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Genetic evaluation for seed cotton yield and fiber quality traits in desi cotton (*Gossypium arboreum* L.)

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Abstract

The experimental material comprised of 39 different elite genotypes of desi cotton along with three checks viz., AKA-7, PA-08 and JLA-794. All these material were grown in Randomized Block Design with two replications during kharif 2018 at Cotton Research Station, Mehboob Baugh Farm, V.N.M.K.V., Parbhani. For earliness parameters, genotypes ARBAS 1502 and CCA 2003 were found to be the best amongst all. Among the genotypes studied, FDK 259(44.40g), RG 690 (42.00g) SV 385 (41.45g), and JLA505 (40.75g) showed higher seed cotton yield per plant over all three checks viz., AKA-7 (27.10g), PA-08 (26.30 g) and JLA-794 (31.55g). The genotypes AKA 9703 (39.08%) CNA 397 (38.95%) for ginning percentage, CISA -6-123 (30.50 mm) and PAIG 370 (30 mm) for upper half mean length, PA 808, JLA 606 (28 g/tex) for fibre strength and GAU 168 (4.5 ug/inch) for micronaire showed superior fiber quality traits.

Keywords: Desi cotton, harvest index, seed cotton yield, upper half mean length

Introduction

Cotton is one of the most important fiber and cash crop of India and plays a dominant role in the industrial and agricultural economy of the country. It provides the basic raw material (cotton fiber) to cotton textile industry.. Although, Indian cotton have very wide quality spectrum, the right combination of fiber length, micronaire and desirable fiber strength is however absent in many of the popular varieties and hybrids. The deficiency particularly discernable in the staple length range of 27 to 30 mm combined with micronaire value of 4.0 to 4.5 ug/inch and a strength of 22 to 25 g/tex. Indian cotton confirming to long and extra long staple group are too fine coupled with weak strength. There is an urgent need to promote those cotton that could come closer in quality to the most sought by modern textile mills.

Out of four cultivated species of genus *Gossypium*, only two species i.e. *G. hirsutum* and *G. arboreum* are being mostly cultivated in Maharashtra. In the last few years there has been a significant reduction in the area of *G. arboreum* cotton across the country and particularly in Maharashtra because of lower productivity and inferior fiber properties as compare to tetraploid cotton in rainfed ecosystem. Therefore, more emphasis should be given to increase the seed cotton yield per unit area of *desi* cotton, by developing varieties with short stature, big boll size and medium to longer staple length with sustained yield in multiple environments.

Materials and Methods

The present study comprised of 39 different elite genotypes of desi cotton along with three checks viz., AKA-7, PA-08 and JLA-794. All these material were grown in Randomized Block Design with two replications during kharif 2018 at Cotton Research Station, Mahboob Baugh Farm, V.N.M.K.V., Parbhani. Observations were recorded on ten yield and yield contributing characters viz., days to 50 percent flowering, days to 50 percent boll bursting, plant height, number of sympodia per plant, number of bolls per plant, boll weight, seed index, lint index, harvest index, seed cotton yield per plant and Five fiber quality characters viz., ginning percent, upper half mean length, fiber strength, micronaire and uniformity ratio. Analysis was carried out as per the method suggested by Panse and Sukhatme (1985).

Results and Discussion

Mean performance of 39 genotypes and 3 checks under study for 15 different yield, yield contributing and fiber quality characters is given in Table 1.

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1. Days to 50 percent flowering

Days to 50 percent flowering ranged from 69.50 to 79.50 days with a general mean 74.23 days. Among the genotypes ARBAS 1502 and CCA 2003 indicating earliness showed the lowest value for days to 50 percent flowering (69.50), while the strain ARBAS 138 and CNA 2023 depicted highest value (79.50) for days to 50 percent flowering.

2. Days to 50 percent boll bursting

Days to 50 percent boll bursting ranged from 111.00 to 121.00 days with a general mean of 117.17 days. Significant differences were observed for days to 50 percent boll bursting among all the genotypes studied. The strain RG 690 (111 days) recorded lowest value for days to 50 percent boll bursting indicating earliness. The strains HD 418 (121 days), KR-84, JLA794 recorded highest value and showing late for 50% boll bursting. Genotypes PA 808 (112 days), CCA 2003 (113.50 days), DWDa 1501 (114.50days), AKA 2009 (114.50days), KWA 1201 (114.50days) and CCA 390 (114.50 days) showed earliness over check JLA-794 (121 days).

3. Plant height (cm)

There was wide variation for plant height ranged from 92.30 to 150.26 cm with general mean 119.02 cm. The highest plant height was recorded in PA 827 (150.26 cm) while lowest plant height was noted in genotype AKA 9703 (92.30 cm). The strain PAIG 377 (144.31 cm) showed high value of plant height over all three checks viz., AKA-7(117 cm), PA-08 (134.20 cm) and JLA-794 (131 cm).

4. Number of sympodia per plant

Number of sympodia per plant ranged from 10.00 to 19.75 with general mean of 14.68 sympodia per plant. The highest number of sympodia was observed in CNA 397 (19.75), while the lowest number of sympodia per plant was observed in strain PA 08 (10). The strains NDLA 2985 (19.60), ARBAS 138 (19.26), ANGAS 1302 (18.70), and PA 808 (17.20) recorded higher number of sympodia per plant over checks AKA-7 (12.80), PA-08 (10.00) and JLA-794 (16.25).

5. Number of bolls per plant

Wide variation was observed for number of bolls per plant ranging from 9.50 to 25.25 with a general mean 17.52 bolls per plant. Among the lines, the highest number of bolls per plant was noted in the line AKA 9703 (25.25), while the lowest number of bolls per plant was observed in line AKA 2009-1 (9.50). The strain FDK 259 (24.75), GAM 168 (24.75), RG 690 (22.50), ARBAS 138 (22.25), and HD 418 (22.25) recorded higher number of bolls per plant over checks AKA-7 (13), PA-08 (115.75) and JLA-794 (18.80).

6. Boll weight (g)

Boll weight ranged from 2.13 to 2.38 g with general mean 2.26 g. The line LD 1026 (2.38 g) recorded highest value while, lowest value for boll weight was recorded in NDLA 3019 (2.0 g).

7. Seed index (g)

The character seed index ranged from 5.17 to 6.40 with general mean 5.59. Among the genotypes CCA 2003 (6.40) showed highest value of seed index. While the strain PA 827 (5.17) showed lowest value. The lines CISA-6-123 (6.37), NDLA 3019 (6.35), KWA 1201 (6.33), RAAS 212 (6.29) and HD 511 (6.29) showed high values of seed index over all checks viz., AKA-7 (5.29), PA-08 (5.20) and JLA-794 (5.37).

8. Lint index (g)

Lint index ranged from 4.32 to 6.37 with a general mean of 4.19. Among the genotypes CISA-6-123 (6.37) showed the highest value of lint index, while DAS 385(4.32) showed the lowest value of lint index. The lines CCA 2003 (5.42), FDK 230 (5.34), NDLA 3019 (5.30), LD 1026 (5.18) and HD 511 (5.17) exhibited higher lint index than checks AKA-7 (3.37), PA-08 (4.22) and JLA-794 (4.37).

9. Harvest index (%)

The character harvest index ranged from 0.335 to 0.435 with general mean 0.392. The highest value for harvest index was recorded i.e. 0.435 for the strain SV 385, while the lowest value was recorded i.e. 0.335 for the strain NDLA 3019 (0.335). The lines viz., RAAS 212 (0.425), RAAS 2011(0.425), JLA 606 (0.420), GAM 123 (0.410) and DWda 1501 (0.410) showed better performance over checks AKA (0.370) and JLA 794 (0.345) for harvest index.

10. Seed cotton yield per plant (g)

Seed cotton yield per plant showed wide variation ranged from 22.00 to 45.50 g. The highest seed cotton yield per plant was observed in line GAM 138 (45.50 g) while lowest was in NDLA 3019 (22.00 g). The line FDK 259 (44.40 g), RG 690 (42.00 g) SV 385 (41.45g), and JLA505 (40.75g) showed higher seed cotton yield per plant over all three checks viz., AKA-7 (27.10 g), PA-08 (26.30 g) and JLA-794 (31.55 g).

11. Ginning percent (%)

Wide variation was observed for the character ginning percent ranging from 30.74 to 39.08% with a general mean 35.42%. The highest value for ginning percent was observed in line AKA 9703 (39.08%), while the lowest value was recorded in for the genotype DAS 385(30.74%). Among the genotypes CNA 397 (38.95%) recorded more ginning outturn than checks AKA-7 (38.60%), PA-08 (36.34%) and JLA-794 (31.19%).

12. Upper half mean length (mm)

Upper half mean length ranged from 21 to 30.50 mm with a general mean 25.61 mm. Among the genotypes GAU 168 (30.50 mm) recorded highest, while genotypes PBD 12 (21 mm) recorded lowest value for upper half mean length. Among PAIG (30.00 mm), ARBAS 138 (29.00 mm), ARBAS 1502 (29.00 mm), GAM 123 (27.20 mm) showed high values for upper half mean length over checks AKA-7 (25.40 mm), PA-08 (26.50 mm) and JLA-794 (26.90 mm)

13. Fiber strength (g/tex)

Fiber strength ranged from 18.40 to 28.60 g/tex with a general mean of 25.54 g/tex. The highest value was recorded by genotype PAIG 370 (28.60 g/tex), while lowest value recorded by CNA 2023 (18.40 g/tex). The genotypes PA 808(28.00 g/tex), JLA 606(28.10 g/tex) recorded high values for fiber strength over three checks viz., AKA-7 (20.10 g/tex), PA 08 (27.80 g/tex) and JLA-794 (26.40 g/tex).

14. Micronaire ($\mu\text{g}/\text{inch}$)

Micronaire value ranged from 4.50 to 7.52 $\mu\text{g}/\text{inch}$ with a general mean 5.74 $\mu\text{g}/\text{inch}$. The lowest micronaire was recorded in lines ARBAS 1052 (4.8 $\mu\text{g}/\text{inch}$), GAU 168 (4.50 $\mu\text{g}/\text{inch}$) and JLA 606, AKA 2009-1, PAIG 377(4.90 $\mu\text{g}/\text{inch}$). The high mean performance for yield and yield contributing characters was also observed by Gumber *et al.* (2005)^[7], Ali and Khan (2007)^[2], Dhamayanti *et al* (2010)^[4], Hussain *et*

al. (2010) [8]; Elango *et al.* (2012) [5], Koli *et al.* (2014) [9], *al.* (2015) [10], Reddy *et al.* (2014) [11], Baloch *et al.* (2015) [3] and Moghny *et*

Table 1: Mean performance of genotypes for yield, yield contributing and fiber quality characters

S. No.	Genotypes	Mean values for yield contributing and fiber quality characters							
		Days to 50% Flowering	Days to 50% boll bursting	Plant height (cm)	Number of sympodia per plant	Number of bolls per plant	Boll weight (g)	Seed index (g)	Lint index (g)
1.	JLA 804	74.50	119.00	118.00	12.85	11.75	2.21	5.22	3.28
2.	RG 606	72.50	118.50	96.00	10.60	18.75	2.28	5.32	4.24
3.	NDLA 3019	70.50	115.00	111.24	14.50	13.00	2.26	6.35	5.30
4.	GAM 123	78.00	119.50	113.20	11.10	18.75	2.21	5.46	4.28
5.	DWda 1501	74.50	114.50	104.65	15.35	15.20	2.15	5.31	3.33
6.	FDK 230	73.50	115.50	110.19	12.60	17.20	2.35	6.23	5.34
7.	CCA 1015	76.50	118.50	93.91	13.70	18.20	2.30	5.28	4.22
8.	LD 1033	70.00	119.00	117.50	16.00	16.50	2.31	6.26	4.37
9.	PBD 12	75.00	115.50	122.00	16.50	17.70	2.28	5.31	4.38
10.	CNA 397	71.00	113.50	122.50	19.75	16.20	2.26	5.28	4.28
11.	SV 385	76.50	116.00	110.95	12.50	20.75	2.28	6.28	4.33
12.	PA 808	74.50	112.50	112.00	17.20	18.05	2.30	5.27	4.79
13.	RAAS 212	77.00	118.50	142.50	13.50	9.75	2.13	6.29	3.38
14.	JLA 606	73.00	120.50	127.00	10.50	16.10	2.21	5.29	4.22
15.	AKA 2009-1	76.00	114.50	110.40	15.85	9.50	2.31	5.25	4.40
16.	ARBAS 138	79.50	117.50	128.00	19.26	22.25	2.35	5.33	4.31
17.	HD 511	72.00	116.50	114.70	15.30	15.55	2.36	6.29	5.17
18.	DAS 1395	71.00	118.50	126.50	10.30	11.50	2.20	5.27	4.19
19.	PAIG 370	78.00	117.50	106.00	16.95	12.80	2.24	5.40	3.33
20.	JLA 505	72.00	116.50	107.40	16.75	23.25	2.26	5.31	3.41
21.	KWA 1201	70.00	114.50	131.00	16.40	14.50	2.27	6.33	4.29
22.	CISA-6-123	71.50	115.50	127.82	13.30	19.75	2.26	6.37	6.37
23.	GAU 168	78.50	118.50	136.56	12.75	24.25	2.20	5.22	4.23
24.	CAN2023	79.50	115.00	140.50	16.10	20.50	2.30	5.27	3.26
25.	RG 690	71.50	111.00	104.45	12.90	22.50	2.33	5.27	4.28
26.	FDK 259	74.50	117.00	117.75	13.70	24.75	2.19	5.23	3.33
27.	RAAS 2011	72.00	119.50	117.00	10.80	18.10	2.25	5.22	3.23
28.	LD 1026	73.50	119.00	135.93	15.35	15.00	2.38	6.22	5.18
29.	AKA 9703	74.50	116.00	92.30	17.90	25.25	2.24	5.28	4.26
30.	PA 827	78.50	116.50	150.26	15.90	21.75	2.24	5.17	4.20
31.	DAS 385	72.00	120.50	124.25	13.20	16.65	2.33	6.18	4.32
32.	ANGAS 1302	73.00	120.50	136.75	18.70	20.00	2.26	5.25	3.21
33.	NDLA 2985	74.50	119.50	104.90	19.60	17.25	2.26	5.29	4.29
34.	ARBAS 1502	69.50	118.00	120.80	15.20	20.50	2.34	5.28	3.29
35.	HD 418	77.50	121.00	118.31	13.80	22.25	2.34	5.27	3.59
36.	CCA 390	76.00	114.50	103.01	15.80	18.80	2.36	6.26	4.26
37.	KR 84	76.00	121.00	115.80	16.80	16.40	2.22	6.21	4.18
38.	PAIG 377	73.50	117.00	144.31	16.05	15.30	2.31	5.31	4.22
39.	CCA 2003	69.50	113.50	100.60	12.50	12.25	2.15	6.40	5.42
40.	AKA-7	72.00	119.00	117.00	12.80	13.00	2.20	5.29	3.37
41.	PA 08	78.50	117.00	134.20	10.00	15.75	2.31	5.20	4.22
42.	JLA 794	76.00	121.00	131.00	16.25	18.80	2.19	5.37	4.37
	G. Mean	74.23	117.17	119.02	14.68	17.52	2.26	5.59	4.19
	S.E. \pm	0.86	0.91	3.28	1.20	1.24	0.03	0.23	0.21
	C.D. at 5%	2.48	2.62	9.39	3.43	3.55	0.11	0.67	0.61

Table 1: Cont.

S. No.	Genotypes	Mean values for yield contributing and fiber quality characters						
		Harvest index	Ginning percent (%)	Upper half mean length (mm)	Fiber strength (g/tex)	Micronaire (μ g/inch)	Uniformity Ratio	Seed cotton yield per plant (g)
1.	JLA 804	0.360	34.31	26.20	27.10	5.88	76.70	25.10
2.	RG 606	0.360	37.10	25.20	26.40	5.77	76.70	33.50
3.	NDLA 3019	0.330	36.10	26.50	25.20	5.70	75.80	22.00
4.	GAM 123	0.410	35.26	27.20	26.20	5.78	79.30	36.35
5.	DWda 1501	0.410	37.26	26.20	27.00	5.40	78.40	29.70
6.	FDK 230	0.385	35.15	25.10	25.60	5.60	74.60	35.90
7.	CCA 1015	0.420	32.92	25.80	27.00	5.84	81.70	38.85
8.	LD 1033	0.380	36.12	24.00	19.10	6.02	74.60	36.40
9.	PBD 12	0.405	37.79	21.00	24.20	7.00	78.50	31.50

10.	CAN 397	0.365	38.95	25.70	27.00	5.70	70.00	38.85
11.	SV 385	0.435	37.30	25.40	27.05	5.90	79.30	41.45
12.	PA 808	0.390	35.81	25.00	28.00	5.70	82.60	34.30
13.	RAAS 212	0.425	30.98	25.00	26.70	5.30	76.40	23.25
14.	GLA 606	0.420	34.95	26.50	28.10	4.90	78.90	34.65
15.	AKA 2009-1	0.375	37.06	24.50	26.00	4.90	78.70	24.45
16.	ARBAS 138	0.435	33.48	29.00	26.00	5.63	79.20	40.65
17.	HD 511	0.410	37.36	22.50	25.00	5.96	75.40	32.40
18.	DAS 1395	0.380	38.16	26.30	26.40	5.30	81.40	24.60
19.	PAIG 370	0.400	34.67	30.00	28.60	5.15	76.70	23.95
20.	JLA 505	0.340	34.30	26.60	27.40	5.87	78.10	40.75
21.	KWA 1201	0.420	38.03	26.00	27.00	5.80	69.70	33.80
22.	CISA-6-123	0.405	34.69	25.50	26.40	5.60	78.90	29.10

Table 1: Cont.....

S. No.	Material	Mean values for yield contributing and fiber quality characters						
		Harvest Index	Ginning percent (%)	Upper half mean length (mm)	Fiber strength (g/tex)	Micronaire ($\mu\text{g}/\text{inch}$)	Uniformity ratio	Seed cotton yield per plant (g)
23.	GAU 168	0.385	33.15	30.50	27.00	4.50	79.70	45.50
24.	CAN2023	0.435	32.52	23.30	18.40	5.81	74.80	39.00
25.	RG 690	0.410	37.66	26.10	26.20	5.30	78.00	42.00
26.	FDK 259	0.355	35.43	23.00	24.50	7.20	78.00	44.40
27.	RAAS 2011	0.425	33.87	25.20	26.70	5.50	80.10	40.40
28.	LD 1026	0.380	35.44	25.40	19.60	6.18	76.90	28.25
29.	AKA 9703	0.400	39.08	24.30	25.00	5.50	75.30	40.25
30.	PA 827	0.395	33.26	25.00	26.70	5.10	80.00	37.30
31.	DAS 385	0.420	30.74	25.00	26.20	5.66	75.90	30.90
32.	ANGAS 1302	0.360	32.87	25.20	27.00	7.52	77.60	39.00
33.	NDLA 2985	0.390	35.21	26.20	26.00	6.20	78.70	32.25
34.	ARBAS 1502	0.415	36.62	29.00	25.00	4.80	73.60	33.30
35.	HD 418	0.405	37.51	24.00	25.40	6.38	74.40	40.00
36.	CCA 390	0.395	37.87	23.60	18.50	6.85	77.80	39.75
37.	KR 84	0.370	34.13	24.90	27.00	5.91	81.50	22.20
38.	PAIG 377	0.400	34.24	24.80	25.60	4.90	77.80	32.05
39.	CCA 2003	0.355	34.39	26.20	26.50	5.50	79.30	23.65
40.	AKA-7	0.370	38.60	25.40	20.10	5.99	84.00	27.10
41.	PA 08	0.420	36.34	26.50	27.80	6.24	84.80	26.30
42.	JLA 794	0.345	31.19	26.90	26.40	5.50	83.90	31.55
	G. Mean	0.39	35.42	25.61	25.54	5.74	77.95	33.49
	S.E. \pm	0.01	0.89	0.44	0.48	0.20	0.90	2.57
	C.D. at 5%	0.04	2.55	1.26	1.37	0.57	2.57	7.3649

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