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Studies on character Association and Path analysis in F_2 Generation of some *G. arboreum* (L.) Crosses

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Correlation and path analysis were studied in F2 generation of 21 crosses of *G. arboreum*. Seed cotton yield was positively and significantly associated with plant height sympodia per plant, boll number and harvest index. Ginning percentage and halolength showed positive association with number of seeds per boll. Path analysis revealed plant height, boll size, number of seeds per boll and harvest index as highest direct contributors to yield while boll number and sympodia per plant indirectly contributed to yield Halolength via boll number, boll size and sympodia per plant and ginning percentage via seeds per boll, seed index, lint index and harvest index affected the seed cotton yield.

Cotton yield is a complex character being a function of a number of components. The knowledge of correlations among the factors contributing the yield, ginning out turn and halo length leads to the most effective method of selection by the use of favourable constellation of characters and to minimize retarding effects of antagonistic correlations. The estimate of correlation coefficients mostly indicate the interrelationships of the characters but path analysis permits the understanding of the cause and effect of related characters (Wright, 1921). Path analysis helps us in partitioning the total correlations into direct and indirect contribution, thereby suggesting the degree of importance of each of the character to yield. Number of such studies have been reported in cotton crop, but they are mostly based on a study of varietal collections rather than the segregating population which constitute most of the breeding material and is subject to selection during improvement programme. Hence, in the present study, attempts were made to determine the yield components in *desi* cotton with the help of correlations and path analysis.

MATERIAL AND METHOD

Seven cotton cultivars viz. CJ-73, G-46, C-C-1-1-3, G-845, G-27, 960 and AK–277 were used for developing a diallel set of (7 x 7) excluding reciprocals. Twenty one crosses in their F_1 generation were grown at Cotton Research Station, Parbhani during kharif season of 1979-80 in a randomised block design with four replications. Two or three seeds were dibbled at 22.5 cm apart in a row spaced at 45 cm with 20 dibbles/row. The net plot consisted of six rows At every hill, one plant was maintained after thinning. Twenty plants were randomly selected from each plot for recording observations on plant height, sympodia/plant, number of bolls, seed cotton yield/plant and harvest index. Seed cotton from twenty well burst boll were collected from each

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plot at the time of second picking for recording weight per boll. Observation on seeds/boll, seed index, ginning out turn, lint index and halolength were recorded in laboratory according to procedures suggested by Santhanam (1967). The correlation coefficients were computed according to the path methods described by Johnson *et al* (1955 b). Path coefficients were worked out according to Dewey and Lue (1959).

RESULTS AND DISCUSSION

The genotypic and phenotypic correlation coefficients between yield and yield contributing characters are presented in Table 1. In the present investigation, the genotypic correlation coefficients were heigher than the corresponding phenotypic coefficients for most of the characters. This indicates that inspite of strong inherent association between various character pairs studied, the environment may modify the full expression of genotypes (Nandpuri *et al* 1973). Inter correlations between seed cotton yield and plant height, sympodia/plant, boll number and harvest index were positive and highly significant. These traits were positively associated with each other also. Number of seeds per boll, boll size, seed index and halo length were found to have low association with yield. Ginning percentage was positively correlated with boll number, seeds per boll and harvest index indicating that selection for these traits will help in improvement of ginning percentage. Halo length showed negaitve correlation with most of the attributes except boll size and seeds per boll. Seed cotton yield and halo length indicated significantly negative correlation at the genotypic level. The association between yield and ginning out turn was positive but low. Ginning percentage and halo length showed significantly negative correlation at the genotypic level. Boll number and boll size were having significantly negative correlations with each other. Similarly, there was negative correlations between seed index and lint index. Such negative correlations could arise primarily from developmentally induced relationships such as two developing components compating for limited sources such as nutrient and water supply (Adams. 1967) when two characters show negative correlations between themselves, it would be difficult to exercise simultenous selection of these characters in developing a variety.

Direct and indirect effects of yield components on yield are presented in Table 2. Plant height and boll size were having the highest direct effects on yield followed by number of seeds per boll and harvest index. Lowest direct effects was of boll number, lint index and sympodia per plant. Boll size which was one of the highest direct contributors for yield was also influencing it indirectly through sympodia per plant, boll number and seed per boll, while through plant height, halo length, seed index, lint index, ginning percentage and harvest index it was having negative impact on yield. Boll number and sympodia per plant had high association with seed cotton yield but were found to be the lowest direct contributers to yield. Their direct effects on yield were out weighed by high negative indirect effects via boll size, seed per boll and

mutual cancellation of indirect effects shown by boll number and sympodia per plant. Ginning percentage did not contribute directly to yield but its effects on yield were via seeds per boll seed index, lint index and harvest index. Halo length although indicated nagative direct effects on yield, its indirect effects via boll number. boll size and sympodia per plant were positive indicating possibility of simultenous improvement of yield and halo length through selection for these traits.

Path coefficient analysis, thus projected boll size, seeds per boll and harvest index as the three factors exerting the greatest influence upon seed cotton yield. Therefore, component selection based on these attributes particularly in the segregating generations of the present breeding material is expected to be useful in identifying high yielding genotypes.

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TABLE 1. Genotypic and phenotypic correlation coefficients between seed cotton yield and yield components.

Characters	Seed cotton yield	Sympodia/ plant	Boll number	Seeds/ boll	Boll size	Ginning %	Halolength	Lint index	Seed index	Harvest index
1	2	3	4	5	6	7	8	9	10	11
Plant height	0 8393**	0.6840**	0.460	−0.724	−0 624	0.128	−0.461	0.235	−0.197	0.723**
	0.4778*	0.3790*	0.399	−0.082	−0.172	−0.104	−0.171	0.106	0.004	0.152
Seed cotton		0 7799**	0.985	−0.597*	−0.793	0 179	−0.604	−0.298	−0.041	0 893**
yield		0.6688**	0 770	−0.78	−0.229	0.086	−0.204	0.031	−0.019	0.639**
Sympodia/plant			0.961	−0.321	−0.909	0.241	−0.679**	0.450*	−0.545*	0.887**
			0.707**	−0.047	−0.271	0 038	−0.293	0.277	−0.203	0.484*
Boll number				−0.284	−0.831**	0.340*	−0.768**	−0 341*	−0.342*	0.970**
				−0.024	−0.320*	0.147	−0.385*	0.095	−0.173	0.522*
Seeds/boll					0 392*	0.895**	0.393*	0.368*	−0 965**	−0.358*
					0.469*	0.249	0.146	−0.236	−0.319*	−0.130
Boll size						0.106	0.793**	0.311*	0.088	−0 653**
						0.100	0.417*	0.108	0.179	−0.168
Ginning percentage							−0.379*	−0.238	−0.652**	0.234
							−0.253	−0.040	−0.173	0.210
Halolength								0.144	0.198	−0.668**
								0.069	−0.008	−0.354
Lint index									−0.441	−0.407
									−0.051	−0.046

Table 2. Direct and indirect effects of different characters on seed cotton yield.

	Plant height	Sympodia/ plant	Seeds/ boll	Boll number	Boll size	Ginning %	Halolength	Seed Index	Lint Index	Harvest Index
Plant height	(0·965)	−0.246	−0.116	−0.360	−0.325	−0 358	−0.475	−0.251	0.151	0.138
Sympodia/plant	0.680	(−.361)	−0.500	−0 753	−0.473	−0.668	0.700	0.709	−0.482	0.170
Seeds/boll	−0.723	0.116	[0.155]	0.222	0.204	−0.248	−0.405	−0.393	0.116	−0.687
Boll number	0.443	−0.347	−0.044	[−0.783]	−0.432	−0.942	0.792	0.367	0.270	0.185
Boll size	−0.602	0.328	0.061	0.651	(0.520)	−0.295	−0.818	−0.332	0.053	−0.125
Ginning percentage	0.124	−0.087	0.139	−0.266	0.055	(−0.277)	0.331	0.254	0.516	0.460
Halo-length	−0 444	0.245	0.061	0.602	0.413	−0.105	(−0.13)	−0.154	−0.154	−0.128
Seed Index	0.226	−0.182	0.267	0 057	0.181	0.660	−0.141	(−0.106)	0.347	−0.781
Lint Intex	−0.190	0.197	−0.228	0.228	0.035	0 180	−0.204	0.472	(−0.791)	0.457
Harvest Index	0.698	−0.320	−0.055	−0.760	−0.340	−0.650	0.689	0.435	−0.188	(0.191)

Residual + −0.0055

Figures in parenthoses indicate direct effects.