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Character Association and Path Coefficient Analyses in Upland Cotton (*Gossypium hirsutum* L.)

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ABSTRACT

Phenotypic and genotypic correlation coefficients and path coefficients were worked out in 48 intra-hirsutum hybrids of upland cotton. Significant positive association of days to 50% flowering, number of sympodia plant^{-1}, number of bolls plant^{-1}, seed index, lint index and lint yield plant^{-1} with seed cotton yield plant^{-1} was observed from correlation studies. Path analysis indicated that number of bolls plant^{-1} and lint yield plant^{-1} exhibited high direct positive effect on seed cotton yield plant^{-1}.

Key words : Correlation Coefficients, Cotton, Path Coefficients

Cotton, also known as "king of fibres", occupies a pre-eminent place among cash crops. Improvement of component characters could lead to improvement in seed cotton yield. Thus, the present investigation to study association, direct and indirect effects of component characters on seed cotton yield in 48 hybrids of cotton along with four checks.

MATERIAL AND METHODS

Forty eight hybrids of upland cotton developed from line × tester crossing (8 lines × 6 testers) along with four standard check hybrids were taken as material for the present study. The 52 hybrids were grown in randomized block design with two replications during kharif 2008-09 at Agricultural College Farm, Bapatla. Each genotype was raised in three rows each of 4.2 m length with inter- and intra-row spacing of 120cm × 60cm. Biometrical observations were recorded on plot basis or on 10 randomly selected plants in each genotype in each replication for plant height, days to 50% flowering, number of monopodia plant^{-1}, number of sympodia plant^{-1}, number of bolls plant^{-1}, boll weight, seed index, lint index, ginning out-turn, 2.5% span length, micronaire value, bundle strength, uniformity ratio, fibre elongation, lint yield plant^{-1} and seed cotton yield plant^{-1}.

Analysis of variance was done as suggested by Panse and Sukhatme (1978). The genotypic and phenotypic correlation coefficients were computed as per Falconer (1964). The path coefficient analysis was worked out as per Dewey and Lu (1959).

RESULTS AND DISCUSSION

The analysis of variance indicated significant differences among the genotypes for all characters. All the traits showed the higher magnitude of genotypic correlations than phenotypic correlations (Table 1) indicating strong inherent association between characters, which was truly reflected in phenotypic expression.

Seed cotton yield was significantly and positively correlated with days to 50% flowering, number of monopodia plant^{-1}, number of sympodia plant^{-1}, number of bolls plant^{-1}, seed index, lint index and lint yield plant^{-1}. Similar results were reported by Sambamurthy *et al.,* (2006) and Vijayalaxmi *et al.,* (2008). Days to 50% flowering was found to be significantly and positively correlated with seed cotton yield.

The positive correlation of bolls plant^{-1} and lint yield plant^{-1} with seed cotton yield plant^{-1} was mainly due to high direct effect of bolls plant^{-1} and lint yield (Table 2 and 3), is in accordance with Vijayalaxmi *et al.,* (2008). Sympodia plant^{-1} had not only a direct effect on seed cotton yield plant^{-1} but also showed high indirect positive effect through bolls plant^{-1}. Mandloi *et al.,* (1998) reported similar association in coloured cotton. Number of monopodia, boll weight, seed index, 2.5% span length, micronaire value, uniformity ratio and fibre elongation showed low direct effects on seed cotton yield plant^{-1}. But all these traits showed considerable positive indirect effect *via* bolls plant^{-1} and lint yield plant^{-1} which is in conformity with Sumathi and Nadarajan (1995) and Mandloi *et al.,* (1998).

Table 1. Phenotypic (above diagonal) and genotypic (below diagonal) correlations of 16 characters in 52 hybrids of cotton (*Gossypium hirsutum* L.)

Character	Plant height	Days to 50% flowering	No. of monopodia plant^{-1}	No. of sympodia plant^{-1}	No. of bolls plant^{-1}	Boll weight	Seed index	Lint index	Ginning out-turn (%)	2.5% span length	Micronaire (10^{-6} g / inch)	Bundle strength (g / tex)	Uniformity ratio (%)	Fibre elongation (%)	Lint yield plant^{-1}	Seed cotton plant^{-1}
Plant height	—	0.20*	0.07	0.25*	0.17	-0.10	0.30**	0.35**	0.02	-0.03	-0.18	0.11	-0.08	0.16	0.12	0.12
Days to 50% flowering	0.28**	—	0.61**	0.38**	0.42**	-0.19	0.30**	0.27**	-0.10	0.07	-0.25**	0.05	-0.13	0.02	0.29**	0.32 **
No. of monopodia plant^{-1}	0.13	0.64**	—	0.37**	0.40**	-0.16	0.34**	0.33**	0.05	-0.07	-0.26**	-0.06	-0.24*	-0.06	0.32**	0.32**
No. of sympodia plant^{-1}	0.50**	0.56**	0.48**	—	0.90**	-0.34**	0.50**	0.56**	0.03	-0.04	-0.16	0.05	-0.13	0.01	0.76**	0.77**
No. of bolls plant^{-1}	0.33**	0.62**	0.49**	0.91**	—	-0.28**	0.53**	0.57**	0.00	0.01	-0.08	-0.00	-0.05	-0.08	0.86**	0.88**
Boll weight	-0.15	-0.26*	-0.18	-0.22*	-0.18	—	-0.15	-0.15	-0.07	0.17	-0.01	0.21*	-0.04	0.25*	0.14	0.15
Seed index	0.36**	0.39**	0.40**	0.86**	0.82**	-0.18	—	0.94**	-0.07	0.02	-0.23*	-0.07	-0.10	-0.06	0.43**	0.46**
Lint index	0.39**	0.33**	0.37**	0.84**	0.78**	-0.17	0.95**	—	0.17	-0.16	-0.19*	-0.05	-0.06	-0.04	0.52**	0.50**
Ginning out-turn (%)	0.02	-0.18**	0.01	0.01	-0.01	-0.07	-0.05	0.21*	—	-0.82**	0.13	-0.28**	0.11	-0.24*	0.18	-0.02
2.5% span length	-0.02	0.15	-0.04	0.03	0.09	0.18	0.00	-0.19*	-0.85**	—	-0.04	0.33**	-0.11	0.28**	-0.09	0.08
Micronaire (10^{-6} g / inch)	-0.16	-0.33**	-0.31**	-0.34**	-0.18	0.02	-0.35**	-0.26**	0.22**	-0.08	—	-0.22 *	0.42**	-0.20*	-0.05	-0.07
Bundle strength (g / tex)	0.18	0.34**	0.08	0.04	-0.11	0.60**	0.19	0.06	-0.53**	0.55**	-0.42**	—	-0.19	0.87**	0.05	0.10
Uniformity ratio (%)	-0.13	-0.07	-0.24*	-0.21*	-0.07	-0.01	-0.13	-0.08	0.18	-0.21*	0.58**	-0.41**	—	-0.21*	-0.04	-0.06
Fibre elongation (%)	0.41**	0.22*	0.05	0.07	-0.18	0.52**	0.16	0.12	-0.34*	0.33**	-0.31**	0.95**	-0.36**	—	-0.00	0.03
Lint yield plant^{-1}	0.24*	0.40**	0.39**	0.68**	0.81**	0.42**	0.68**	0.71**	0.17	-0.02	-0.12	0.02	-0.05	-0.00	—	0.97**
Seed cotton yield plant^{-1}	0.25*	0.47**	0.40**	0.70**	0.83**	0.42**	0.71**	0.68**	-0.04	0.18	-0.16	0.11	-0.08	0.04	0.97**	—

*, ** = Significant at 5% and 1% levels of probability, respectively.

Table 2. Direct and indirect effects (genotypic) of yield components on seed cotton yield per plant in 52 hybrids of cotton (*Gossypium hirsutum* L.)

Character	Plant height	Days to 50% flowering	No. of monopodia plant^{-1}	No. of sympodia plant^{-1}	No. of bolls plant^{-1}	Boll weight	Seed index	Lint index	Ginning out-turn (%)	2.5% span length	Micronaire (10^{-6} g / inch)	Bundle strength (g / tex)	Uniformity ratio (%)	Fibre elongation (%)	Lint yield plant^{-1}	Correlation with SCYP
Plant height	**0.0164**	-0.0303	0.0053	-0.085	0.1631	-0.0061	-0.1462	0.1340	-0.0075	0.0010	0.0040	0.0225	-0.0045	-0.0065	0.1912	**0.2514***
Days to 50% flowering	0.0048	**-0.1046**	0.0253	-0.0958	0.3048	-0.0104	-0.1596	0.1128	0.0479	-0.0062	0.0078	0.0426	-0.0024	-0.0035	0.3147	**0.4781****
No. of monopodia plant^{-1}	0.0022	-0.0680	**0.0389**	-0.0816	0.2444	-0.0075	-0.1632	0.1258	-0.0044	0.0017	0.0073	0.0107	-0.0081	-0.0008	0.3042	**0.4016****
No. of sympodia plant^{-1}	0.0082	-0.0590	0.0187	**-0.1699**	0.4514	-0.0089	-0.3475	0.2837	-0.0041	-0.0015	0.0081	0.0059	-0.0072	-0.0012	0.5262	**0.7030****
No. of bolls plant^{-1}	0.0055	-0.0649	0.0193	-0.1562	**0.4911**	-0.0072	-0.3300	0.2629	0.0046	-0.0038	0.0042	-0.0139	-0.0025	0.0030	0.6267	**0.8389****
Boll weight	-0.0025	0.0273	-0.0074	0.0381	-0.0891	**0.0399**	0.0745	-0.0584	0.0191	-0.0078	-0.0006	0.0744	-0.0004	-0.0082	0.3274	**0.4262****
Seed index	0.0060	-0.0415	0.0158	-0.1467	0.4028	-0.0074	**-0.4023**	0.3230	0.0142	-0.0004	0.0084	0.0236	-0.0044	-0.0026	0.5269	**0.7152****
Lint index	0.0065	-0.0350	0.0145	-0.1431	0.3833	-0.0069	-0.3856	**0.3370**	-0.0571	0.0080	0.0062	0.0082	-0.0029	-0.0019	0.5550	**0.6862****
Ginning out-turn(%)	0.0005	0.0192	0.0007	-0.0027	-0.0087	-0.0029	0.0218	0.0736	**-0.2615**	0.0352	-0.0054	-0.0659	0.0060	0.0055	0.1385	**-0.0461**
2.5% span length	-0.0004	-0.0159	-0.0016	-0.0061	0.0449	0.0076	-0.0039	-0.0657	0.2234	**-0.0412**	0.0021	0.0686	-0.0070	-0.0053	-0.0193	**0.1801**
Micronaire (10^{-6} g/inch)	-0.0028	0.0348	-0.0122	0.0584	-0.0887	0.0010	0.1438	-0.0893	-0.0599	0.0037	**-0.0235**	-0.0532	0.0194	0.0049	-0.0987	**-0.1621**
Bundle strength (g/tex)	0.0030	-0.0360	0.0034	-0.0081	-0.0552	0.0240	-0.0769	0.0224	0.1393	-0.0228	0.0101	**0.1237**	-0.0136	-0.0150	0.0162	**0.1145**
Uniformity ratio(%)	-0.0022	0.0077	-0.0096	0.0368	-0.0368	-0.0004	0.0537	-0.0296	-0.0472	0.0087	-0.0138	-0.0508	**0.0330**	0.0057	-0.0438	**-0.0886**
Fibre elongation(%)	0.0068	-0.0231	0.0020	-0.0127	-0.0929	0.0209	-0.0680	0.0419	0.0913	-0.0139	0.0074	0.1183	-0.0120	**-0.0156**	-0.0029	**0.0476**
Lint yield per plant	0.0041	-0.0427	0.0153	-0.1159	0.3989	0.0169	-0.2747	0.2424	-0.0469	0.0010	0.0030	0.0026	-0.0019	0.0001	**0.7716**	**0.9738****

* = Significant at 5% level **=Significant at 1% level, Bold & diagonal values indicate direct effects, Residual effect = 0.0833 SCYP = Seed cotton yield plant^{-1}

Hence, from the correlation and path coefficient analysis study it was inferred that number of bolls plant^{-1} and lint yield plant^{-1} had significant association and also showed high positive direct effects on seed cotton yield plant^{-1}. Hence, due importance may be given for these traits to improve genetic yield potential in cotton.

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