



Research Paper

**STUDY OF GENETIC VARIABILITY, HERITABILITY AND GENETIC
ADVANCE IN SOME GENOTYPES OF EGYPTIAN COTTON
(*Gossypium barbadense* L.)**

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Abstract

Ten germplasm lines of cotton (*Gossypium barbadense* L.) were studied for genetic variability, heritability and genetic advance as per cent of mean for ten quantitative and qualitative traits. Analysis of variance revealed, significant differences for all the characters under study except seed cotton yield. The highest genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) observed for the character number of bolls per plant, whereas average boll weight, seed cotton yield, micronaire index ($\mu\text{g}/\text{inch}$), span length (mm) and fiber strength (g/tex) recorded moderate GCV values. Number of bolls per plant, ginning outturn, days to fifty percent flowering and span length (mm) shows high heritability coupled with high GCV and high genetic advance as per cent of mean (GAM) indicates selection could be effective for improvement in these characters.

Key words: *Gossypium barbadense*, *Gossypium barbadense*, Heritability, Genetic advance.

INTRODUCTION

Cotton is an important cash crop of Indian farmers and commercially cultivated in the temperate and tropical regions of world. In India the approximate area under cotton cultivation is 118.81 lakh hectares and production is 352 lakh bales [7]. Gujarat, Maharashtra, Madhya Pradesh, Andhra Pradesh, Tamil Nadu and Karnataka are major cotton producer states of India. Cotton fiber with long and extra long staple length is demand of textile industries. The fiber with long and extra long staple length is characteristic of Egyptian cotton (*Gossypium barbadense* L.) and market value of this cotton fiber is more. But In India the yield from the genotypes of *Gossypium barbadense* is very low as compare to *Gossypium hirsutum* genotypes due to small boll size and other yield components. This problem could be overcome by developing the interspecific hybrids of cotton (*Gossypium hirsutum* L. x *Gossypium barbadense* L.) through various hybridization techniques. Selection of genetically variable parents is

essential for the development of superior genotypes with high yield and good fiber quality through hybridization. The variability in various characters is essential thing for plant breeder; however the genetically variable genotypes along with high to medium genetic advance provide scope for selection.

MATERIAL AND METHODS

In the present investigation, an attempt has been made to evaluate genetic variability parameters for yield, yield contributing and fiber quality traits. Ten genotypes of *Gossypium barbadense* L. were collected from Dr. Panjabrao Deshmukh Agricultural University, Akola and CICR. Nagpur. These genotypes were grown at Department of Botany, Government Institute of Science, Aurangabad in randomized block design with three replications and spacing of 90 x 60 cm. The observations were recorded on five randomly selected plants from each genotype for ten quantitative and qualitative traits *viz.* days to 50 percent flowering, number of bolls per plant, average boll weight, plant height (cm), seed cotton yield per plant (Kg), ginning outturn, span length (mm), fiber uniformity %, fiber strength (g/tex) and micronaire ($\mu\text{g}/\text{inch}$). The coefficient of variation was calculated by the method of Burton [1] and heritability in broad sense was estimated according to Burton and Devane[2]. The expected genetic advance was calculated as per the method suggested by Johnson *et al.* [3].

RESULTS AND DISCUSSION

Analysis of variances exhibited significant differences among genotypes for all the characters studied except seed cotton yield (Table no. 1). Similar results were reported by Dhamayanathi *et al.* [4], Reddy and Sarama [6] and Reddy & Reddy [8]. The phenotypic coefficient of variation was higher than genotypic coefficient of variation for the all studied characters, however large difference observed among PCV and GCV for the characters *viz.* Seed cotton yield, micronaire index ($\mu\text{g}/\text{inch}$), average boll weight (g), number of bolls per plant, ginning outturn and fiber strength (g/tex) which indicating the influence of the environment in the expression of these characters (Table no. 2). These results are similar to Reddy and Sarama [6] and Reddy & Reddy [8] however contrary with Dhamayanathi *et al.* [4], improvement could be possible through selection of genotypes in these traits. The character number of bolls per plant recorded high GCV, whereas average boll weight, seed cotton yield, micronaire index ($\mu\text{g}/\text{inch}$), span length (mm) and fiber strength (g/tex) recorded moderate GCV values, while the characters days to 50 % flowering and fiber uniformity (%) exhibited low GCV values. Similar finding were reported by Reddy and Sarama [6] and Dhamayanathi *et al.* [4].

None of single studied character recorded heritability estimates more than 1 % *viz.* fiber uniformity % (0.94 %), days to 50 % flowering (0.88 %), span length (0.86 %), number of bolls per plant (0.85 %), plant height (0.84 %), average boll weight (0.68 %), micronaire index (0.44 %) and seed cotton yield (0.32 %) (Table no. 2). These results are contrary with findings of Reddy and Reddy [8], Reddy and Sarama [6] and Dhamayanathi *et al.* [4]. The high genetic advance (GA) exhibited by characters number of bolls per plant (22.94), plant height (cm) (18.85), days to 50 % flowering (10.01), ginning outturn (6.11), span length (5.71), fiber strength (5.13) and fiber strength (4.86) while the characters average boll weight (0.55), micronaire index (0.44) and seed cotton yield (0.06) recorded low GA value. The character number of bolls per plant (81.43 %) revealed high genetic advance as percent of mean (GAM) and characters average boll weight (25.78 %), ginning outturn (21.36 %), plant height (19.93 %), fiber strength (19.38 %) and span length (18.67 %) showed medium GAM, while the

characters micronaire index (14.94 %), days to 50 % flowering (14.12 %) and fiber uniformity (11.72 %) expressed low GAM (Table no. 2). Similar results were reported by Dhamayanathi *et al.* [4], Reddy and Sarama [6], Dhivya *et al* [5] and Reddy and Reddy [8].

Table no. 1 Analysis of variance for quantitative and qualitative characters

Characters	Replicates	Treatments	Error
Days to 50 % flowering	3.60	51.26**	2.22
Average boll weight	0.06	0.22**	0.02
Number of bolls per plant	34.57	280.32**	15.07
Plant height (cm)	23.14	191.86**	10.98
Seed cotton yield (Kg/ plot)	0.00	0.01	0.00
Ginning outturn (%)	14.47	24.99*	2.80
span length (mm)	2.13	17.19**	0.88
Fiber uniformity %	0.33	12.14**	0.21
Fiber strength (g/tex)	1.22	15.34**	1.59
Micronaire (µg/inch)	0.16	0.22*	0.06

*, ** significance at 5 % and 1 % level respectively

Table no. 2 Genetic variability parameters for quantitative and qualitative characters

Characters	Range	Mean	PCV (%)	GCV (%)	h ² (BS) %	GA	GAM %
Days to 50 % flowering	62.66 - 76.33	70.90	6.079	5.702	0.880	10.012	14.121
Average boll weight	1.76 - 2.70	2.14	14.200	11.776	0.688	0.553	25.781
Number of bolls / plant	15.63 - 48.00	28.17	36.104	33.372	0.854	22.945	81.434
Plant height (cm)	86.00 - 114.96	94.58	8.926	8.210	0.846	18.854	19.933
Seed cotton yield (Kg/plot.)	0.450 - 0.626	0.531	14.895	8.548	0.329	0.069	12.949
Ginning outturn (%)	25.00 - 33.08	28.60	11.166	9.507	0.725	6.113	21.369
Span length (mm)	27.52 - 3.11	30.58	8.219	7.625	0.861	5.712	18.675
Fiber uniformity %	40.07 - 45.94	43.75	4.679	4.559	0.949	5.131	11.729
Fiber strength (g/tex)	21.64 - 30.20	25.11	9.895	8.523	0.742	4.868	19.381
Micronaire (µg/inch)	2.23 - 3.18	2.72	12.848	8.528	0.441	0.407	14.943

High heritability along with high or moderate genetic advance as percent of mean (GAM) were showed by characters number of bolls per plant, ginning outturn, days to fifty percent flowering and span length which revealed that the selection could be effective for these characters. Similar results for plant height and other traits were

recorded by Dhamayanathi *et al.* [4] and Reddy and Reddy [8]. The heritability should be considered along with genetic advance as percent of mean, however it is not necessary that character showing high heritability will also express high genetic advance [3]. Characters micronaire index and seed cotton yield accompanied by low genetic advance as percent of mean (GAM) and the low heritability may be due to the influence of environmental condition. Hence, it may be concluded that characters number of bolls per plant, ginning outturn, days to fifty percent flowering and span length are considered as suitable for effective selection in breeding program.

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