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Genetic Variability for Seed Cotton Yield and Yield Components in Cotton (*Gossypium hirsutum* L.)

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ABSTRACT

The study was undertaken with an objective to study the genetic variability for seed yield and yield traits in cotton genotypes during *kharif,* 2013-14 at Regional Agricultural Research Station, Lam Farm, Andhra Pradesh. Analysis of variance showed highly significant differences among the fifty seven genotypes for all the characters studied indicating that the data generated from the above diverse material will yield reliable genetic information. The genetic variability studies revealed that the material used in the present investigation possessed variability which provides scope for selection by breeder. Moderate to low coefficients of variability was observed for most of the traits indicating moderate variability. The estimates of high heritability and moderate genetic advance as per cent of mean were observed for the traits sympodia per plant, bolls per plant, 2.5 % span length and seed cotton yield per plant.

Key words : Cotton, Heritability, Variability.

Cotton is an important fibre crop of global importance which is grown in tropical and subtropical regions of more than 75 countries of the world. Despite threat from synthetic fibre or manmade fibre, cotton retains its reputation as "Queen of the fibre plants". For multiple uses of lint and by-products, cotton is also referred to as "white gold". It is the most important commercial crop contributing nearly 65 per cent of the total raw material needs of the textile industry in our country.

The possibility of crop improvement is dependent on the available variability for the yield and yield attributing traits. The studies on heritability and genetic advance give clear picture regarding the contribution of the genetic parameters in the expression of the traits. Hence, an attempt was made to know the nature and magnitude of variability present in the studied material into heritable and non-heritable components based on genetic parameters like genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability and genetic advance as percent of mean (GAM).

MATERIAL AND METHODS

The experiment was conducted during 2013-14 *kharif* at Regional Agricultural Research Station, Lam Farm. The experimental material consisted of 45 hybrids, obtained from crossing programme involving ten parents in half diallel fashion and two hybrid checks. The experiment laid in a randomized block design with three replications. Each plot consisted of two rows each of 6 m length with a spacing of 120 X 60 cm. Observations were recorded on ten randomly selected plants for the parameters *viz*., plant height (cm), days to 50% flowering, number of monopodia per plant, number of sympodia per plant, number of bolls per plant, boll weight (g), seed index (g), lint index (g), ginning out-turn (%), bundle strength (g/tex), fibre elongation (%), uniformity ratio, micronaire (10^{-6}g/in), and seed cotton yield per plant (g). The mean data were used for the statistical analysis. The genotypic coefficient of variation and phenotypic coefficient of variation were worked out as per the formula suggested by Burton (1952). Broad sense heritability was computed according to the formula given by Lush (1940) and genetic advance was calculated as per the formula suggested by Johnson *et al.* (1955).

RESULTS AND DISCUSSION

The analysis of variance showed that the genotypes under study differed significantly among themselves for the traits studied. The mean, range,

GCV, PCV, heritability and genetic advance as per cent of mean were given in Table 1.

In the present study, range of variation was observed for most of the traits was high and indicates their exploitation in the breeding programmes. The PCV values were higher than the GCV values for all the traits indicating the presence of environmental effect on the expression of the traits and the effect was varied based on the trait as some traits like plant height, fays to 50% flowering, no. of monopodia per plant, no. of bolls per plant, boll weight, seed index, lint index, micronaire, bundle strength, uniformity ratio, fibre elongation and seed cotton yield showed least influence while other characters showed maximum environmental influence on the expression. PCV and GCV values were lower for all the traits indicating the presence of lower variability for the traits in the studied material. These results are in accordance with the report of Haritha *et al*. (2012) while Asha *et al*. (2013) observed wider variability for the traits in their study. Among the parameters, monopodia per plant recorded high GCV and GCV while, bundle strength recorded the lowest GCV and PCV values. Similar results were also recorded in the studies of Paramjit and Buttar (2013).

All the studied characters recorded high heritability except the traits like no. of sympodia per plant and ginning outturn indicating the role of genetic component in their expression and less influence of environmental component. Similar results were also recorded by Asha *et al*. (2013) and Paramjit and Buttar (2013) in their studies on cotton. Genetic advance was the highest for the trait, no. of monopodia per plant (37.85) followed by seed cotton yield per plant (32.94) and no. of bolls per plant (22.79) indicating high selection response for these traits in the studied material. While the traits, boll weight, lint index, plant height, 2.5% span length, fibre elongation% and micronaire showed moderate genetic advance and the remaining traits recorded lower genetic advance as per cent of mean values indicating their lowest selection response.

The traits, number of monopodia per plant, bolls per plant and seed cotton yield per plant showed high heritability coupled with high genetic advance indicating the importance of additive gene action in governing the inheritance of these traits and the role of simple selection in the exploitation of these traits. Paramjit and Buttar (2013) and Dhivya *et al.* (2014) also recorded similar results

Table: 1. Mean, genetic variability, heritability (broad sense) and genetic advance as per cent of mean for seed cotton yield and yield components in cotton (*Gossypium hirsutum* L.).

Character	Mean	Range		PCV (%)	GCV (%)	Heritability (%)	Genetic Advance as % of Mean
		Minimum	Maximum				
Plant height (cm)	129.57	105.34	145.67	8.75	8.03	84.00	15.18
Days to 50% flowering	58.07	51.23	61.13	4.13	3.77	83.00	7.08
No. of monopodia per plant	1.35	0.89	1.93	24.64	21.28	75.00	37.85
No. of sympodia per plant	18.04	14.19	21.08	12.74	6.09	23.00	6.00
No. of bolls per plant	37.65	24.32	45.89	12.60	11.81	88.00	22.79
Boll weight (g)	4.73	3.61	5.23	9.73	9.24	90.00	18.09
Seed index %	10.10	8.96	11.54	5.15	4.68	83.00	8.76
Lint index %	5.03	4.11	5.96	8.65	8.35	93.00	16.59
Ginning out-turn (%)	32.97	30.01	35.73	4.92	2.65	29.00	2.94
2.5% span length (mm)	29.11	26.12	35.34	14.89	7.36	96.00	14.89
Micronaire (10^{-6} g Inch $^{-1}$)	4.42	3.80	5.04	7.87	6.62	71.00	11.46
Bundle strength (g/Tex)	22.63	19.92	25.12	4.09	3.18	60.00	5.10
Uniformity ratio	47.33	43.14	50.25	5.11	4.77	87.00	9.19
Fibre elongation (%)	5.60	4.91	6.12	6.73	6.38	90.00	12.47
Seed cotton yield per plant (g)	170.41	106.12	217.89	19.84	17.81	81.00	32.94

in their studies in cotton. Paul (1978) also reported that, if heritability in broad sense is mainly due to additive gene effects then only it associates with high genetic gain. Selection would be rewarding for the traits which show high heritability coupled with high genetic advance as per cent of mean.

Moderate genetic advance along with high or medium heritability was recorded in case of plant height, boll weight, lint index, 2.5% span length and bundle strength, fibre elongation and micronaire indicating the operation of both additive and non additive gene effects. While, the number of sympodia per plant and ginning out turn recorded low heritability with low genetic advance, revealing that these traits are controlled by non-additive gene effects and further improvement of this character would be possible through heterosis breeding rather than simple selection (Sivaprasad *et al*., 2004). The characters, seed index and uniformity ratio recorded high heritability with low genetic advance indicating the predominance of additive and non- additive gene actions in governing the inheritance of these traits and the best possibility of improvement through mass selection, progeny selection or any modified selection procedure aiming to exploit the additive gene effects effectively.

Thus, the present study indicated that the presence of low variability in the studied material and the traits, number of monopodia per plant, bolls per plant and seed cotton yield per plant, had high heritability coupled with high genetic advance indicating the role of additive gene action in governing the inheritance of these traits and exploitation by using simple selection.

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