



## Research Note

# Character association and Path analysis of some Quantitative and Qualitative traits among interspecific crosses of *Gossypium arboreum* and *Gossypium herbaceum*

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### Abstract:

Studies on correlation indicated that intensive selection on the positive side for plant height, sympodia per plant, seed index, lint index, 2.5 per cent span length and bolls per plant since these characters showed positive correlation with seed cotton yield and also positive correlation among themselves. Days to flower initiation, micronaire value and elongation per cent showed negative correlation with seed cotton yield and hence a compromise towards selection is required in this case. Path coefficient analysis further revealed that bolls per plant played a major role in determining the seed cotton yield.

**Key words:** *Gossypium arboreum*, *Gossypium herbaceum*, correlation.

Cotton is an important industrial crop of India with a current production of 32 million bales during 2010-11, up from 29.5 million bales during 2009-10. The current global textile fibre market share of nearly 66 per cent and the contribution of cotton to export income is to the tune of Rs. 36 crores (Kairon *et al.*, 2000). Cotton output in India is likely to jump to a record 35 million bales in 2010/11, higher than prior estimates of 32.5 million bales on better yields. Seed cotton yield is a complex polygenic quantitative trait, greatly affected by environment. Hence, selection of superior genotypes based on yield as such is not effective. Hence, information on the phenotypic and genotypic inter-relationships of cotton yield with its contributing traits would be very much useful to the plant breeder in developing an appropriate breeding strategy. Selection has to be made for the components of seed cotton yield. The association of plant characters and seed cotton yield, thus assumes special importance in formulation of a basis of selection of desired strains.

A line x tester set was made in *kharif* 2003 using six genotypes of *Gossypium arboreum* (AH 56, AH59, AH 60, AH 67, AH 262 and PA 375) and four genotypes of *Gossypium herbaceum* (RAHS 129, Jayadhar, Digvijay and G.Cot.17) to generate twenty four interspecific hybrids. The parents and F<sub>1</sub>s were evaluated in RBD with two replications by adopting a

spacing of 75 x 30cm. On five random plants from each replications, data were recorded on days to flower initiation (days), plant height (cm), number of monopodia per plant, sympodia per plant, bolls per plant, seed cotton yield (kg), seed index, ginning outturn, lint index, 2.5 per cent span length (mm), uniformity ratio, micronaire value, bundle strength (g/tex) and elongation per cent to identify the nature of correlation of various quantitative traits with seed cotton yield. The phenotypic and genotypic correlation coefficients were worked out according to the procedures suggested by Al-Jibouri *et al.* (1958) using variance and covariance components. Path coefficient analysis was utilized to partition the genotypic correlation coefficient into direct and indirect effects as per Dewey and Lu (1959).

Seed cotton yield in cotton is a complex trait controlled by many genes. Selection based on yield alone often misleading. Hence, the knowledge about relationship between yield and its contributing characters is needed for an efficient selection strategy. The characters *viz.*, plant height, sympodia per plant, bolls per plant and micronaire value exhibited positive and significant correlation with seed cotton yield. Positive contribution of plant height, sympodia per plant, and bolls per plant was already confirmed by the findings of Preetha (2003), Ahuja *et. al.*, (2008) and Remzi Ekinici *et.al.*,(2010).

The information on the inter association among the yield components shows the nature and extent of relationship with each other. This will help in the simultaneous improvement of different characters along with seed cotton yield in breeding programme. In the present study, plant height, sympodia per plant, bolls per plant, seed index, lint index and 2.5 per cent span length were positively correlated with seed cotton yield. Rauf *et al.*, (2004) reported the positive correlation of sympodia per plant and bolls per plant to single plant yield. Days to flower initiation was positively correlated with monopodia per plant and micronaire value. Significant and positive correlation was noticed between plant height and monopodia per plant, sympodia per plant, seed index, bolls per plant, ginning outturn, lint index, uniformity ratio and bundle strength (Table 1). Sympodia per plant had positive and significant correlation with bolls per plant, seed index, ginning outturn, lint index, 2.5 per cent span length, uniformity ratio and bundle strength. Singh *et al.* (1990) reported positive and significant correlation with monopodia per plant. Plant height and bolls per plant are positively correlated as observed by Sumathi and Nadarajan (1995). Rajarathinam *et al.* (1993) reported positive and significant correlation of bolls per plant with lint index, 2.5 per cent span length and bundle strength. Seed cotton yield and fiber strength showed negative association in three crosses, indicating less gain through selection (Khalid Hussain *et al.*, 2010).

Path coefficient analysis permits a thorough understanding of contribution of various characters by partitioning the correlation coefficients into components of direct and indirect effects. The different yield contributing traits, plant height, sympodia per plant, bolls per plant, ginning outturn and lint index had high direct effect on seed cotton yield (Table 2). Sumathi and Nadarajan (1995) studied 51 diverse genotypes and reported that plant height, bolls per plant, ginning outturn, and lint index directly contributed to seed cotton yield. The direct effect of days to 2.5 per cent span length, uniformity ratio and bundle strength on seed cotton yield was positive and moderate, while seed index had positive and negligible effect. The effect of monopodia per plant on seed cotton yield was low.

Interspecific hybridization in *Gossypium* aims in retrieval and improvement of quality traits. Seed cotton yield being controlled by complex genes and hence information on the phenotypic and genotypic interrelationships of cotton yield with its contributing traits would be very much useful to the plant breeder

in developing an appropriate breeding strategy. In conclusion, the number of bolls per plant that had positive and high direct effect on seed cotton yield considered playing a major role in determining seed cotton yield.

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**Table 1. Intra and Inter correlation of different quantitative and qualitative traits**

Traits	Days to flower initiation	Plant height	Monopodia per plant	Sympodia per plant	Bolls per plant	Seed index	Ginning outturn	Lint index	2.5 per cent span length	Uniformity ratio	Micronaire value	Bundle strength	Elongation per cent
Days to flower initiation	1.000	-0.1996	0.1214	-0.3882*	-0.4602**	-0.1748	-0.0985	-0.4130*	-0.5214**	-0.2112	2.0151	-0.2003	-0.1435
Plant height	1.000	1.000	0.2283	0.4755**	0.6773**	0.4200*	0.1017	0.7605**	-0.0049	0.3515*	-2.0520	0.5552**	-0.2219
Monopodia a per plant	1.000	1.000	1.000	-0.0244	0.1023	0.0168	-0.0472**	-0.0297	-0.3670*	0.0549	0.9650	0.1075	-0.2215
Sympodia per plant	1.000	1.000	1.000	1.000	0.7926**	0.2030	0.4280	0.9445**	0.2272	0.2125	-0.9255	0.0022	-0.1095
Bolls per plant	1.000	1.000	1.000	1.000	1.000	0.5744**	0.0467	0.8971**	0.3650*	0.5364**	-2.3355	0.4193*	-0.2943
Seed index	1.000	1.000	1.000	1.000	1.000	1.000	-0.7593	0.3241	0.4328*	0.1107	-2.0692	0.4984	-0.2370
Ginning outturn	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.3650*	-0.5977**	0.1494	0.1051	-0.1469	0.4087*
Lint index	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-0.2677	0.3857*	-3.0109	0.3757*	0.2419
2.5 per cent span length	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.4915**	-4.8718*	0.0554	-1.2936
Uniformity ratio	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-3.5711*	0.5144*	-0.0689
Micronaire value	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-0.5276**	4.9134**
Bundle strength	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.0106
Elongation per cent	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Seed cotton yield	-0.2002	0.6329*	0.1502	0.6486**	0.8593**	0.4098*	0.0897	0.7582**	0.3967*	0.2790	-2.4786**	0.2312	-0.4049*

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

**Table 2. Path co-efficient analysis for different quantitative and qualitative traits.**

Traits	Days to flower initiation	Plant height	Monopodia per plant	Sympodia per plant	Bolls per plant	Seed index	Ginning outturn	Lint index	2.5 per cent span length	Uniformity ratio	Micronaire value	Bundle strength	Elongation per cent
Days to flower initiation	<b>0.699</b>	-0.0140	0.0085	-0.0272	-0.0322	-0.0122	-0.0069	-0.0289	-0.0365	-0.0148	0.1409	-0.0140	-0.0100
Plant height	0.0253	<b>-0.1269</b>	-0.0290	-0.0603	-0.0859	-0.0533	-0.0129	-0.0965	0.0006	-0.0446	0.2603	-0.0704	0.0281
Monopodia per plant	-0.0062	-0.0116	<b>-0.0507</b>	0.0012	-0.0052	-0.0009	0.0024	0.0015	0.0186	-0.0028	-0.0489	-0.0054	0.0112
Sympodia per plant	0.3651	-0.4471	0.0229	<b>-0.9404</b>	-0.7453	-0.1909	-0.4025	-0.8882	-0.2136	-0.1998	0.8741	-0.0021	0.1030
Bolls per plant	-0.7589	1.1170	0.1687	1.3070	<b>1.6491</b>	0.9473	0.0770	1.4794	0.6018	0.8846	-3.8515	0.6914	-0.4853
Seed index	-0.2861	0.6875	0.0275	0.3324	0.9403	<b>1.6370</b>	-1.2431	0.5359	0.7085	0.1812	-3.3873	0.8160	-0.3879
Ginning outturn	-0.1937	0.2000	-0.0928	0.8420	0.0919	-1.4938	<b>1.9673</b>	0.7181	-1.1758	0.2939	0.2067	-0.2889	0.8040
Lint index	0.3297	-0.6071	0.0237	-0.7539	-0.7161	-0.2613	-0.2914	<b>-0.7982</b>	0.2137	-0.3078	2.4033	-0.2999	-0.1931
2.5 per cent span length	0.1416	0.0013	0.0996	-0.0617	-0.0991	-0.1175	0.1623	0.0727	<b>-0.2715</b>	-0.1335	1.3228	-0.0150	0.3512
Uniformity ratio	0.0805	-0.1340	-0.0209	-0.0810	-0.2045	-0.0422	-0.0570	-0.1470	-0.1874	<b>-0.3813</b>	1.3616	-0.1961	0.0263
Micronaire value	-0.1052	0.1072	-0.0504	0.0485	0.1220	0.1081	-0.0055	-0.1572	0.2544	0.1865	<b>-0.0522</b>	0.0276	-0.2566
Bundle strength	0.0816	-0.2263	-0.0438	-0.0009	-0.1709	-0.2032	0.0599	-0.1531	-0.0226	-0.2097	0.2151	<b>-0.4076</b>	-0.0043
Elongation per cent	0.0562	0.0869	0.0867	0.0429	0.1152	0.0928	-0.1600	-0.0947	0.5064	0.0270	-1.9236	-0.0041	<b>-0.3915</b>
Seed cotton yield	-0.2002	0.6329	0.1502	0.6486	0.8593	0.0897	0.7582	0.3967	0.2790	0.2790	-2.4786	0.2312	-0.4049

**Residual effect : 0.2703**