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Study of variability and association analysis in *Bt* cotton hybrids

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ABSTRACT : Forty three *Bt* cotton hybrids along with two checks were evaluated to assess the correlation and association among different characters related to seed cotton yield. The information on phenotypic and genotypic coefficients of variability, heritability, genetic advance, associations and path coefficients for seed cotton yield and component traits was computed. The estimates of phenotypic coefficient of variability (PCV) were high (>20%) for boll , monopods and sympods/plant, plant height and lint yield. The low genotypic coefficient of variability (GCV) for plant height indicated more influence of environment and consequently this trait showed low heritability and genetic advance. All other traits showed high heritability and genetic advance. In general phenotypic and genotypic correlations between different characters were in agreement with each other. Significant positive association of seed cotton yield was observed with boll number, boll weight, sympods/plant and lint yield. Boll, sympods/plant and lint yield also showed positive association among themselves. The ginning outturn showed positive correlation with boll number, sympods/plant and lint yield but negative association with seed index. Partitioning of phenotypic correlation coefficients of various component characters with seed cotton yield into direct and indirect contributions revealed that boll number followed by boll weight had maximum direct effects upon seed cotton yield. Though, sympods/plant made little direct contribution to seed cotton yield but made sufficient indirect contribution *via* boll number. The contributions of traits like monopods/plant, plant height and ginning outturn was negligible. It is concluded that seed cotton yield may be improved by selection of plants having more sympods with high boll number and boll weight.

Key words: Correlations, cotton, path analysis, seed cotton yield, variability

Cotton (*Gossypium hirsutum* L.) is the most important cash crop of India and played a dominant role in the industrial and agricultural economy of the country. The *Bt* cotton has been widely adopted in developed as well as developing countries. The variability in a crop species is the basis for effective selection and is measured by phenotypic and genotypic coefficients of variation. The information on heritability and genetic advance for different traits in a population is a pre requisite to start any plant improvement programme. The efficiency of selection procedures will increase if the nature of interrelationships among component characters and seed cotton yield is understood. Path coefficient analysis helps to resolve these correlations into direct and indirect contributions of different component characters towards yield and thus unravels the causes of apparent correlations. The present investigation was attempted to study the correlation and causation among different characters related to seed cotton yield in *Bt* cotton hybrids of upland cotton.

The experimental material consisting of 43 *Bt* cotton hybrids along with two standard checks *viz*. RCH 134 *Bt* and LH 2076 of *Gossypium hirsutum* was grown in randomized block design with three replications at the Experimental Area, Punjab Agricultural University, Regional Research Station, Bathinda during *kharif* 2008-2009. Five rows of 6.0 m length of each genotype/replication were grown and the plants were spaced 67.5 cm between the rows and 75 cm within rows. The data were recorded on individual plant basis in each row for seed cotton yield (g), boll number, boll weight(g), monopods and sympods/plant, plant height(cm), ginning outturn (%), lint yield (g) and seed index (g). Analysis of variance for all characters was carried out to test the significance of differences among genotypes for different characters. Phenotypic and genotypic coefficients of variability, heritability and genetic advance along with phenotypic and genotypic correlations between characters were worked out from the means of different characters. The significance of phenotypic correlation coefficients was tested against table values at n 2 degree of freedom. The path coefficient analysis was performed using phenotypic correlation coefficients.

The estimates of phenotypic and genotypic coefficients of variability (PCV and GCV) along

Table 1. Estimates of phenotypic and genotypic coefficient of variability, heritability and genetic advance in upland cotton.

Character	Phenotypic coefficient of variability (%)	Genotypic coefficient ofvariability (%)	Heritability (%)	Genetic advance (%)
Seed cotton yield	19.55	17.32	78.55	31.63
Boll number	24.94	22.72	83.02	42.64
Boll weight	12.45	11.07	79.31	20.28
Monopods/plant	39.16	35.16	80.63	65.04
Sympods/plant	23.01	16.82	53.40	25.32
Plant height	73.01	13.52	3.43	5.15
Ginning Outturn	5.66	4.94	76.33	8.90
Lint yield	20.74	18.55	80.02	34.18
Seed index	10.70	9.38	76.82	16.93

with heritability and genetic advance for different characters are given in Table 1. The estimates of phenotypic coefficients of variability (PCV) were high (>20%) for boll number, monopods/plant, sympods/plant, plant height and lint yield. The estimates of genotypic coefficients of variability were high for boll number and monopods/plant. High GCV value for boll number and monopods/plant indicated that variability for these characters is of heritable nature and selection for these traits would be effective. In the contrast plant height had very low genotypic coefficient of variability indicating more influence of the environment and consequently this trait had low heritability and genetic advance. The heritability estimates were of high magnitude for other traits. The estimates of genetic advance were high for seed cotton yield, boll number, monopods/plant and lint yield. High heritability coupled with genetic advance for seed cotton yield was also reported by Sakthi *et al.*, (2007).

Phenotypic and genotypic correlations

Table 2. Phenotypic (above diagonal) and genotypic (below diagonal) correlations among yield components in cotton

Character	Seed cotton yield	Boll number	Boll weight	Monopods/plant	Sympods/plant	Plant height	Ginning outturn	Lint yield	Seed index
Seed cotton yield	1.000	0.513**	0.279**	-0.142	0.400**	0.158	0.027	0.956**	-0.081
Boll number	0.605	1.000	-0.166	-0.073	0.758**	-0.016	0.185*	0.536**	-0.278**
Boll weight	0.295	-0.178	1.000	-0.015	-0.106	0.178*	-0.364**	0.161	0.555**
Monopods/plant	-0.178	-0.100	-0.030	1.000	0.133	0.111	0.052	-0.118	0.108
Sympods/plant	0.510	0.965	-0.213	0.156	1.000	0.090	0.190*	0.428**	-0.099
Plant height	0.828	0.125	0.619	0.009	0.105	1.000	0.087	0.178*	0.022
Ginning outturn	0.065	0.235	-0.437	0.057	0.329	0.521	1.000	0.313**	-0.335**
Lint yield	0.957	0.632	0.158	-0.149	0.563	0.946	0.346	1.000	-0.167
Seed index	-0.141	-0.323	0.655	0.143	-0.183	0.072	-0.375	-0.226	1.000

*Significant at 5 per cent level ** Significant at 1 per cent level.

Table 3. Direct and indirect contributions of component characters to seed cotton yield in cotton

Character	Boll number	Boll weight	Monopods/plant	Sympods/plant	Plant height	Ginning outturn	Seed index	PCC with seed cotton yield
Boll number	**0.479**	-0.074	0.008	0.052	-0.002	0.006	0.044	0.513
Boll weight	-0.079	**0.447**	0.002	-0.007	0.016	-0.012	-0.088	0.279
Monopods/plant	-0.035	-0.007	**-0.104**	0.009	0.010	0.002	-0.017	-0.142
Sympods/plant	0.363	-0.047	-0.014	**0.069**	0.008	0.006	0.016	0.400
Plant height	-0.008	0.080	-0.012	0.006	**0.092**	0.003	-0.003	0.158
Ginning outturn	0.089	-0.163	-0.005	0.013	0.008	**0.033**	0.053	0.027
Seed Index	-0.133	0.249	-0.011	-0.007	0.002	-0.011	**-0.170**	-0.081

Bold are direct effects; PCC=Phenotypic Correlation Coefficient

between different characters are presented in Table 2. In general phenotypic and genotypic correlations observed between different characters were in agreement with each others. Significant positive association of seed cotton yield was observed with boll number, boll weight, sympods/plant and lint yield, which is in agreement with the studies conducted by Afiah and Ghoneim (2000); Iqbal *et al.*, (2003); Saeed *et al.*, (2004) and Anandan (2009). Seed cotton yield also showed high genotypic correlation with these traits and was found to be independent from monopods/plant, plant height, ginning outturn and seed index. Boll and sympods/plant were identified to be desirable traits as besides positively correlated with each other they also showed positive association with ginning outturn and lint yield. Lint yield of a cultivar is always proportional to its ginning outturn as indicated by significant positive association of these traits in the present study.

Partitioning of phenotypic correlation coefficients of various component characters with seed cotton yield into direct and indirect contributions (Table 3) revealed that boll number had the maximum (0.479) direct effect upon seed cotton yield followed by boll weight (0.447). Although sympods/plant did not contribute much directly, yet it contributed towards seed cotton yield indirectly *via* bolls/plant (0.363). Seed index also contributed to seed cotton yield indirectly via boll weight. Do Thi *et al.*, (2008) and Girase and Mehetre (2002) also reported that number of bolls/plant and boll weight had positive direct effect on seed cotton yield. It is concluded that seed cotton yield may be improved by selection of sympodial plants with high boll number and boll weight in the segregating populations. Considering the overall direct and indirect effects of various plant characters on yield, an ideal plant type of cotton should have more number of bolls/plant, higher boll weight and more number of sympods/plant with high seed index.

REFERENCES

Afiah, S. A. N. and Ghoneim, E. M. 2000. Correlation, stepwise and path coefficient analysis in Egyptian cotton under saline conditions. *Arab. Uni. J. Agri. Sci.* **8**: 607-18.

Anandan, A. 2009. Studies on choice of characters for breeding for seed cotton yield and fibre quality traits in cotton. *Crop. Imp.* **36**: 35-37.

Do Thi, H. A., 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** : 14-18.

Girase, V. S. and Mehetre, S. S. 2002. Correlation and path analysis in cotton. *J. Cotton Res. Dev.* **16**: 1-7.

Iqbal, M., Chag, M. A., Iqbal, M. Z., Mahmood, H., Nasir, A. and Noor, I. 2003. Correlation and path coefficient analysis of earliness and agronomic characters of upland cotton in Multan (Pakistan). *Pak. J. Agron.* **2**: 160-68.

Saeed, R., Khan, T. M., Sadaqat, H. A. and Khan, A. I. 2004. Correlation and path coefficient analysis of yield components in cotton (*Gossypium hirsutum* L). *Int. J. Agri. Biology* **6**: 686-88.

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**: 148-52.

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