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CORRELATION AND PATH COEFFICIENT STUDIES OVER ENVIRONMENTS IN *DESI* COTTON (*GOSSYPIUM ARBOREUM* L.)

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ABSTRACT

Eighty three genotypes (60 F_1s and 23 parents) were raised over three environments to study the correlation and path coefficients among ten quantitative characters in *desi* cotton (*Gossypium arboreum*). Seed-cotton yield showed high order positive and significant association with number of bolls, seed yield, lint yield, ginning (%) and lint index. However, positive and significant correlations were observed for number of bolls with seed yield, lint yield, ginning (%), lint index and seed- cotton yield; seed yield with lint yield, ginning (%), lint index and seed-cotton yield; lint yield with ginning (%), lint index and seed-cotton yield; ginning (%) with lint index and seed- cotton yield; seed index with lint index. These correlations were quite consistant over environments with few exceptions. The path coefficient analysis revealed that seed yield and lint yield are the direct contributors to the seed-cotton yield whereas number of bolls, ginning (%) and lint index are indirect contributors via seed and lint yields.

Separating the correlation coefficients of yield components into direct and indirect effects can be used to understand the exact association. Consistency of these associations over a number of environments is also a valuable asset. The present investigation was, therefore, undertaken to estimate the phenotypic and genotypic correlations and their direct and indirect effects on seed-cotton yield over three locations to find out their consistency.

MATERIALS AND METHODS

Sixty F_1s obtained from 20 lines x 3 testers mating design were evaluated alongwith 23 parents in randomized block design with three replications at three locations, viz. Bulandshahr, Modipuram, and Nagina, during kharif 1987. Each plot was consisted of a 5 m long row spaced 60 cm apart with 30 cm plant to plant spacing. Data were recorded on

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ten randomly selected plants in each plot for ten quantitative characters, viz., days to flower initiation, plant height, bolls/plant, seed-cotton yield/plant, seed yield/plant, lint yield/plant, halo length, ginning (%) and seed and lint indices. Data from each locations were utilized to estimate the phenotypic correlation coefficients [1] and their direct and indirect effects [2].

RESULTS AND DISCUSSION

The phenotypic correlation coefficients among yield and yield components are presented in Table 1. Seed-cotton yield had positive and significant correlations with

Table 1. Phenotypic correlation coefficients among seed-cotton yield and its contributing characters in desi cotton in different environments

Character	Location	Plant height	Bolls per plant	Seed yield	Lint yield	Halo length	Ginning %	Seed index	Lint index	Seed-cotton yield
Days to flower initiation	Bulandshahr	0.02	0.03	0.02	0.03	–0.13	–0.01	0.07	0.03	0.02
	Modipuram	–0.15	0.04	0.04	0.05	–0.25*	0.02	0.05	0.07	0.01
	Nagina	0.04	–0.01	–0.01	–0.01	–0.16	–0.03	0.11	0.04	–0.01
Plant height	Bulandshahr		–0.04	–0.02	–0.03	–0.19	–0.06	0.07	–0.08	–0.03
	Modipuram		–0.17	–0.18	–0.15	–0.13	–0.02	–0.04	–0.05	–0.16
	Nagina		0.08	0.09	0.06	–0.20	–0.03	–0.10	–0.07	0.08
Bolls/plant	Bulandshahr			0.99**	0.99**	0.14	0.65**	0.21	0.57**	0.99**
	Modipuram			0.99**	0.99**	0.22*	0.72**	0.23*	0.63**	1.00**
	Nagina			1.00**	0.99**	0.08	0.68**	0.13	0.59**	1.00**
Seed yield/plant	Bulandshahr				0.98**	0.14	0.59**	0.19	0.52**	1.00**
	Modipuram				0.98**	0.23*	0.68**	0.22*	0.60**	0.99**
	Nagina				0.98**	0.08	0.63**	0.13	0.55**	1.00**
Lint yield/plant	Bulandshahr					0.13	0.72**	0.20	0.62**	0.99**
	Modipuram					0.21	0.79**	0.22*	0.67**	0.98**
	Nagina					0.08	0.76**	0.13	0.66**	0.99**
Halo length	Bulandshahr						0.01	0.08	0.06	0.14
	Modipuram						0.05	0.02	0.05	0.22*
	Nagina						0.03	–0.05	0.01	0.08
Ginning (%)	Bulandshahr							0.17	0.80**	0.64**
	Modipuram							0.17	0.77**	0.72**
	Nagina							0.12	0.83**	0.69**
Seed index	Bulandshahr								0.71**	0.19
	Modipuram								0.74**	0.20
	Nagina								0.62**	0.13
Lint index	Bulandshahr									0.56**
	Modipuram									0.61**
	Nagina									0.60**

*,**Significant at 5% and 1% levels, respectively.

Table 2. Direct (in bold) and indirect phenotypic effects of different characters towards seed cotton yield in different environments

Character	Total correlation of seed cotton yield per plant	Indirect effects via different characters								
		days to flower initiation	plant height	bolls per plant	seed yield per plant	lint yield per plant	halo length	ginning %	seed index	lint index
Bulandshahr										
Days to flower initiation	0.024	**–0.002**	–0.000	0.001	0.012	0.011	0.000	0.000	–0.000	0.000
Plant height	–0.027	–0.000	**–0.003**	–0.002	–0.011	–0.013	0.000	0.001	–0.000	–0.000
Bolls/plant	0.993**	–0.000	0.000	**0.040**	0.545	0.414	–0.000	–0.006	–0.000	0.001
Seed yield/plant	0.997**	–0.000	0.000	0.040	**0.551**	0.412	–0.000	–0.005	–0.000	0.001
Lint yield/plant	0.994**	–0.000	0.000	0.040	0.542	**0.418**	–0.000	–0.007	–0.000	0.001
Halo length	0.137	0.000	0.000	0.006	0.078	0.055	**–0.002**	–0.000	–0.000	0.000
Ginning %	0.645**	0.000	0.000	0.026	0.362	0.301	–0.000	**–0.009**	–0.000	0.001
Seed index	0.195	–0.000	0.000	0.008	0.104	0.085	–0.000	–0.001	**–0.002**	0.001
Lint index	0.560**	–0.000	0.000	0.023	0.285	0.259	–0.000	–0.007	–0.002	**–0.001**
Modipuram										
Days to flower initiation	0.015	**–0.033**	–0.001	–0.001	0.034	0.013	0.004	–0.000	0.000	–0.000
Plant height	–0.162	0.005	**0.006**	0.006	–0.142	–0.039	0.002	0.000	–0.000	0.000
Bolls/plant	0.988**	–0.001	–0.001	**–0.034**	0.780	0.250	–0.003	–0.000	0.000	–0.002
Seed yield/plant	0.990**	–0.001	–0.001	–0.034	**0.784**	0.248	–0.003	–0.000	0.000	–0.002
Lint yield/plant	0.979**	–0.002	–0.001	–0.034	0.768	**0.253**	–0.003	–0.000	0.000	–0.003
Halo length	0.219*	0.008	–0.001	–0.008	0.181	0.053	**–0.015**	–0.000	0.000	–0.000
Ginning %	0.721**	–0.001	–0.000	–0.024	0.537	0.199	–0.001	**–0.000**	0.014	–0.003
Seed index	0.203	–0.001	–0.000	–0.008	0.174	0.056	–0.000	–0.014	**0.000**	–0.003
Lint index	0.609**	–0.002	–0.000	–0.021	0.468	0.169	–0.001	–0.000	0.000	**–0.004**
Nagina										
Days to flower initiation	–0.006	**–0.000**	–0.000	–0.001	–0.001	–0.003	0.000	0.000	0.001	–0.000
Plant height	0.081	–0.000	**–0.000**	0.022	0.035	0.024	0.000	0.000	–0.001	0.001
Bolls/plant	1.000**	0.000	–0.000	**0.270**	0.376	0.362	–0.000	–0.003	0.001	–0.007
Seed yield/plant	0.996**	0.000	–0.000	0.270	**0.377**	0.358	–0.000	–0.003	0.001	–0.006
Lint yield/plant	0.993**	0.000	–0.000	0.268	0.369	**0.365**	–0.000	–0.003	0.001	–0.007
Halo length	0.079	0.000	0.000	0.021	0.030	0.029	**–0.001**	–0.000	–0.000	–0.000
Ginning %	0.686**	0.000	0.000	0.183	0.237	0.279	–0.000	**–0.004**	0.001	–0.009
Seed index	0.134	–0.000	0.000	0.037	0.050	0.049	0.000	–0.000	**0.006**	–0.007
Lint index	0.597**	–0.000	0.000	0.160	0.207	0.240	–0.000	–0.004	0.004	**–0.011**

Residual effects at Bulandshahr, Modipuram and Nagina were 0.0018, 0.0164 and 0.0016, respectively.

bolls/plant, seed yield/plant, lint yield/plant, ginning (%) and lint index at all locations. Similarly, other positive and significant correlations were recorded for bolls/plant with seed yield/plant, lint yield/plant, ginning (%), lint index and seed-cotton yield/plant; seed yield/plant with lint yield/plant, ginning (%), lint index and seed-cotton yield/plant; lint yield/plant with ginning (%), lint index and seed-cotton yield/plant; ginning (%) with lint index and seed-cotton yield; seed index with lint index. All these correlations were quite consistent over environments. However, association of bolls/plant with halo length and seed index, seed yield/plant with halo length and seed index and lint yield/plant with seed index were found to be positive and significant whereas days to flower initiation was negative and significant at Modipuram only indicating their inconsistency over environments. These associations are partly in accordance with the results observed by several workers [3–6].

The correlations were further partitioned into direct and indirect effects to establish the cause and effect relationship among the yield and its component characters. The direct effect of days to flower initiation, plant height, ginning (%), halo length, seed and lint indices towards seed-cotton yield were negligible. However, a very strong direct positive associations of seed yield/plant and lint yield/plant with seed-cotton yield/plant were recorded at all locations suggesting their consistency over environments. Whereas, association of bolls/plant with seed-cotton yield/plant showed some variable results at different environments. These results are in accordance with other reports [6].

Bolls/plant, ginning (%), seed and lint indices had very strong positive indirect effect through seed yield/plant and lint yield/plant towards seed-cotton yield/plant. Similarly, seed yield/plant showed highly indirect positive effect via lint yield/plant and lint yield/plant via seed yield/plant. These indirect effects were also consistent over environments and are the important components for seed-cotton yield [4–6]. The rest of direct and indirect associations were very meagre. Therefore, it revealed from the study that number of bolls, seed yield, lint yield, ginning (%) and lint index are the most important component traits to improve the seed-cotton yield.

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