

Genetic Variability, Correlation and Path Analyses for Yield and Fibre Characters in Cotton (*Gossypium hirsutum* L.).

Key words : Cotton, Correlation, Path Analysis

Cotton (*Gossypium hirsutum* L.) is an important fibre crop of India which is cultivated in 9.5 m.ha with a production of more than 30 million bales. Correlation and path analyses studies provide useful information regarding selection of parents based on the character association and their direct and indirect effects on yield. The present investigation was carried out to study variability, correlations and path analyses of yield and fibre properties in 63 cotton genotypes.

The present investigation was carried on 63 cotton genotypes at Regional Agricultural Research Station, Lam, Guntur during *kharif* 2005, in randomized complete block design with 3 replications. Each genotype was sown in two rows of 6 m length with inter- and intra-row spacing of 120x60 cm in black cotton soil. Data were recorded on ten randomly selected plants or on plant basis per genotype per replication on characters *viz.*, plant height, number of monopodia, number of sympodia, number of bolls plant⁻¹, boll weight, fibre length, fibre strength, micronaire, uniformity and yield. The genotype means were considered for estimation of genotypic and phenotypic coefficient of variation (GCV and PCV), heritability (broad sense) and genetic advance as per Burton (1952) and Allard

(1960). The correlations as per Falconer (1964) and path analysis as per Dewey and Lu (1959) were estimated.

Analysis of variance indicated significant difference for all the character studied. The treatment differences are highly significant for plant height, number of sympodia, number of bolls plant⁻¹, boll weight, fibre length, fibre strength, uniformity ratio and yield.

The values of genetic and phenotypic variance ranged from 0.38 to 0.40 in boll weight and 115034.20 to 126547.60 in yield. The characters with high magnitude of phenotypic and genotypic variances had high GCV and PCV. The PCV values for characters *viz.*, yield, number of bolls plant⁻¹, plant height, micronaire and number of sympodia were much higher than GCV value indicating that these characters interacted with environment to greater extent. High heritability with high genetic advance was observed in characters fibre length, boll weight, uniformity and yield indicating prevalence of additive gene action. Whereas the characters like, micronaire, number of boll plant⁻¹, number of monopodia and plant height had low heritability with low genetic advance indicating prevalence of non-additive gene action (Table 1).

Table 1. Components of variance for yield and fibre characters in cotton.

Character	Phenotypic variance	Genotypic variance	PCV	GCV	Heritability	GA	GA as per cent of mean
Plant height (cm)	464.10	323.30	14.41	12.02	0.696	0.91	20.68
No.of monopodia	0.42	0.24	28.72	21.83	0.577	0.77	34.18
No.of sympodia	10.13	6.24	16.51	12.96	0.615	4.03	20.95
No.of bolls plant ⁻¹	106.37	57.44	21.77	16.00	0.540	11.47	24.22
Boll weight(g)	0.40	0.38	14.08	13.61	0.93	1.23	27.11
Fibre length(cm)	5.76	5.50	8.63	8.43	0.95	4.72	16.98
Fibre strength(g tex ⁻¹)	3.05	2.64	7.77	7.23	0.86	3.11	13.86
Micronaire	0.32	0.038	14.71	5.02	0.1167	0.13	3.53
Uniformity	12.33	11.36	7.29	7.00	0.92	6.66	13.84
Yeild	126547.60	115034.20	25.64	24.44	666.14	48.01	

Selection intensity at 5% GA = Genetic advance

Table 2. Estimation of phenotypic and genotypic correlation coefficients among yield and yield components in cotton (*Gossypium hirsutum* L.).

Character	Plant height (cm)	Monopodia	Sympodia	Bolls plant ⁻¹	Boll weight (g)	Fibre length (cm)	Fibre strength	Micronaire	Uniformity	Yield
Plant height(cm)	1.0000 (1.0000)	-0.1798* (-0.2521)	0.3519*** (0.4321)	0.3624*** (0.4780)	0.1339 (0.1682)	-0.2703** (-0.3252)	-0.2608** (-0.3183)	0.0390 (0.4797)	0.2050* (0.2597)	0.2478*** (0.3129)
Monopodia	-0.1798* (-0.2521)	1.0000 (1.0000)	-0.0865 (-0.0590)	0.1663 (0.3395)	-0.0137 (-0.0027)	-0.0213 (-0.0492)	0.0412 (0.0658)	0.0345 (-0.2983)	-0.0367 (-0.0758)	0.1585 (0.1852)
Sympodia	0.3519*** (0.4321)	-0.0865 (-0.0590)	1.0000 (1.0000)	0.3577*** (0.5636)	0.1063 (0.1174)	-0.1760* (-0.2323)	-0.1053 (-0.1782)	-0.0780 (0.0884)	0.1075 (0.1746)	0.2636** (0.3501)
Bolls plant ⁻¹	0.3624*** (0.4780)	0.1663 (0.3395)	0.3577*** (0.5636)	1.0000 (1.0000)	0.0962 (0.1742)	-0.1210 (-0.2082)	-0.0647 (-0.1525)	0.0282 (0.0093)	0.2032 (0.2443)	0.3649*** (0.5520)
Boll weight(g)	0.1339 (0.1682)	-0.0137 (-0.0027)	0.1063 (0.1174)	0.0962 (0.1742)	1.0000 (1.0000)	0.0344 (0.0456)	0.1325 (0.1437)	-0.1286 (-0.3740)	0.0192 (0.0122)	0.1705 (0.1700)
Fibre length (cm)	-0.2703** (-0.3252)	-0.0213 (-0.0492)	-0.1760* (-0.2323)	-0.1210 (-0.2082)	0.0344 (0.0456)	1.0000 (1.0000)	0.8183*** (0.9284)	-0.2507** (-0.7093)	-0.5731*** (-0.5973)	-0.0508 (-0.0517)
Fibre strength	-0.2608** (-0.3183)	0.0412 (0.0658)	-0.1053 (-0.1782)	-0.0647 (-0.1525)	0.1325 (0.1437)	0.8183*** (0.9284)	1.0000 (1.0000)	-0.2139* (-0.7463)	-0.5467*** (-0.6196)	-0.0041 (-0.0112)
Micronaire	0.0390 (0.4797)	0.0345 (-0.2983)	-0.0780 (0.0884)	0.0282 (0.0093)	-0.1286 (-0.3740)	-0.2507** (-0.7093)	-0.2139* (-0.7463)	1.0000 (1.0000)	0.2420** (0.4169)	-0.0945 (-0.4684)
Uniformity	0.2050* (0.2597)	-0.0367 (-0.0758)	0.1075 (0.1746)	0.2032* (0.2443)	0.0192 (0.0122)	-0.5731*** (-0.5973)	-0.5467*** (-0.6196)	0.2420** (0.4169)	1.0000 (1.0000)	-0.0179 (-0.0262)

Values in parantheses indicate genotypic correlation coefficients
 *, **, *** = Significance at 0.05, 0.01 and 0.001 levels, respectively

Table 3. Estimation of (genotypic) direct and indirect effects of yield components an yield in cotton (*Gossypium hirsutum* L.)

Character	Plant height (cm)	Monopodia plant ⁻¹	Sympodia plant ⁻¹	Bolls plant ⁻¹	Boll weight (g)	Fibre length (cm)	Fibre strength	Micronaire	Uniformity
Plant height(cm)	1.0348	-0.2609	0.4472	0.4947	0.1741	-0.3365	-0.3294	0.4965	0.2688
Monopodia	0.1187	-0.4708	0.0278	-0.1598	0.0013	0.0232	-0.0310	0.1404	0.0357
Sympodia	-0.1259	0.0172	-0.2914	-0.1642	-0.0342	0.0677	0.0519	-0.0258	-0.0509
Bolls plant ⁻¹	0.1436	0.1020	0.1693	0.3005	0.0523	-0.0626	-0.0458	0.0028	0.0734
Boll weight(g)	-0.1387	0.0022	-0.0968	-0.1436	-0.8246	-0.0376	-0.1185	0.3084	-0.0101
Fibre length (cm)	0.4279	0.0647	0.3057	0.2740	-0.0600	-1.3160	-1.2219	0.9334	0.7861
Fibre strength	0.1076	-0.0222	0.0602	0.0515	-0.0486	-0.3138	-0.3380	0.2522	0.2094
Micronaire	-0.1720	0.7287	-0.2160	-0.0228	0.9136	1.7327	1.8231	-2.4429	-1.0184
Uniformity	-0.0832	0.0243	-0.0559	-0.0782	-0.0039	0.1913	0.1984	-0.1335	-0.3202
Genotypic correlation with yield	0.3129	0.1852	0.3501	0.5520	0.1700	-0.0517	-0.0112	-0.4684	-0.0262

Diagonal and bold values indicate direct effects.

The positive phenotypic and genotypic correlations of yield with plant height, number of monopodia, number of sympodia, number of bolls plant⁻¹ and boll weight indicating that improvement in these characters will ultimately result in improvement of seed cotton yield in agreement with Yadava *et al.*, (2000).

The path coefficient analysis (Table 3) indicated that plant height, number of monopodia, number of sympodia, number of bolls plant⁻¹ and boll weight exerted direct positive effect on yield. The results suggested that number of bolls plant⁻¹, number of sympodial branches and plant height could be very effective in improvement of yield plant⁻¹. Where as fibre length, fibre strength, micronaire and uniformity were found to have direct negative effect on yield. Thus based on the above results much importance would be given to number of bolls plant⁻¹, boll weight and number of sympodial branches plant⁻¹ to improve the yield in cotton.

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