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STUDIES ON CORRELATION AND PATH-COEFFICIENT ANALYSIS FOR SEED COTTON YIELD AND ITS CONTRIBUTING TRAITS IN COTTON (*GOSSYPIUM HIRSUTUM* L.)

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Abstract

Thirty three cotton genotypes were subjected to study the association among the seed cotton yield and yield contributing traits. Thirteen characters viz., days to fifty percent flowering, plant height, number of sympodial branches per plant, number of bolls per plant, single boll weight, seed index, Ginning out turn, lint index, biological yield, 2.5 percent span length, micronaire, bundle strength and seed cotton yield per plant were studied. Correlation studies revealed that plant height, number of sympodial branches per plant, number of bolls per plant and single boll weight registered significant positive association with seed cotton yield. Path analysis revealed the importance of number of bolls per plant, lint index and single boll weight, which exerted high positive direct effect towards seed cotton yield.

Key words : Cotton, correlation and causation.

Introduction

Cotton is one of the most important fiber and cash crop of India and plays a dominant role in the industrial and agricultural economy of the country. Cotton is the most important fibre crop not only of India but of the entire world. It provides direct livelihood to 6 million farmers and about 40 – 50 million people are employed in cotton trade and its processing.

India has the largest area under cotton cultivation in the world though she is the world's third largest producer of cotton after China and the USA. Currently, it is grown over six per cent of the net sown area. In Tamilnadu, it is grown both as a *kharif* as well as a rabi crop. Here, the rainfall occurs after September and rainfed cotton is sown in October. The irrigated crop is sown in January-February. Most of the crop is grown mixed with other kharif crops such as maize, jowar, ragi, sesame, castor, groundnut and other vegetables.

In any selection programme, it may not be always possible to select on the basis of yield alone for evolving superior yielding genotypes because yield is a complex character and is contributed by many component traits. The inter-relationships between yield and yield contributing traits are estimated by correlation co-efficient analysis. Such association studies provide information on nature of extent and direction of selection.

Path analysis has been used to organize the relationship between the dependent and independent variables. Further, the partitioning of correlation co-efficient into direct and indirect effects of the yield components on yield would be useful in culling out the choice of traits for further crop improvement through breeding.

Materials and Methods

The present investigation was carried out in the Plant Breeding Farm, Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamilnadu, India. The experimental material comprised of 33 cotton genotypes collected from various places.

These genotypes were sown in the second week of

May. The experiment was laid out in a Randomized Block Design with three replications with a spacing of 75 cm between the rows and 30cm between plants within row. Recommended agronomic practices and need based plant protection measures were adopted.

Five plants at random in each replication were chosen and labeled for recording observations and the mean of five plants were used for statistical analyses. The data on the following yield and yield components and quality parameters were recorded. The characters viz., days to fifty per cent flowering, plant height at maturity, number of sympodial branches per plant, number of bolls per plant, single boll weight, seed index, ginning out turn, lint index, biological yield per plant, 2.5 per cent span length, micronaire, bundle strength and seed cotton yield. The genotypic and phenotypic correlation co-efficients were calculated from the mean of the three replications of each genotype by adopting the method suggested by Al-Jibouri *et al*. (1958). Path-coefficient analysis was also done as per the method suggested by Wright (1921) and elaborated by Dewey and Lu (1959).

Results and Discussion

Breeding high yielding varieties in the most of the crops needs information on the extent of inter relationship among yield and yield components. The efficiency of selection for yield mainly depends on the direction and magnitude of the associations of the components traits with yield. Correlation studies provide estimates of degree of association of seed cotton yield with its components help in planning effective selection strategies. The estimates of phenotypic and genotypic correlations coefficients among the thirteen traits are discussed below.

In the present study, the genotypic correlation coefficients were higher in magnitude than phenotypic correlation coefficients. This can be interpreted as a strong inherent genotypic relationship between the characters studied though their phenotypic expression was impeded by environmental influence. The phenotypic and genotypic correlation coefficients among different characters revealed that seed cotton yield per plant had exhibited significant positive association with number of bolls per plant followed by single boll weight, plant height and number of sympodial branches per plant. Similar results were reported by Khan *et al*. (2010) and Ashok Kumar *et al*. (2010) for number bolls per plant and single boll weight this indicated that association between these traits could be utilized for increasing seed cotton yield. This corroborates with the findings of Kaushik *et al*. (2006) thus suggesting that selection pressure applied for increasing the aforementioned traits would eventually increase the seed cotton yield. Significant negative correlations were observed with days to fifty per cent flowering at both levels. Whereas, bundle strength recorded significant negative genotypic correlation with seed cotton yield per plant.

However, correlation of yield and its components alone are not adequate in any selection programme. The inter relationship among the individual character may ultimate influence the yield.

In the present study, significant positive association observed between days to fifty percent flowering with ginning out turn at both levels while it had significant negative association with number of bolls per plant and seed index. Plant height had exhibited significant positive association with number of bolls per plant at both levels. Number of sympodial branches per plant had showed significant positive association with number of bolls per plant at phenotypic and genotypic levels, while it had registered significant negative genotypic correlation with micronaire. This is in corroboration with the earlier reports of Shazia *et al*. (2010), Desalegn *et al*. (2009) and Sharma *et al*. (2005).

Seed index had significant positive association with lint index and biological yield at both levels while ginning out turn recorded significant positive association with lint index at phenotypic and genotypic levels. Bundle strength revealed significant positive genotypic correlation with lint yield, biological yield and micronaire. These results are in confirmity with that of Preetha and Raveendran (2007) and Kaushik *et al*. (2006).

The correlation coefficient alone are insufficient to explain the relationship for effective manipulation of the characters, but path analysis furnishes a method for partitioning the correlation coefficient into direct and indirect effects and measures the relative importance of the causal factors in determining the seed cotton yield. The results of such analysis are discussed below.

Among the yield component characters, number of bolls per plant had recorded maximum positive direct effect on seed cotton yield per plant followed by lint index, single boll weight, 2.5 percent span length, number of sympodial branches per plant, bundle strength and days to fifty percent flowering. Similar results were earlier reported by Ashok kumar and Ravikesavan (2010). Negative direct effect of seed index followed by ginning out turn, micronaire, biological yield and plant height towards seed cotton yield per plant was recorded in the present inquiry. Similar results were earlier reported by Thiyagu *et al*. (2010).

Table 1 : Phenotypic and Genotypic correlation among various characters in 33 cotton genotypes.

Characters		D 50%F	PHT	NSYB/P	NB/P	SBW	SI	GOT	LI	BY	SPL	MCN	BS	SCY
D 50 % F	P	1.000	-0.343	-0.071	-0.506*	-0.201	-0.520*	0.353*	-0.145	-0.217	0.145	0.301	0.162	-0.460*
	G	1.000	-0.352*	-0.089	-0.550*	-0.200	-0.556*	0.364*	-0.163	-0.225	0.188	0.304	1.090	-0.540*
PHT	P		1.000	0.057	0.467*	0.173	0.281	-0.103	0.150	0.223	-0.151	0.028	0.121	0.452*
	G		1.000	0.060	0.498*	0.173	0.291	-0.103	0.156	0.224	-0.187	0.031	0.842	0.494*
NSYB/P	P			1.000	0.426*	-0.042	0.081	-0.268	-0.159	0.073	0.128	-0.343	-0.021	0.372*
	G			1.000	0.473*	-0.033	0.044	-0.286	-0.198	0.072	0.174	-0.365*	-0.307	0.374*
NB/P	P				1.000	0.059	0.284	-0.231	0.052	0.167	0.006	-0.208	0.142	0.810*
	G				1.000	0.063	0.298	-0.247	0.050	0.180	-0.001	-0.229	-0.099	0.848*
SBW	P					1.000	0.186	-0.074	0.081	0.245	-0.172	0.005	-0.133	0.551*
	G					1.000	0.197	-0.076	0.088	0.249	-0.199	0.014	-1.015	0.614*
SI	P						1.000	-0.192	0.628*	0.416*	0.052	-0.091	0.057	0.304
	G						1.000	-0.200	0.632*	0.433*	0.074	-0.088	0.285	0.315
GOT	P							1.000	0.617*	-0.048	0.030	0.215	0.082	-0.205
	G							1.000	0.643*	-0.048	0.038	0.223	0.536	-0.223
LI	P								1.000	0.283	0.054	0.076	0.106	0.098
	G								1.000	0.294	0.077	0.097	0.706*	0.067
BY	P									1.000	0.179	0.129	0.047	0.243
	G									1.000	0.221	0.132	0.354*	0.265
SPL	P										1.000	-0.253	0.091	-0.083
	G										1.000	-0.321	1.071	-0.104
MCN	P											1.000	0.116	-0.184
	G											1.000	0.539*	-0.195
BS	P												1.000	0.045
	G												1.000	-0.640*
SCY	P													1.000
	G													1.000

* Significant at 5 per cent level, P – Phenotypic correlation, G – Genotypic correlation.

Table 2 : Path co-efficient analysis showing direct and indirect effects of yield component characters on seed cotton yield.

Characters	DF	PHT	NSYB/P	NB/P	SBW	SI	GOT	LI	BY	SPL	MCN	BS
DF	**0.0014**	0.0020	-0.0010	-0.4497	-0.1168	0.2986	-0.1773	-0.1025	0.0013	0.0026	-0.0024	0.0036
PHT	-0.0005	**-0.0056**	0.0006	0.4068	0.1015	-0.1564	01.0502	0.0984	-0.0013	-0.0026	-0.0002	0.0027
NSYB/P	-0.0001	-0.0003	**0.0114**	0.3870	-0.0190	-0.0236	0.1397	-0.1245	-0.0004	0.0024	0.0029	0.0010
NB/P	-0.0008	-0.0028	0.0054	**0.8175**	0.0369	-0.1602	0.1204	0.0314	-0.0011	-0.0001	0.0018	-0.003
SBW	-0.0003	-0.0009	-0.0003	0.0516	**0.5852**	-0.1057	0.0371	0.0557	-0.0015	-0.0028	-0.0001	-0.0033
SI	-0.0008	-0.0016	0.0005	0.2437	0.1152	**-0.5373**	0.0976	0.3978	-0.0026	0.0010	0.0007	0.0009
GOT	0.0005	0.0005	-0.0032	-0.2018	-0.0445	0.1074	**-0.4879**	0.4047	0.0003	0.0005	0.0018	0.0017
LI	-0.0002	-0.0008	-0.0022	0.0408	0.0517	-0.3394	-0.3135	**0.6298**	-0.0018	0.0010	-0.0007	0.0023
BY	-0.0003	-0.0012	0.0008	0.1468	0.1459	-0.2328	0.0236	0.1851	**-0.0061**	'0.0031	-0.0010	0.0011
SPL	0.0002	0.0010	0.0019	-0.0001	-0.1164	-0.0395	-0.0184	0.0486	-0.0013	**0.0141**	0.0025	0.0035
MCN	0.0004	-0.0001	-0.0041	-0.1870	0.0080	0.0472	-0.1089	0.0611	-0.0008	-0.0045	**-0.0080**	0.0017
BS	0.0016	-0.0047	-0.0035	-0.0805	-0.5939	-0.1533	-0.2615	0.4445	-0.0021	0.0151	-0.0043	**0.0033**

Residual effect = .177825

In addition to direct effect, maximum positive indirect effects of plant height, number of sympodial branches per plant, seed index and biological yield via number of bolls per plant and the traits bundle strength, ginning out turn, seed index and biological yield via lint index were observed on seed cotton yield per plant. Maximum negative indirect effects of bundle strength, days to fifty per cent flowering, 2.5 per cent span length, ginning out turn and number of sympodial branches per plant via single boll weight and the traits days for fifty per cent flowering, ginning out turn, micronaire and buddle strength via number of bolls per plant were noticed on seed cotton yield per plant. Similar results were reported by Remzi Ekinci *et al*. (2010), Gumber *et al*. (2005).

It is inferred that the pattern of path co efficient observed in the present study is in agreement with the correlation obtained. In general, the characters, plant height, number of sympodial branches per plant, number of bolls per plant and lint index exhibited positive significant correlation and recorded high direct effect with seed cotton yield. Hence, these traits could well be given prime importance while selection for high yielding genotypes. Similar results were earlier reported by Rasheed and Murtaza (2009), Sharama *et al*. (2005), Naveed *et al*. (2004), Muthuswamy *et al*. (2004).

The character such as ginning out turn, seed index, days to fifty percent flowering recorded variable performance for direct and indirect effect and more similarly for correlation coefficient. Hence, selection for such characters could be positioned to later generation until there is favorable and constant association of genes controlled the characters.

In the present study, it may be concluded that the correlation and causation studies revealed that the characters namely, number of bolls per plant, single boll weight, lint index and number of sympodial branches might be applied with selection pressure to improve seed cotton yield.

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