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Research Article

Study on genetic variability for the quantitative traits in some genotypes of upland cotton (*Gossypium hirsutum* L.)

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Abstract

Twenty five germplasm lines of cotton (*Gossypium hirsutum* L.) were evaluated for genetic variability, heritability and genetic advance on the basis of as percent of mean for eight traits. Analysis of variance revealed, significant differences for all the eight quantitative characters under study. Plant height (cm), number of bolls per plant, average boll weight, and ginning percentage observed high genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV). Plant height (cm), number of bolls per plant, average boll weight and ginning outturn recorded high heritability coupled with high genotypic coefficient of variation (GCV) and high genetic advance as per cent of mean indicates selection could be effective for improvement in these characters.

INTRODUCTION

Cotton is an important fiber crop having high commercial value. It is grown commercially in the temperate and tropical regions of more than 70 countries. It belongs to family Malvaceae and genus *Gossypium*. India has the largest cotton area in the world with 118.81 lakh hectors and 352 lakh bales (Anonymous 2015-16). In India, cotton is grown in Gujarat, Maharashtra, Madhya Pradesh, Andhra Pradesh, Tamil Nadu and Karnataka states as a *Kharif* crop. The demand of cotton fiber will be fulfill by developing new genotypes with desire characters by applying various breeding techniques. For the development of superior genotypes through hybridization, it is essential to select genetically variable parent. The variability for various characters is pre requisite for plant breeder; however variability along with high to medium genetic advance provides scope for selection of parents in breeding program (Dhamayanathi *et al.*, 2010).

In the process of identification of superior genotypes, seed cotton yield coupled with various quality traits are considered to be good character. Several yield contributing traits such as plant height, number of monopodia, number of sympodia, number of bolls, and number of fruiting points per plant are responsible for the improvement in seed cotton yield.

In cotton crop, genotypic and phenotypic variation for different quantitative and qualitative traits such as plant height, number of monopodia, number of sympodia, number of bolls per plant, seed index, lint index, micronaire value and seed cotton yield has been studied by several earlier research workers such as Krishna Rao and Marry 1990, Sumathi and Nadarajan 1995, Sambamurthy et al. 1998, Ahuja and Tuteja 2000, Neelam and Potdukhe 2002, Sakthi *et al.*, 2007 and Dhamayanathi *et al.*, 2010.

The genetic improvement in cotton crop is depends on the existence of initial genetic variability among the populations. The initial.

variability and the degree of correlations amongst yield and yield attributing traits are prime important for developing superior genotypes of cotton A study was conducted with the objective of evaluating the variability in *Gossypium hirsutum* genotypes and correlations for yield and yield contributing characters, to analyze its heritable components of the actual variability for making selections for breeding program.

MATERIAL AND METHODS

In the present investigation, an attempt has been made to assess genetic variability parameters for yield and yield contributing traits. Twenty five genotypes of cotton collected from Vasantrao Naik Marathwada Agricultural University, Parbhani, Dr. Panjabrao Deshmukh Agricultural University, Akola and CICR. These genotypes were grown in randomized block design with three replications and spacing of 90 x 60 cm at the Department of Botany, Government Institute of Science, Aurangabad. The observations were recorded on five randomly selected plants from each genotype for eight quantitative traits *viz.* days to 50 percent flowering, number of bolls per plant, average boll weight, plant height (cm), seed cotton yield per plant, ginning outturn, seed index (g) and lint index (g). The coefficient of variation was calculated according to Burton (1952) and heritability in broad sense was estimated as per suggestion of Burton and Devane (1953). The expected genetic advance was calculated according to method suggested by Johnson *et al.* (1955).

RESULTS AND DISCUSSION

Analysis of variances revealed significant differences among genotypes for all the quantitative characters *viz.* days to 50 % flowering, number of bolls per plant, average boll weight, plant height (cm), seed cotton yield (Kg/ plot), ginning outturn (%), seed index (g) and lint index (g) (Table no.1). Similar results were reported by Dhamayanathi *et al.* (2010), Dhivya *et al.* (2014) and Reddy and Sarama (2014). Phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (GCV) for all that characters and large difference observed between PCV and GCV for characters *viz.* days to 50 % flowering, average boll weight, plant height, seed cotton yield per plot and lint index indicating the influence of the environment in the expression of these characters (Table no. 2). These results are similar to Reddy and Sarama (2014), however contrary with Dhamayanathi *et al.* (2010). High GCV was shown by the characters *viz.* plant height (cm), seed cotton yield and lint index, improvement could be possible trough selection in these traits. Characters days to 50 % percent flowering, average boll weight and number of bolls per plant recorded moderate GCV values, while low GCV values were exhibited by ginning outturn and seed index. Similar finding were reported by Reddy and Sarama (2014) and Dhamayanathi *et al.* (2010).

High heritability estimates were recorded by characters *viz.* seed index (70.20%), ginning outturn (54.68%), plant height (53.72%) and seed cotton yield (33.28%). However, the character days to 50 % flowering showed low heritability estimates (Table 2). These results are contrary with findings of Reddy and Sarama (2014) and Dhamayanathi *et al.* (2010). The high genetic advance (GA) revealed by characters plant height (cm) (9.18), cotton yield (8.42) and days to 50 % flowering (5.69) while number of bolls per plant (0.69), average boll weight (0.73) and lint index (0.27) recorded low GA value. Characters *viz.* plant height (22.02%), seed cotton yield (15.62%) and ginning outturn (10.67%) had high and medium values respectively for genetic advance as percent of mean (GAM), however characters days to 50 % flowering (4.38%), number of bolls per plant (6.50%), average boll weight (6.53%) and seed index (6.70%) expressed low GAM (Table 2). Similar results were reported by Reddy and Sarama (2014) and Dhamayanathi *et al.* (2010).

High heritability along with high or moderate genetic advance as percent of mean (GAM) were recorded by characters plant height, seed cotton yield and seed index revealed that selection could be effective for these characters. Similar results for plant height were recorded by Dhamayanathi *et al.* (2010). 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 (Johnson *et al.*, 1995). Characters ginning outturn, number of bolls per plant, average boll weight and lint index exhibited high heritability accompanied by low genetic advance as percent of mean (GAM) and the high heritability may be due to the influence of environmental condition. Similar results reported by Dhamayanathi *et al.* (2010), Reddy and Sarama (2014) and Dhivya *et al.* (2014) Hence, it may be concluded that traits *viz.* plant height, seed cotton yield and seed index are considered as suitable to effective selection.

Table No. 1. Analysis of variance for quantitative characters in cotton

Characters	Replications	Treatments	Error
Days to 50 % flowering	38.16	125.46**	27.58
Number of bolls per plant	0.14	8.46**	4.30
Average boll weight	0.28	2.19**	0.90
Plant height (cm)	108.97	1216.40*	687.13
Seed cotton yield (Kg/ plot)	20.01	183.34**	74.15
Ginning outturn (%)	0.64	7.49**	1.47
Seed index (g)	0.37	12.89**	1.55
Lint index (g)	0.021	0.27**	0.12

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

Table No. 2. Genetic variability parameters for quantitative characters in cotton

Characters	Range	Mean	PCV (%)	GCV (%)	h^2(BS) %	GA	GAM %
Days to 50 % flowering	58-70.33	62.78	18.42	5.25	9.77	5.69	4.38
Number of bolls / plant	2-3.9	36.2	10.78	5.87	29.37	0.69	6.50
Average boll weight	25.3-74.5	3.00	8.16	6.24	29.43	0.73	6.53
Plant height (cm)	84-116.7	98.4	19.14	14.19	53.72	9.18	22.02
Seed cotton yield (Kg/plt.)	0.75-1.92	1.17	21.74	10.70	33.28	8.42	15.62
Ginning outturn (%)	26.67-41.9	34.42	4.06	3.2	54.68	1.97	10.67
Seed index (g)	4.33-7.93	6.59	4.67	3.94	70.20	3.36	6.70
Lint index (g)	2.1-4.5	3.3	14.20	7.61	27.98	0.27	8.37

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