



## Genetic Variability, Heritability and Genetic Advance for Seed Cotton Yield and its Components in Cotton (*Gossypium hirsutum* L.)

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### ABSTRACT

An investigation was carried out in cotton to assess the variability, heritability and genetic advance for eighteen characters *viz.*, plant height (cm), days to 50% flowering, number of monopodia per plant, number of sympodia per plant, relative water content (%), specific leaf weight (mg/cm<sup>2</sup>), number of bolls per plant, boll weight (g), seed index (g), lint index (g), ginning out turn (%), 2.5% span length (mm), micronaire value (10<sup>-6</sup> g/in), bundle strength (g/tex), uniformity ratio, seed cotton yield per plant (g), lint yield per plant (g) and fibre elongation (%) in 52 genotypes (fifty hybrids, along with two checks). The results revealed that high PCV and GCV were observed for the characters number of monopodia per plant, number of bolls per plant. High heritability accompanied with high genetic advance was recorded in number of monopodia per plant, specific leaf weight, number of bolls per plant and seed cotton yield per plant indicating the preponderance of additive gene action which may be exploited through breeding methods involving simple selection like mass selection, ear-to-row method, etc. are to be followed to improve these traits.

**Key words :** Cotton, Genetic advance, Heritability, Variability.

Knowledge of the nature and magnitude of genotypic and phenotypic variability present in any crop species plays a vital role in formulating successful breeding programme for evolving superior cultivars. Effectiveness of selection directly depends upon the amount of heritability and expected genetic advance as per cent of mean for that character. The present investigation was carried out to estimate the magnitude of genetic variability, heritability and genetic advance for yield, yield components and fibre quality traits in cotton.

### MATERIAL AND METHODS

The experimental material for the present study comprised of 50 F<sub>1</sub>s obtained by crossing ten lines (DGHH-11, DGHH-16, DGHH-21, DGHH-26, DGHH-31, DGHH-36, DGHH-41, DGHH-46, DGHH-51 and DGHH-56) with five testers (DGHH-116, DGHH-119, DGHH-124, DGHH-136 and DGHH-145) in a Line x Tester fashion. The 50 F<sub>1</sub>s along with two checks were grown in a Randomized Block Design with three replications during 2013-2014 crop season at Agricultural College Farm, Bapatla. Observations were recorded on five randomly chosen plants for eighteen quantitative characters *viz.*, plant height

(cm), days to 50% flowering, number of monopodia per plant, number of sympodia per plant, relative water content (%), specific leaf weight (mg/cm<sup>2</sup>), number of bolls per plant, boll weight (g), seed index (g), lint index (g), ginning out turn (%), 2.5% span length (mm), micronaire value (10<sup>-6</sup> g/in), bundle strength (g/tex), uniformity ratio, seed cotton yield per plant (g), lint yield per plant (g) and fibre elongation (%). The data was subjected to statistical analysis and genetic parameters such as phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability and expected genetic advance as per cent of mean were worked out as per Johnson *et al.* (1955) and Hanson (1963).

### RESULTS AND DISCUSSION

The analysis of variance revealed significant differences among all the 52 genotypes for all the characters studied, indicating a high degree of variability in the material (Table 1). In the present study, the variation was also estimated character wise in terms of phenotypic and genotypic coefficients of variation (Table 2). There is very less difference between the PCV and GCV indicating less influence of environment on expression of these traits. Highest PCV and GCV

Table 1. Analysis of variance for yield and yield component traits in cotton (*Gossypium hirsutum* L.).

Source	d.f.	Plant height (cm)	Days to 50% flowering	Number of monopodia plant <sup>-1</sup>	Number of sympodia plant <sup>-1</sup>	Relative water content (%)	Specific leaf weight (mg/cm <sup>2</sup> )	Number of bolls per plant <sup>-1</sup>	Boll weight (g)	Seed index (g)
Replications	2	107913	0.560	0.021	6.226	17.024	0.562	2.311	0.023	0.708
Crosses	49	189534*	34.493**	0.377	8.519**	126.508**	2.340**	92.581**	0.318	3.635**
Error	98	42475	0.872	0.006	1.978	15.465	0.325	7.571	0.027	0.454

  

Source	d.f.	Lint index (g)	Ginning Out-turn (%)	2.5% span length (mm)	Micronaire Value (10 <sup>-6</sup> g (inch))	Bundle strength (g/tex)	Uniformity ratio	Seed cotton yield plant <sup>-1</sup> (g)	Lint yield plant <sup>-1</sup> (g)	Fibre elongation
Replications	2	0.290	11.031	3.789*	0.000	2.352	1.690	2.180	6.329	0.004
Crosses	49	0.990	11.072**	3.568**	0.313	2.567**	3.706**	411.295**	76.901**	0.032
Error	98	0.222	3.130	1.019	0.105	0.975	1.097	28.404	23.012	0.007

\* Significant at 5% level

\*\* Significant at 1% level

was exhibited by monopodia per plant (30.78 and 30.01), number of bolls per plant (22.91 and 20.49), whereas lowest PCV and GCV was recorded by days to 50% flowering (5.91 and 5.69), relative water content (9.31 and 7.81), boll weight (9.58 and 8.54), ginning out turn (6.30 and 4.36), 2.5% span length (4.69 and 3.17), bundle strength (5.50 and 3.29), uniformity ratio (2.88 and 1.89) and fibre elongation (2.46 and 1.80). These results were in accordance with the findings of Vineela *et al.* (2013) and Bazi (2011), Haritha *et al.* (2012), Dhivya *et al.* (2014). Moderate PCV and GCV was recorded for number of sympodia per plant (15.90 and 11.40) and seed index (14.35 and 11.32). This indicate that there is considerable amount of variability for majority of the characters studied.

Heritability estimates were high for days to 50% flowering, number of monopodia per plant, number of bolls per plant, boll weight and seed index. Similar results were obtained by Dhivya *et al.* (2014) and Erande *et al.* (2014). The physiological characters like relative water content and specific leaf weight also recorded high heritability these are in support with Kumari and Subbaramamma (2006). The maximum value for heritability was recorded by number of monopodia per plant (95.05%) and minimum was recorded by bundle strength (35.91%).

Heritability estimates along with expected genetic advance are more helpful in predicting the gain under selection than heritability estimates alone. The estimates of heritability and expected genetic advance as per cent of mean were high for number of monopodia per plant, number of bolls per plant, seed cotton yield per plant and specific leaf weight indicating that these characters were less influenced by environment and governed by additive gene action which may be exploited through breeding methods involving simple selection like mass selection, ear-to-row method, etc. These findings were in agreement with Erande *et al.* (2014), Preetha and Raveendran (2007).

High heritability coupled with moderate expected genetic advance as per cent of mean was observed for days to 50% flowering, relative water content, boll weight and seed index, whereas moderate heritability coupled with moderate genetic advance as per cent of mean was observed for plant height, lint index and number of sympodia per plant indicating the role of both additive and non-additive gene actions in the inheritance of these traits and can be improved by population improvement methods. While low heritability coupled with low expected genetic advance as per cent of mean was observed for ginning out turn, 2.5% span length, micronaire, bundle strength,

Table 2. Estimates of variability, heritability (broad sense) and genetic advance as percent of mean for seed cotton yield and its Component traits in cotton (*Gossypium hirsutum* L.).

S. No.	Character	Mean	Range		Coefficient of variation		Heritability (broad sense) (%)	Genetic advance as per cent of mean
			Minimum	Maximum	PCV (%)	GCV (%)		
1	Plant height (cm)	94.73	80.18	113.28	10.11	7.52	55.41	11.54
2	Days to 50% flowering	57.78	50.66	64.33	5.91	5.69	92.69	11.28
3	Number of monopodia plant <sup>-1</sup>	1.17	0.50	1.96	30.78	30.01	95.05	60.28
4	Number of sympodia plant <sup>-1</sup>	12.83	9.33	17.06	15.90	11.40	51.36	16.83
5	Relative water content (%)	76.73	61.63	88.91	9.31	7.81	70.47	13.51
6	Specific leaf weight (mg/cm <sup>2</sup> )	4.49	2.69	6.39	21.87	17.90	67.05	30.20
7	Number of bolls plant <sup>-1</sup>	26.43	15.13	38.20	22.91	20.49	80.05	37.77
8	Boll weight (g)	3.76	3.07	4.52	9.58	8.54	79.33	15.67
9	Seed index (g)	8.80	6.99	11.71	14.35	11.32	62.23	18.39
10	Lint index (g)	5.86	4.82	7.62	11.68	8.56	53.71	12.93
11	Ginning out-turn (%)	40.05	34.17	44.92	6.30	4.36	48.02	6.23
12	2.5% span length (mm)	28.58	25.42	30.94	4.69	3.17	45.64	4.41
13	Micronaire (10 <sup>-6</sup> g/inch)	3.36	2.80	3.98	12.22	7.69	39.54	9.96
14	Bundle strength (g/tex)	22.03	20.19	24.29	5.50	3.29	35.91	4.06
15	Uniformity ratio	47.97	44.84	50.42	2.88	1.89	42.96	2.55
16	Seed cotton yield plant <sup>-1</sup> (g)	62.88	31.00	88.00	21.25	19.48	84.05	36.80
17	Lint yield plant <sup>-1</sup> (g)	25.68	11.26	37.13	26.36	18.54	49.48	26.87
18	Fibre elongation (%)	5.16	4.92	5.37	2.46	1.80	53.32	2.71

PCV = Phenotypic coefficient of variation

GCV = Genotypic coefficient of variation

uniformity ratio, and fibre elongation indicating the role of non-additive gene action and can be improved by exploiting the methods of heterosis breeding.

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