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Studies of genetic parameters for yield, yield contributing and fiber quality characters in *desi* cotton (*Gossypium arboreum* L.)

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ABSTRACT: In the present investigation, 42 *desi* (*Gossypium arboreum* L.) genotypes were studied to observe genetic variability, heritability and genetic advance for fifteen yield contributing and fiber quality characters. The analysis of variance revealed that sufficient variability was present in the material for all the characters. The value of phenotypic coefficient of variation (PCV) was greater than genotypic coefficient of variation (GCV). The high GCV and PCV were observed for seed cotton yield / plant, sympodia / plant, plant height, bolls / plant, harvest index and lint index. High heritability estimates coupled with high expected genetic advance were observed for the characters plant height, sympodia / plant, bolls / plant, lint index, harvest index, upper half mean length and seed cotton yield / plant indicating the presence of additive gene action and phenotypic selection may be more fruitful and effective for desired genetic improvement.

Key words : Genetic advance, *Gossypium arboreum,* heritability, seed cotton yield, variability

Cotton (*Gossypium* spp.) is an important fiber and cash crop of the country which provides lint as raw material to the textile industry. *Gossypium* is a large, diverse and economically viable genus, which includes many diploid and tetraploid species. The extensive genetic variation present in this genus is distributed among 50 species, out of which four are cultivated, 44 are wild diploids and two are wild tetraploids. India is the only country growing all the four species of cultivated cotton *Gossypium arboreu*m L. and *G. herbaceum* L. (Asian cotton), *G. barbadense*L. (Egyptian cotton) and *G. hirsutum* L. (American upland cotton) besides hybrid cotton. Among the two cultivated diploid species, *Gossypium arboreum* in considered the most important one for its wide adaptability with resistance to sucking pests.

Knowledge of genetic variability, heritability and genetic advance is prerequisite for initiating appropriate breeding programme for crop improvement in any crop. The heritable variation is masked by non heritable variation which creates difficulties in exercising selection. Hence, it becomes necessary to spot over all variability into heritable and non heritable components with the help of certain genetic parameters which may enable the breeder to adopt proper breeding strength. Since many characters of economic importance are highly influenced by environmental conditions, progress in any breeding programme is mainly depends upon the magnitude of genetic variability present in the population.The presence of genetic diversity is important for improving any crop species. The precious

evaluation of the genetic diversity of the excellent germplasm will provide a guide for choosing parents and predicting the degree of inheritance, variation and level of heterosis, which are essential for releasing the breeding goal.In present study, efforts have been made to analyze the components of variability with reference to future breeding programme.

MATERIAL AND METHODS

The experiment was carried out during *kharif,* 2016 at Cotton Research Station, Mehboob Baugh Farm, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The experimental material consisted of 42 diverse elite genotypes of *desi* cotton (*Gossypium arboreum* L.) including three checks *viz.,* AKA 7, PA 08 and JLA 794. The experimental material was sown on 29th June, 2016 by dibbling 2-3 seeds / hill. Recommended agronomical and plant protection practices were followed regularly. Fertilizer dose of 50:25:25 kg NPK/ha was applied to the crop, out of which 25:25:25 kg NPK/ha was given at the time of sowing and remaining 25 kg N/ha was applied 45 days after sowing.

Observations were recorded on ten yield and yield contributing characters *viz.*, days to 50 per cent flowering, days to 50 per cent boll bursting, plant height, sympodia / plant, bolls / plant, boll weight, seed index, lint index, harvest index and seed cotton yield / plant, five fiber quality characters *viz.*, ginning per cent, upper half mean length, fiber strength, micronnaire and uniformity ratio. The data were collected and analyzed for genotypic and phenotypic coefficients of variation, heritability (broad sense) and expected genetic advance as per cent of mean.

RESULTS AND DISCUSSION

Wide range of variability was observed for majority of yield contributing characters. Range of variation on the basis of mean was more for the traits plant height (69.30 - 174.60 cm), seed cotton yield / plant (17.73 - 51.93 g), upper half mean length (19.00 - 31.00 mm), sympodia / plant (9.4 - 20.9), bolls / plant (8.4 - 19.8), days to 50 percent boll bursting (112.0 - 122.5 days), ginning percent (30.59 - 39.62), uniformity ratio (74 - 83), days to 50 per cent flowering (69.50-78.50 days) and fiber strength (24.2 - 28.7 g/tex) (Table 1). Similar results of wide ranged variability for yield contributing and fiber quality characters were reported by Naqib *et al.,* (2010), Vinodhana *et al.,* (2013), Dhivya *et al.,* (2014), Reddy *et al.,* (2014), Santosh Kumar *et al.,* (2014), Dahiphale *et al.,* (2015) and Latif *et al.,* (2015).

The values of phenotypic variance were more than the genotypic variance for all the characters. It means that the apparent variation is not only due to genotypes but also due to influence of environment. Similar results reported by Rumesh *et al.,* (2014), Reddy *et al.,* (2014), Farooq *et al.,* (2014), Santoshkumar*et al.,* (2014).

High estimates of genotypic and phenotypic coefficient of variation were observed for seed cotton yield / plant, sympodia / plant, plant height, bolls / plant, harvest index and lint index. Similar findings were reported by Elango *et al.,* (2012), Alkuddsi *et al.,* (2013), Vinodhana *et al.,* (2013), Dahiphale *et al.,* (2015). Whereas, Santosh Kumar *et al.,* (2014) observed moderate values of GCV and PCV for the

character plant height. Moderate values for GCV and PCV were observed for seed index, upper half mean length, micronnaire and boll weight. Similar findings were also reported by Elango *et al.,* (2012), Vinodhana *et al.,* (2013). The lowest genotypic and phenotypic coefficient of variation were observed for days to 50 per cent flowering, days to 50 per cent boll bursting, uniformity ratio, fiber strength and ginning per cent. Vinodhana*et al.,* (2013) also observed low GCV and PCV values for the trait ginning per cent. Whereas, Elango*et al.,* (2012) reported moderate GCV and PCV for ginning per cent. Patil*et al.,* (2014) observed lowest GCV and PCV for the trait uniformity ratio.

The selection under field condition may be strongly influenced by the environmental factors affecting the progressive improvement programme. In the present investigation though the phenotypic coefficient of variations were greater than genotypic coefficient of variations, the differences between them were of lower magnitude *i.e.* they were more or less close to each other. This indicates that there is small effect of environment on character and selection may be effective for such characters. Alkuddsi *et al.,* (2013) also observed that there were no much differences between PCV and GCV for seed cotton yield. Dhivya *et al.,* (2014) also reported that GCV had a similar trend as PCV for all the traits, indicating ample scope for improvement

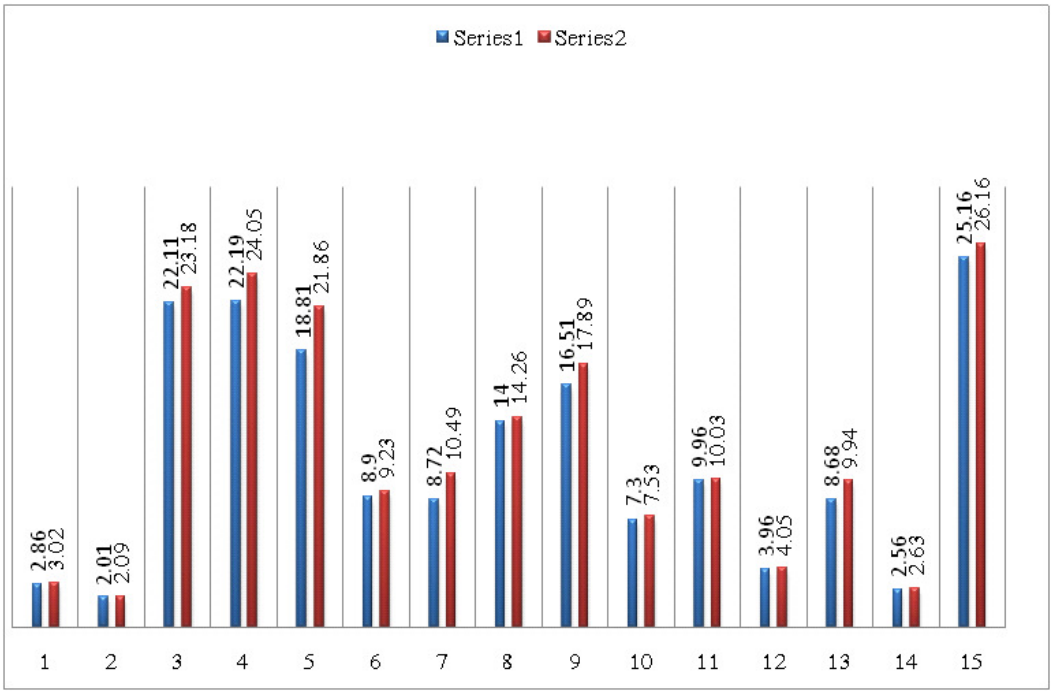

Fig. 1 : GCV and PCV for yield contributing and fiber traits

Characters

1. Days to 50 per cent flowering
2. Days to 50 per cent boll bursting
3. Plant height
4. Sympodia/plant
5. Bolls/plant
6. Boll weight
7. Seed index
8. Lint index
9. Harvest index
10. Ginning per cent
11. Upper half mean length
12. Fiber strength
13. Micronaire
14. Uniformity ratio
15. Seed cotton yield/plant

Table 1. Parameters of genetic variability for yield contributing and fiber quality characters

Sr. No.	Characters	Range	GM	GV (%)	PV (%)	GCV (%)	PCV (%)	Heritability (%)	Genetic advance	EGA (%)
1	Days to 50 per cent flowering	69.5-78.5	73.76	4.44	4.96	2.86	3.02	89.6	4.12	5.57
2	Days to 50 per cent boll bursting	112.0-122.5	117.33	5.57	6.05	2.01	2.09	92.1	4.67	3.98
3	Plant height	69.3-174.6	114.64	690.94	715.30	22.11	23.18	96.6	54.41	47.46
4	Sympodia/plant	9.4-20.9	15.27	11.49	13.50	22.19	24.05	85.1	6.44	42.18
5	Bolls/plant	8.4-19.8	14.56	7.49	10.13	18.81	21.86	74.0	4.85	33.33
6	Boll weight	2.03-2.72	2.43	0.047	0.05	8.9	9.23	93.1	0.43	17.69
7	Seed index	3.79-6.89	5.73	0.25	0.36	8.72	10.49	69.2	0.86	14.95
8	Lint index	2.21-3.83	3.00	0.18	0.19	14.00	14.26	96.7	0.85	28.39
9	Harvest index	0.225-0.605	0.47	0.006	0.007	16.51	17.89	85.1	0.49	31.37
10	Ginning per cent	30.59-39.62	34.21	6.24	6.63	7.30	7.53	94.1	4.99	14.59
11	Upper half mean length	19-31	25.47	6.44	6.53	9.96	10.03	98.6	5.19	20.37
12	Fiber strength	24.2-28.7	26.45	1.098	1.15	3.96	4.05	95.7	2.12	7.98
13	Micronaire	4.5-7.1	5.29	0.22	0.27	8.68	9.94	76.3	0.83	15.61
14	Uniformity ratio	74-83	79.47	4.15	4.36	2.56	2.63	95.2	4.09	5.15
15	Seed cotton yield/plant	17.73-51.93	35.57	80.15	86.68	25.16	26.16	92.5	17.74	49.85

through selection for studied traits. The characters such as days to 50 per cent flowering, 2.5 per cent span length and micronnaire value exhibited low PCV and GCV which indicated that the breeders should go for source of high variability for these characters to make improvement.

The desirable broad sense heritability (more than 60 per cent) was observed for all the characters studied i.e. days to 50 per cent flowering (89.6%), days to 50 per cent boll bursting (92.1%), plant height (96.6%), sympodia / plant (85.1%), bolls / plant (74%), boll weight (93.1%), seed index (69.2%), lint index (96.7%), harvest index (85.1%), ginning per cent (94.1%), upper half mean length (98.6%), fiber strength (95.7%), micronnaire (76.3%), uniformity ratio (95.2%) and seed cotton yield / plant (92.5%) (Table 1). These results are in conformity with the results reported by Elango *et al.,* (2012), Vinodhana *et al.,* (2013), Erande *et al.,* (2014), Rumesh *et al.,* (2014), Santoshkumar *et al.,* (2014), Dahiphale *et al.,* (2015), Latif *et al.,* (2015) and Baloch *et al.,* (2015).

High heritability estimates coupled with high expected genetic advance were observed for the characters plant height, sympodia/plant, bolls/plant, lint index, harvest index, upper half mean length and seed cotton yield/plant. Similar findings were reported by Elango *et al.,* (2012), Vinodhana *et al.,* (2013), Erande *et al.,* (2014), Dahiphale *et al.,* (2015).

High heritability estimates coupled with moderate gen etic advance were observed for boll weight, seed index, ginning per cent and micronnaire value. Similar results were reported by Elango *et al.,* (2012) for micronnaire value, Dhivya *et al.,* (2014) for boll weight, Rumesh *et al.,* (2014) for seed index, Santoshkumar *et al.,* (2014) for ginning per cent and micronnaire value, Dahiphale *et al.,* (2015) for ginning outturn.

High heritability estimates coupled with low expected gen etic advance were observed for the characters days to 50 per cent flowering, days to 50 per cent boll bursting, fiber strength and uniformity ratio. Similar result reported by Santoshkumar *et al.,* (2014) for uniformity ratio, Farooq *et al.,* (2014) for fiber strength.

In the present investigation, high heritability was associated with high expected gen etic advance for the traits *viz.*, plant height, sympodia / plant, bolls / plant, lint index, harvest index, upper half mean length and seed cotton yield / plant. Since, selection based on the characters being of additive nature is likely to be more efficient for their improvement. Thus, while exploiting genetic variability a due weightage should be given for these characters.

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