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Research Note

Genetic variabilty studies in interspecific cotton (*Gossypium* spp) hybrids

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Abstract

The genetic variability parameters for eleven yield and five fibre quality characters were investigated in 54 interspecific cotton (*G.hirsutum* × *G.barbadense*) hybrids along with their parents during *Rabi* 2012. The environmental coefficient of variation (ECV) was lower than the corresponding phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) for all the traits. The traits *viz.*, plant height, number of monopodial branches per plant, number of sympodial branches per plant, number of bolls per plant, boll weight, number of seeds per boll, seed cotton yield per plant, lint index and elongation percentage showed high values for heritability and genetic advance. High heritability with moderate genetic advance was registered for days to 50 per cent flowering, ginning percentage and fibre fineness. Seed index and 2.5 per cent span length recorded moderate genetic advance coupled with moderate heritability.

Key words
Cotton, variability, yield

Cotton, the versatile natural plant fibre with unique properties rendering it highly spinnable into yarns for textile use, is considered as "White gold" because of the potential it offers to rural economy, global trade and national GDP. Genetic enhancement is one of the important tools to improve upon the productivity in cotton. The GCV, PCV and ECV are helpful in exposing and understanding the nature of existing variability in the populations. High magnitude of variability in a population provides the opportunity for selection to evolve a variety having desirable characters (Singh *et al.*, 2007).

A survey of genetic variability with the help of suitable parameters such as genotypic coefficient of variation, heritability estimates, genetic advance are absolutely necessary to start an efficient breeding program (Atta *et al*., 2008). Important function of the heritability in the genetic study of quantitative characters is its predictive role to indicate the reliability of the phenotypic value as a guide to breeding value (Dabholkar, 1992; Falconer and Mackay, 1996). The GCV along with heritability estimates provide reliable estimates of the amount of genetic advance to be expected through phenotypic selection (Burton, 1952). Keeping in view the present investigation has been made to analyse the genetic variability among interspecific hybrids for seed cotton yield components and fibre quality traits.

Nine *G.hirsutum* genotypes *viz.,* MCU 5, MCU 7, MCU 12, TCH 1608, TCH 1705, TCH 1710, TCH 1716, TCH 1728 and TCH 1744 were used as female parents with six *G.barbadense* genotypes *viz.,* PSH, SUVIN, TNB 1, TNB 10, TNB 26 and TNB 37 as male parents in a line × tester mating design. The resultant fifty four F_1 hybrids along with their parents were evaluated in a randomized block design with three replications at Agricultural College and Research Institute, Killikulam during *Rabi* 2012 for sixteen yield and fibre quality traits. Phenotypic (PCV), genotypic (GCV) and environmental coefficients of variation (ECV) were estimated according to the method proposed by Burton (1952). The PCV and GCV ranges were classified according to the scale suggested by Sivasubramanian and Madhavamenon (1973). Heritability was estimated using formula suggested by Lush (1940) and the genetic advance under selection was estimated vide Johnson *et al*. (1955). Both heritability and genetic advance were classified based upon the scale range suggested by Johnson *et al*. (1955).

In the present investigation, the calculated PCV was slightly higher than the corresponding genotypic coefficient of variation (Table 1). In general, the differences between PCV and GCV were less for most of the traits indicating that these traits were not much influenced by the environment, thus suggesting ample scope for improvement through selection. Low values of PCV and GCV were observed for traits like days to 50 per cent flowering, ginning percentage, 2.5 per cent span length, bundle strength, fibre fineness and uniformity ratio indicating narrow range of variability for these traits, thereby restricting the scope of selection. These results are in broad agreement with the findings of Neelima and Reddy (2008) and Rao and Reddy (2001).

Moderate estimates PCV and GCV indicate diversity among the material studied depicting the possibility of improvement in the yield by further selection in segregating generations. In the present investigation, the traits *viz.,* plant height, number of sympodial branches per plant, boll weight, number of seeds per boll, lint index, seed index and elongation percentage recorded moderate PCV and GCV. The traits like number of monopodial branches per plant, number of bolls per plant and seed cotton yield per plant exhibited high PCV and GCV, which indicate that the ample scope for selection for such traits. These results are in broad agreement with findings of Rao and Reddy (2001).

High heritability alone is not enough to make efficient selection unless accompanied by substantially higher genetic advance. Genetic advance has added advantage over heritability as a guiding factor in a selection programme.

The characters plant height, number of monopodial branches per plant, number of sympodial branches per plant, number of bolls per plant, boll weight, number of seeds per boll, seed cotton yield per plant, lint index and elongation percentage showed high heritability coupled with high genetic advance. This reveals that additive gene action plays a major role for the expression of these traits and hence, simple selection in early generation will be fruitful for the improvement of these traits. This is in line with findings of Sakthi *et al*. (2007) for plant height; Neelima and Reddy (2008) for number of monopodial branches per plant; Haan *et al*. (2008) for number of sympodial branches per plant, number of bolls per plant, boll weight, seed cotton yield per plant and lint index.

High heritability with moderate genetic advance was registered by the traits like days to 50 per cent flowering, ginning percentage and fibre fineness. It indicates that additive gene action plays a major role in the inheritance of such traits thereby, suggesting the use of simple selection method for improvement of these traits. This is in conformity with the findings of Sambamurthy and Chamundeswari (2006) for fibre fineness; Haan *et al*. (2008) for ginning percentage.

Seed index and 2.5 per cent span length showed moderate genetic advance coupled with moderate heritability. This indicates the preponderance of non-additive gene action and therefore, reciprocal recurrent selection method may be utilized for the improvement of such traits. This is similar to the findings of Haan *et al*. (2008) for 2.5 per cent span length. Moderate heritability along with low genetic advance was revealed for expression of bundle strength and uniformity ratio. Recurrent selection may be a viable breeding method for this trait due to preponderance of non-additive genetic action. This is similar to the result outcomes of Neelima and Reddy (2008) for bundle strength and uniformity ratio.

To conclude, ten of the seed cotton yield components could be improved by simple selection method due to the preponderance of additive gene effects for the traits, while, seed index could be improved by reciprocal recurrent selection due to the role of non additive gene effects. Among the five fibre quality traits, elongation percentage and fibre fineness could be improved by simple selection method and 2.5 per cent span length could be improved by reciprocal recurrent selection, whereas bundle strength and uniformity ratio could be improved by recurrent selection due to the preponderance of non additive gene effects. The key seed cotton yield components and fibre quality traits studied in this study could be used for breeding and other future crop improvement programmes in cotton.

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References

Atta, B. M., Haq, M.A and Shah, T. M. 2008. Variation and inter relationships of quantitative traits in chickpea (*Cicer arietinum* L.). *Pak. J. Bot.,* **40**(2): 637 - 647.

Burton, G. W. 1952. *Quantitative inheritance in grasses*. Proc.6th. Intl. Grassland Congr., 1: 277 - 283.

Dabholkar, A. R. 1992. *Elements of biometrical genetics*. Concept Publishing Company, New Delhi, India.

Falconer, D. S. and Mackay, T. F. C. 1996. *Introduction to quantitative genetics*. 4th Edn., Benjamin Cummings, England.

Haan, T. D., Ravikesavan, R and Iyanar, K. 2008. Genetic advance and heritability as a selection index for improvement of yield and quality in cotton. *J. Cotton Res. Dev.,* **22**(1): 14 - 18.

Johnson, H. W., Robinson, H. E and Comstock, R. E. 1955. Estimates of genetic and environmental variability in soybean. *Agron. J*., **47**: 314 - 318.

Lush, J. L. 1940. Intro-sire correlation and regression of offspring on dams as a method of estimating heritability of characters. *Proc. Amer. Soc. Animal Production.,* **33**: 293 - 301.

Neelima, S. and Reddy,V. C. 2008. Genetic parameters of yield and fibre quality traits in American cotton (*Gossypium hirsutum* L.). *Indian J. Agric. Res.,* **42**(1): 67 - 70.

Rao, G. N. and Reddy, M. S. 2001. Heterosis and combining ability for yield and its components in upland cotton. *J. Indian Soc. Cotton Improv.,* **26**: 67 - 73.

Sakthi, A. R., Kumar, M. and Ravikesavan, R. 2007. Variability and association analysis using morphological and quality traits in cotton (*Gossypium hirsutum* L.). *J. Cotton Res. Dev.,* **21**(2): 148 - 152.

Sambamurthy, J. S. V. and Chamundeswari. N. 2006. Yield component analysis in introgressed lines of upland cotton (*Gossypium hirsutum* L.). *J. Cotton Res. Dev.,* **20**(1)**:** 1 - 4.

Singh, M., Kumar, K and Singh, R. P. 2007. Study of coefficient of variation, heritability and genetic advance in hybrid rice. *Oryza*, **44**(1): 160-162.

Sivasubramanian, S. and Madhavamenon, P. 1973. Genotypic and phenotypic variability in rice. *Madras Agric. J.*, **60**: 1093 - 1096.

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Table 1. Genetic parameters of yield components and fibre quality traits

Characters	GCV (%)	PCV (%)	ECV (%)	Heritability (%) (h^2)	GA (%) of mean
Days to 50 per cent flowering	5.71	6.51	3.12	77.00	10.33
Plant height (cm)	17.17	17.23	1.44	99.30	35.26
Number of monopodial branches per plant	21.62	25.53	13.56	71.77	37.74
Number of sympodial branches per plant	13.64	15.79	7.96	74.56	24.26
Number of bolls per plant	21.59	24.20	10.93	79.60	39.68
Boll weight (g)	16.23	16.69	3.91	94.50	32.50
Number of seeds per boll	15.24	19.34	11.90	62.12	24.70
Seed cotton yield per plant (g)	32.18	34.22	11.63	88.44	62.35
Ginning percentage (%)	8.16	10.08	5.90	65.66	13.63
Lint index	13.50	16.43	9.35	67.58	22.87
Seed index	10.59	13.87	8.95	58.35	16.67
2.5 per cent span length (mm)	7.12	9.53	6.34	55.82	10.96
Bundle strength (g/tex)	6.78	11.11	8.80	37.21	8.52
Fibre fineness (Mic.)	8.93	11.36	7.02	61.82	14.47
Uniformity ratio (%)	4.12	5.65	3.86	53.19	6.19
Elongation percentage (%)	12.05	12.88	4.52	87.65	23.25