



## Character Association and Path Analyses in American cotton (*Gossypium hirsutum* L.)

**Key words :** Cotton, Character Association, Path Analyses

Improvement in yield and its components depends on nature and magnitude of genetic variability available in the material. Correlation of characters is a measure of strength relationship between group of characters. Hence, the present study was taken up to elicit information on variability, character association and path analysis for yield and fiber quality in upland cotton (*Gossypium hirsutum* L.). Thirty genotypes of diverse origin from different centers under TMC MM 1.2 project were sown in a randomized block design with three replications during *kharif* 2004-2005 at Regional Agricultural Research Station, Lam, Guntur. Each entry was sown in 2 rows of 6 m length, with row to row spacing of 120 cm and plant to plant spacing of 60 cm. Observations were recorded on five competitive plants per genotype per replication on number of monopodia, number of sympodia, number of bolls, 2.5 per cent span length (mm), uniformity ratio, micronaire (10-6 g/inch), strength (g/tex), boll weight (g), and seed cotton yield (kg/ha) were recorded on plot basis. The genotypic and phenotypic coefficients of variation as per Burton and Devane (1953), heritability as per Hanson et al, 1956 and genetic advance as per Allard, 1960 were estimated. Genotypic and phenotypic correlation coefficients as per Miller et al, 1958 and path coefficient analysis as per Dewey and Lu, 1959 were performed.

Significance genotypic differences were noticed among the genotypes for all the characters studied. The estimates of phenotypic coefficient of variation (PCV) were greater than the estimates of genotypic coefficient of variation (GCV) for all the characters (Table 1). The GCV estimates were close to PCV in the case of 2.5 per cent span length and uniformity ratio indicating that there is ample scope for improvement of these traits through selection. Wide differences were observed between GCV and PCV estimates for micronaire, strength, boll weight, number of monopodia, number of sympodia, number of bolls and seed cotton yield suggesting that these characters were highly influenced by environment. Similar results were reported by Dedaniya and Pethani (1994). The genetic advance as percentage of mean ranged from 1.904 (uniformity ra-

tio) to 18.967 (number of monopodia). High heritability estimates were recorded for 2.5% span length indicating lesser influence of environment. Fiber strength, number of sympodia and seed cotton yield showed low heritability values and were highly influenced by environmental fluctuations.

Selection for characters with high heritability and high genetic advance will lead to fruitful gains (Johnson et al., 1955) as in case of 2.5 per cent span length (mm). Low heritability and low genetic advance as in the case of strength, number of sympodia, number of bolls and seed cotton yield indicated the greater influence of environment. Thus, it indicated that selection for yield component characters may result in simultaneous improvement for yield as observed by Gururajan (2000).

Correlation studies (Table 2) revealed that the genotypic correlation estimates were larger than the phenotypic estimates indicating high proneness to environmental fluctuations. The character 2.5 % span length recorded high significant positive correlation with strength and boll weight and high negative significant correlation with uniformity ratio and micronaire. Seed cotton yield showed significant positive association with micronaire and number of bolls per plant as also reported by Muthu et al (2004).

Partition of the correlation coefficient estimates into direct and indirect effects through path analysis showed that direct positive effect of various component characters resulted in positive correlation and direct negative effects showed a low and non-significant correlation with yield. The characters 2.5% span length, micronaire and number of bolls per plant had direct positive effect on yield and direct selection can be made for these traits (Table 3). In the present study, all these characters showed considerable direct positive or negative effects. The character boll number was having highest direct effect on yield and it was confirmed by its significant positive correlation with yield. From this it was observed that due weightage should be given to boll number towards positive side, while exercising selection for yield improvement. The high residual effect indicated the inadequacy of the characters chosen for path analysis.

Table 1. Estimates of mean, range, variability, heritability and genetic advance for different characters in Cotton (*Gossypium hirsutum* L.)

Character	Mean	Range		GCV	PCV	Heritability	GA (as % of mean)
		Min	Max				
2.5 per cent span length (mm)	27.02	24.04	32.76	7.19	8.30	0.75	12.82
Uniformity ratio	48.62	46.53	51.13	1.903	3.92	0.24	1.91
Micronaire (10 <sup>-6</sup> g/inch)	3.68	2.70	4.46	9.35	14.07	0.44	12.80
Strength (g/tex)	21.48	19.47	23.83	2.95	8.12	0.13	2.21
Boll weight (g)	3.99	3.30	4.63	7.74	13.03	0.34	9.27
No of monopodia	1.92	0.89	2.57	16.88	30.96	0.30	18.97
No of sympodia	18.01	14.53	21.10	5.70	14.99	0.15	4.46
No of bolls	49.44	40.87	57.53	6.87	13.72	0.25	7.09
Yield (kg/ha)	1669.50	1284.00	2128.33	7.29	18.17	0.16	6.02

Table 2. Genotypic (G) and Phenotypic (P) correlations between seed cotton yield and component characters in Cotton (*Gossypium hirsutum* L.)

Character		2.5 per cent span length	Uniformity ratio	Micronaire	Strength	Boll weight / plant	Monopodia / plant	Sympodia / plant	Bolls / plant
Uniformity ratio	G	-0.727**							
	P	-0.473**							
Micronaire	G	-0.268*	0.343**						
	P	-0.287**	0.235*						
Strength	G	0.976**	-0.670**	-0.454**					
	P	0.433**	-0.130	-0.418**					
Boll weight	G	0.452**	-0.661**	0.369**	0.219*				
	P	0.265*	0.010	0.090	0.108				
Monopodia / plant	G	-0.256*	0.567**	0.351**	0.185	-0.095			
	P	-0.097	0.219*	0.289**	-0.171	-0.151			
Sympodia / plant	G	-0.220*	0.421**	-0.822**	0.421**	-0.336**	0.104		
	P	-0.005	0.006	-0.129	0.144	-0.212*	0.071		
Bolls / plant	G	-0.107	0.151	-0.041	-0.667**	-0.238*	0.107	0.424**	
	P	-0.018	-0.065	-0.158	-0.022	-0.015	0.029	0.045	
Yield	G	0.144	-0.057	0.425**	-0.264*	-0.132	0.092	-0.099	0.695**
	P	0.066	0.030	0.108	-0.139	0.072	-0.073	-0.186	0.021

Table 3. Direct (Bold) and indirect effects of different characters on yield in American cotton *Gossypium hirsutum* L.)

Character	2.5 per cent span length	Uniformity ratio	Micronaire	Strength	Boll weight	Monopodia / plant	Sympodia / plant	Bolls / plant
2.5 per cent span length	<b>0.211</b>	-0.099	-0.060	0.091	0.056	-0.021	-0.001	-0.004
Uniformity ratio	-0.054	<b>0.114</b>	0.027	-0.015	0.001	0.025	0.000	-0.007
Micronaire	-0.024	0.020	<b>0.085</b>	-0.036	0.008	0.025	-0.011	-0.013
Strength	-0.078	0.023	0.075	<b>-0.180</b>	-0.020	0.031	-0.026	0.004
Boll weight	-0.000	0.000	0.000	0.000	<b>0.000</b>	0.000	0.000	0.000
Monopodia / plant	0.012	-0.027	-0.036	0.021	0.019	<b>-0.123</b>	-0.009	-0.004
Sympodia / plant	0.001	-0.001	0.018	-0.020	0.030	-0.010	<b>-0.140</b>	-0.006
Bolls / plant	0.000	-0.001	-0.002	-0.000	-0.000	0.000	0.000	<b>0.310</b>
Correlation with Yield	0.144	-0.057	0.425**	-0.264*	-0.132	0.092	-0.099	0.695**

\*, \*\* = Significant at 0.05 and 0.01 levels of probability

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