Research Note
Correlation and path analysis in american cotton

J.Tulasi, Lal Ahamed M., J.S.V. Samba Murthy and Y.Ashoka Rani
Department of Genetics and Plant Breeding, Agricultural College, Bapatla-522101
E-mail: lalahamed@gmail.com

Abstract
Correlation and path coefficient analysis have been worked out for 9 quantitative characters in 40 genotypes of upland cotton at Agricultural College Farm, Bapatla, Andhra Pradesh. The correlation and path coefficient analysis together indicated that number of bolls plant^{-1}, boll weight, ginning outturn, seed index and lint index should be considered as selection indices for seed cotton yield plant^{-1} improvement programme.

Cotton (*Gossypium hirsutum* L.) occupies a prime position as fibre crop of masses of the world in general and of India in particular. The sufficient production of cotton for meeting the fibre requirements of the world's exploding population is now universally realized. Keeping in view the future needs of the country, cotton research needs to be versatile and accelerated to develop more productive cotton genotypes. For this, it is desirable for plant breeder to know the extent of relationship between yield and its various components which will facilitate him in selecting plants of desirable characteristics. Correlation coefficient analysis measures the magnitude of relationship between various plant characters and determines the component character on which selection can be based for improvement of seed cotton yield. Further, the true picture of correlation between seed cotton yield and traits is reflected from direct and indirect effects in order to perceive the most influencing characters to be utilized as selection criteria in cotton breeding programme.

The experiment was conducted during *kharif* 2010-11 in randomized block design with 40 germplasm lines obtained from all over India with three replications following spacing of 120 x 60 cm at Agricultural College Farm, Bapatla, Andhra Pradesh. The soils are black cotton type with clay texture. Recommended doses of fertilizers 90:45:45 N, P_2O_5 and K_2O kg ha^{-1} were applied in split doses. Each plot consisted of two rows of 6m length and observations were recorded on five randomly selected plants from each genotype per replication for 9 characters *viz.,* plant height (cm), number of sympodia plant^{-1}, number of monopodia plant^{-1}, number of bolls plant^{-1}, boll weight (g), seed index (g), lint index (g), ginning out-turn (%) and seed cotton yield /plant (g). The data as statistically analyzed to estimate genotypic, phenotypic correlation coefficients and path analysis using genotypic correlation coefficients

following the procedure given by Falconer (1964) and Wright (1921), respectively.

At both genotypic and phenotypic levels, seed cotton yield plant^{-1} showed significant positive association with plant height, number of monopodia plant^{-1}, number of sympodia plant^{-1}, number of bolls plant^{-1}, boll weight, ginning out-turn, seed index and lint index (Table 1). These results are in conformity with earlier works of Eswara Rao *et al.* (2009) and Mahantesh *et al.* (2010).

Plant height showed significant positive association with number of monopodia plant^{-1}, number of bolls plant^{-1} , boll weight, ginning out-turn, seed index, lint index and seed cotton yield plant^{-1} both at phenotypic and genotypic levels indicating the simultaneous improvement of these traits in the breeding programmes. These results are in conformity with Batool *et al*. (2010).

Number of monopodia plant^{-1} and number of sympodia plant^{-1} showed significant positive association with boll weight, ginning out-turn, seed index and lint index. Similar results are reported by Altaher and Singh (2003), Leela Pratap *et al.* (2007) and Shazia Salhuddin *et al.* (2010).

Number of bolls plant^{-1} and boll weight showed significant positive association with seed cotton yield plant^{-1} where as ginning out-turn significant positive association with seed cotton yield per plant both at phenotypic and genotypic levels indicating simultaneous improvement of these characters will be possible with ginning out-turn. Seed index and lint index recorded significant positive association with seed cotton yield plant^{-1}. The above results are supported by Neelima *et al.* (2005), Leela Pratap *et al.* (2007), Eswara Rao *et al.* (2009) and Vijaya Lakshmi *et al.* (2008).

The path analysis he was carried out using genotypic correlation coefficients with seed cotton yield plant^{-1}. The residual effect (0.424) indicates that the choice of characters for path analysis are appropriate. Among the characters seed index, number of bolls plant^{-1} and ginning outturn recorded high positive direct effect. The characters plant height, recorded high moderate direct effect while boll weight, number of monopodia plant^{-1} and lint index had high negative direct effect. With regard to indirect effects, all traits recorded high indirect effects via number of bolls plant^{-1}, ginning outturn and seed index and negative and moderate indirect effects via boll weight and number of sympodia plant$^{-1.}$. Hence based on path analysis, number of bolls plant^{-1}, boll weight, ginning outturn, seed index and lint index should be considered as selection indices for seed cotton yield plant^{-1} improvement programme.

References:

Altaher, A. F. and Singh, R. P. 2003. Yield component analysis in upland cotton (*Gossypium hirsutum* L.). *J. Indian Soc. Cotton Improv.,* **28**: 151-157.

Batool, S., Khan, N. U., Makhdoom, K., Bibi, Z., Hassan, G., Marwat, K.B., Farhatullah Mohammad, Raziuddin, F. and Khan, I. A. 2010. Heritability and genetic potential of upland cotton genotypes for morpho-yield traits. *Pakistan. J. Bot.,* **42**: 1057-1064.

Eswara Rao, G., Chenga Reddy, V., Lal Ahamed, M., Srinivasa Rao, V., Panduranga Rao, C. and Bali Reddy, V. 2009. Correlation and path coefficient analysis in cotton (*Gossypium hirsutum* L.). *Andhra Agric. J.,* **56**: 192-195.

Falconer, D. S. 1964. An Introduction to Quantitative Genetics, Second edition, Oliver and Boyd, Edinburgh, London, 312-324.

Leela Pratap, K., Chenga Reddy, V., Rama Kumar, P. V. and Srinivasa Rao, V. 2007. Correlation and path coefficient analyses for yield and yield component traits in cotton (*Gossypium hirsutum* L.). *Andhra Agric. J.,* **54**: 31-35.

Mahantesh, Lal Ahamed, M., Panduranga Rao, C. and Samba Murthy, J. S. V. 2010. Character association and path coefficient analysis in upland cotton (*Gossypium hirsutum* L.). *Andhra Agric. J.,* **57:**230-233.

Neelima, S. Chenga Reddy, V. and Narisireddy, A. 2005. Association and path analysis in American cotton (*Gossypium hirsutum* L.). *J. Indian Soc. Cotton Improv.,* **30**: 53-58.

Shazia Salahuddin, Saifullah Abro, M.M., Kandhro, L., Salahuddin. and Laghari, S. 2010. Correlation and path coefficient analysis of yield components of upland cotton (*Gossypium hirsutum* L.). *World Appl. Sci. J.,* **8**: 71-75.

Vijaya Lakshmi, G., Chenga Reddy, V., Panduranga Rao, C., Satish Babu, J. and Srinivasulu, R. 2008. Character association and path coefficient analysis in cotton (*Gossypium hirsutum* L.). *Andhra Agric. J.,* **55**: 156-160.

Wright, S. 1921. Correlation and causation. *J. Agric. Res.,* **20**: 557-585

Table 1. Phenotypic and genotypic correlations of 9 characters in 40 cotton (*Gossypium hirsutum* L.) **genotypes**

Character		No.of monopodia plant^{-1}	No.of sympodia plant^{-1}	No.of bolls plant^{-1}	Boll weight (g)	Ginning out-turn (%)	Seed index (g)	Lint index (g)	Seed cotton yield plant^{-1} (g)
Plant height (cm)	P	-0.4248**	0.2458**	0.3935**	0.4289**	0.2958**	0.4207**	0.3700**	0.4920**
	G	0.4948**	0.5711	0.9120**	0.8501**	0.5269**	0.6127**	0.5553**	0.8226**
No.of monopodia plant^{-1}	P		0.2488**	0.2375**	0.2592**	0.3902**	0.3281**	0.3345**	0.1964*
	G		0.4206**	0.3614**	0.3077**	0.4928**	0.4005**	0.3932**	0.2993**
No.of sympodia plant^{-1}	P			0.1056	0.4558**	0.2500**	0.2513**	0.3038**	0.2109*
	G			0.5655**	0.7664**	0.4877**	0.6425**	0.5951**	0.4609**
No. of bolls plant^{-1}	P				0.2232*	0.3094**	0.2529**	0.0936	0.5831**
	G				0.6305**	0.5208**	0.3682**	0.2218*	0.9504**
Boll weight (g)	P					0.3478**	0.2735**	0.3281**	0.3568**
	G					0.6055**	0.5026**	0.4534*?*	0.5321**
Ginning out-turn (%)	P						0.1872*	0.3289**	0.2365**
	G	-					0.2037*	0.5886**	0.4755**
Seed index (g)	P							0.4730**	0.4411**
	G							0.6349**	0.6910**
Lint index (g)	P								0.2167*
	G								0.3813**

*=Significant at 5%level   **=Significant at 1%level

Table 2. Direct and indirect effects of yield components on seed cotton yield in 40 genotypes of cotton (*Gossypium hirsutum* L.).

	Plant height (cm)	No.of monopodia plant^{-1}	No.of sympodia plant^{-1}	No.of bolls plant^{-1}	Boll weight (g)	Ginning out-turn (%)	Seed index (g)	Lint index (g)	Genotypic correlation with Seed cotton yield plant^{-1} (g)
Plant height (cm)	0.376	-0.192	-0.061	0.587	-0.545	0.331	0.550	-0.224	0.823**
No.of monopodia plant^{-1}	0.186	-0.388	-0.045	0.233	-0.197	0.309	0.359	-0.158	0.299**
No.of sympodia plant^{-1}	0.215	-0.163	-0.107	0.364	-0.491	0.306	0.576	-0.240	0.461**
No.of bolls plant^{-1}	0.343	-0.140	-0.060	0.644	-0.404	0.327	0.330	-0.089	0.950**
Boll weight (g)	0.320	-0.119	-0.082	0.406	-0.641	0.380	0.451	-0.183	0.532**
Ginning out-turn (%)	0.198	-0.191	-0.052	0.335	-0.388	0.627	0.183	-0.237	0.476**
Seed index (g)	0.230	-0.155	-0.068	0.237	-0.322	0.128	0.897	-0.256	0.691**
Lint index (g)	0.209	-0.152	-0.063	0.143	-0.291	0.369	0.570	-0.403	0.381**

Residual effect= 0.424