV GMS	26.35	5.1	21.70	52	0.86	6.40	9.50
16	DCH-32 (Check)	33.50	2.5	29.80	46	0.81	6.80	6.20
Grand		26.16	3.6	22.63	50.18	0.815	5.81	11.96
SE±		0.132	0.067	0.138	0.680	0.0039	0.0548	0.0839
C.D. at 5%		0.382	0.193	0.398	1.960	0.0113	0.158	0.242

Maturity ratio ranged from 0.76 to 0.86 with a general mean 0.81. The highest value for maturity ratio was recorded in PA 402 and MPKV GMS (0.86) while, the lowest value was recorded in Phule 492 (0.76). Maturity percentage determines the quality of fiber. The mature fiber has good

spinning wide variation ranged from 6.2 to 18.2 with a general mean 11.96. The highest value for short fiber index was recorded in Phule 492 (18.20) while lowest value recorded in check DCH-32 (6.20).

The present findings are in close agreement with the results reported by Ratnakumari and Subharamamma (2006), Palve *et al.* (2007), Ahuja *et al.* (2007), Asif *et al.* (2008), Bhatade *et al.* (2004) and Aziz *et al.* (2011).

From the results of the all studied parameters, it was concluded that PA 255, DCH 32 and RHCb 001 are the most suitable cotton varieties for good quality fiber with better staple length, strength, fineness. These genotypes can be utilized in future breeding programme.

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