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Correlation and Path Analysis for Seed Cotton Yield and its Contributing Traits under Irrigated Conditions of Sirsa in Desi Cotton

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ABSTRACT

The present study comprises 30 elite genotypes of desi cotton as its experimental material. The genotypes were sown at the Cotton Research Station in Sirsa. Correlation coefficient analysis indicated a highly significant positive relationship between seed cotton yield and the yield contributing traits. Lint yield, number of bolls per plant, boll weight, and gossypol content had the most positive and significant correlation with seed cotton yield. The path-coefficient study revealed that the number of bolls per plant, boll weight, and lint yield was important since they had a positive direct influence on seed cotton yield per plant. As a result, selection based on the above-mentioned traits will result in genotypes with high seed cotton yield.

Keywords: cotton, path ananlysis, correlation, genotype

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INTRODUCTION

Cotton, popularly known as the "White Gold," is one of the most valuable commercial crops. Cotton is nature's most precious gift to mankind, supplied by the genus "*Gossypium*" to cover people all over the world. Cotton - based textiles have traditionally been manufactured in India. Cotton seed coat matures into tubular fibre, which is spun into yarn. Four of the world's 50 identified cotton species are cultivated species. All the four cultivated cotton species *viz*., *Gossypium arboreum*, G. *herbaceum*, G. *hirsutum*, and G. *Barbadense* are grown commercially in India. All of the cultivated species as well as some of their hybrid combinations are grown commercially in India. Correlation coefficient analysis in plant breeding reveals the component qualities on which selection may be based for genetic improvement in yield by measuring the mutual relationship between various plant characteristics. Path coefficient analysis, as compared to correlation coefficient, delivers more detailed information on the relationships, therefore it is often used by plant breeders to assess seed cotton yield and its relation with other traits (Board *et al*. 1997). As a result, the present study was designed to evaluate the correlation, and path analysis for seed cotton yield and its contributing traits in 30 different genotypes of desi cotton (*Gossypium arboreum* L.).

MATERIALS AND METHODS

The present investigation was carried out during *kharif* 2017 at the CCS Haryana Agricultural University Cotton Research station, Sirsa. The Sirsa district is located in the semi-arid, sub-tropical region of north-western India, in the state of Haryana at 29° 25' latitude, 74° 40' E longitude and at an altitude of 202 meters above mean sea level. The experimental material for this research comprised of 30 different desi cotton genotypes (Table 1) which were taken from the cotton section of the Department of Genetics and Plant Breeding at CCS Haryana Agricultural University, Hisar. The experiment was conducted in randomized block design with three replications. The genotypes were grown in two rows of three metres each. Row to row spacing was retained at 67.5 cm, while plant to plant spacing was kept at 30 cm. For raising the crop, all the recommended agronomic practices were adopted. The observations were recorded on five randomly selected competitive plants for fifteen morphological traits *viz*., days to first flower, plant height (cm), number of monopods per plant, number of bolls per plant, boll weight (g), number of seeds per boll, ginning outturn (%), seed index (g), lint index (g), lint yield per plant (g), seed cotton yield per plant (g) and four biochemical traits *viz*., protein content (%), oil content (%), gossypol content (%) and sugar content. Phenotypic correlation coefficient was calculated as per Al-

Table 1: List of *Gossypium arboreum* genotypes used in present investigation

Sr. No.	Genotypes.	Sr. No.	Genotypes.
1	HD 324	16	HD 540
2	HD 418	17	HD 541
3	HD 432	18	HD 542
4	HD 503	19	HD 543
5	HD 509	20	HD 544
6	HD 514	21	HD 545
7	HD 521	22	HD 546
8	HD 524	23	HD 547
9	HD 526	24	HD 548
10	HD 534	25	HD 549
11	HD 535	26	HD 550
12	HD 536	27	HD 551
13	HD 537	28	HD 552
14	HD 538	29	HD 553
15	HD 539	30	HD 554

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Table 2: Phenotypic correlations of seed cotton yield and its attributing traits

Characters	Days to first flower	Plant height (cm)	No of monopods per plant	Number of bolls per plant	Boll weight (g)	Number of seeds per boll	Ginning outturn (%)	Seed index (g)	Lint index (g)	Lint yield (g)	Protein content (%)	Oil content (%)	Gossypol content (%)	Sugar content (%)	Seed cotton yield (g)
Days to first flower	1	-0.046	-0.190*	-0.122*	0.202*	-0.113*	0.015	0.103*	0.083	0.010	0.022	0.046	-0.092	-0.034	0.027
Plant height (cm)		1	0.148*	0.060	-0.036	0.151*	-0.134	0.117*	0.007	-0.033	-0.190*	-0.115*	-0.115*	-0.045	0.024
No of monopods per plant			1	-0.048	-0.027	0.014	0.053	0.100*	0.135*	-0.055	-0.065	0.047	-0.054	0.101*	- 0.049
Number of bolls per plant				1	0.027	0.069	-0.096	0.012	-0.052	0.725*	-0.096	-0.117*	0.498*	-0.175*	**0.791***
Boll weight (g)					1	0.230*	0.230*	0.133*	0.236*	0.507*	0.152*	0.065	-0.058	-0.211*	**0.619***
Number of seeds per boll						1	-0.096	0.126*	0.044	0.150*	0.001	0.211*	0.112*	0.160*	0.202*
Ginning outturn (%)							1	0.092	0.662*	0.328*	-0.093	-0.107*	-0.045	0.134*	0.068
Seed index (g)								1	0.804*	0.103*	0.058	-0.054	0.208*	0.032	0.100*
Lint index (g)									1	0.268*	-0.010	-0.100*	0.131*	0.117*	0.113*
Lint yield (g)										1	0.026	-0.056	0.333*	-0.235*	**0.908***
Protein content (%)											1	0.170*	0.058	-0.066	0.024
Oil content (%)												1	0.042	0.106*	- 0.047
Gossypol content (%)													1	-0.020	0.352*
Sugar content (%)														1	- 0.285*
Seed cotton yield (g)															1

Jibouri *et al*. (1958) and path coefficient analysis was done as per method suggested by Dewey and Lu (1959).

RESULTS AND DISCUSSION

Correlation coefficient analysis

The computation of the correlation between yield and yield-attributing traits is critical in plant selection. The results of phenotypic correlation are presented in Table 2. At the phenotypic level, seed cotton yield had a positive and significant correlation with lint yield (0.908), followed by the number of bolls per plant (0.791), boll weight (0.619), Gossypol content (0.352), number of seeds per boll (0.202), lint index (0.113), and seed index (0.203). Whereas, none of the traits exhibited significant negative correlation with seed cotton yield at phenotypic level. As a result, in the future breeding programme, selecting for these qualities would aid in improving seed cotton yield.

Path coefficient analysis

Correlation does not reveal the direct and indirect impacts of independent variables on dependent variables. Path coefficient analysis was used for this and the findings are shown in Table 3. The results demonstrated that the number of bolls per plant (0.563), boll weight (0.479) and lint yield had significant positive direct effect on seed cotton yield (0.279). Negative direct effects on seed cotton yield were revealed by days to first flower (-0.001), plant height (-0.002), ginning outturn (-0.112), protein content (-0.008) and sugar content (-0.011). Residual effect was 0.065. A highest positive indirect effect on seed cotton yield (Fig. 1) was exerted by number of bolls per plant *via* lint yield.

Table 3: Direct effects (diagonal) and indirect effects (off diagonal) of different traits on seed cotton yield

Characters	Days to first flower	Plant height (cm)	No of monopods per plant	Number of bolls per plant	Boll weight (g)	Number of seeds per boll	Ginning outturn (%)	Seed index (g)	Lint index (g)	Lint yield (g)	Protein content (%)	Oil content (%)	Gossypol content (%)	Sugar content (%)	Seed cotton yield (g)
Days to first flower	**-0.001**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.027
Plant height (cm)	0.001	**-0.002**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.024
No of monopods per plant	-0.019	0.002	**0.010**	-0.001	0.000	0.000	0.001	0.001	0.001	-0.001	-0.001	0.001	-0.001	0.001	-0.049
Number of bolls per plant	-0.069	0.034	0.027	**0.563**	0.015	0.039	-0.054	0.007	-0.030	0.408	-0.054	-0.066	0.280	-0.098	0.791
Boll weight (g)	0.097	-0.017	-0.013	0.013	**0.479**	0.110	0.110	0.064	0.113	0.243	0.073	0.041	-0.028	-0.101	0.619
Number of seeds per boll	-0.001	0.001	0.000	0.001	0.002	**0.007**	-0.001	0.001	0.000	0.001	0.000	0.002	-0.001	0.001	0.202
Ginning outturn (%)	-0.002	0.015	-0.006	0.011	-0.026	0.011	**-0.112**	-0.010	-0.074	-0.037	0.010	0.012	0.005	-0.015	0.068
Seed index (g)	-0.003	-0.004	-0.003	0.000	-0.004	-0.004	-0.003	**-0.032**	-0.026	-0.003	-0.002	0.002	-0.007	-0.001	0.100
Lint index (g)	0.004	0.000	0.007	-0.003	0.012	0.002	0.034	0.042	**0.052**	0.014	-0.001	-0.005	0.007	0.006	0.113
Lint yield (g)	0.003	-0.009	-0.015	0.202	0.141	0.042	0.092	0.029	0.075	**0.279**	0.007	-0.016	0.093	-0.066	0.908
Protein content (%)	0.000	0.002	0.001	0.001	-0.001	0.000	0.001	-0.001	0.000	0.000	**-0.008**	-0.001	-0.001	0.001	0.024
Oil content (%)	-0.001	0.002	-0.001	0.002	-0.001	-0.003	0.002	0.001	0.001	0.001	-0.002	**-0.014**	-0.001	-0.002	-0.047
Gossypol content (%)	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	**0.002**	0.000	0.352
Sugar content (%)	0.000	0.001	-0.001	0.002	0.002	-0.002	-0.002	0.000	-0.001	0.003	0.001	-0.001	0.000	**-0.011**	-0.285

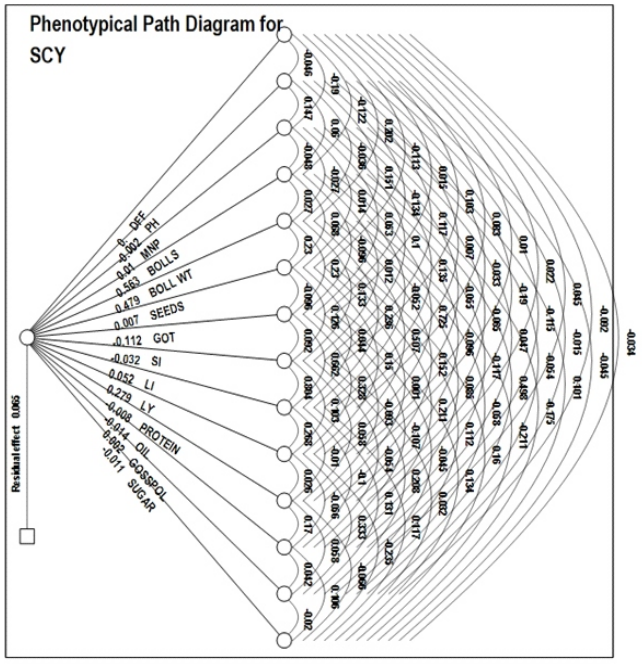

Fig 1: Path diagram showing direct and indirect effects of different traits on seed cotton yield per plant

For plant selection, computation of correlation between seed cotton yield and its contributing traits is of considerable importance. Seed cotton yield exhibited highly significant and positive correlation with lint yield, number of bolls per plant, boll weight and gossypol content. These results are in conformity with earlier results of Ladole and Meshram (2000), Rao *et al.* (2001), Neelam and Potdukhe(2002), Kaushik *et al.* (2003), Rajamani *et al.* (2013), Pujer *et al.* (2014), Wadeyar and Kajjidoni (2015) and Reddy *et al.* (2017). Lint index and seed index also showed positive and significant correlation with seed cotton yield per plant. Similar findings were reported earlier by Padmavathi *et al.* (2016), Sambamurthy *et al.* (2006) and Erande *et al.* (2014). Among the traits investigated, the number of bolls per plant, boll weight, and lint yield all had a direct effect on seed cotton yield per plant. As a result, because these features contribute directly to seed cotton yield production, they can be utilised in future seed cotton yield development programmes. Similar results were reported by Ahuja *et al.* (2004), Kaushik and Kapoor (2006), Gite *et al.* (2006), Patnaik and Sial (2010), Kalpande *et al.* (2014) and Asha *et al.* (2015). The smaller residual impact (0.065) suggested that the characteristics included in path analysis study were suitable and appropriate.

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