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Association of Yield with Various Economic Traits in *Gossypium hirsutum* L.

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ABSTRACT

Lint index had maximum genetic association with seed cotton yield per plant. Extremely high heritability was estimated for lint index. Path analysis study showed that lint percentage had the highest positive direct effect on yield of seed cotton per plant. Indirect improvement in yield of seed cotton could be achieved through selecting types having higher lint index and percentage, and obtain different genetic combinations of these parameters.

Key Words: Path analysis; Lint index; Staple length; American upland cotton

INTRODUCTION

Cotton has major role in the economy of Pakistan for earning foreign exchange as well as engaging millions of workers in picking, textile, garments manufacturing, edible oil production and dairy industry. It is, therefore, important to select high yielding cotton varieties.

Yield is complex entity and is polygenically controlled multicative end product of many factors called yield components. For effective selection, information on nature and magnitude of variation in population, association of character with yield and among themselves and the extent of environmental influence on the expression of these characters is necessary. In such situations, path coefficient analysis may be an important tool to bring about appropriate cause and effect relationship.

MATERIALS AND METHODS

The present investigations for path analysis studies of economic traits of cotton (*G. hirsutum* L.) were conducted at University of Agriculture, Faisalabad, during 1997. Six commercial varieties namely NIAB Krishma, CIM–435, CIM–443, CIM-1100, BH-36 and BH-95 were planted in a field according to a RCBD with three replications. The plants were later thinned to 75 cm between the rows and 30 cm within the row. There were 14 plants in each row having length of 3.9 m. During growth and development of plants, the recommended production practices were applied. At maturity, the middle 10 plants were consecutively taken for collecting data from each row in each replication, while two plants on either end of each row were treated as non experimental. The lint percentage and index were calculated. The lint cotton obtained from each experimental plant was tested individually for its physical parameters i.e. staple length (at both span length 2.5 and 5.0%) in millimeters and fiber fineness in microgram per inch (Micronaire Value). The tests were conducted on High Volume Instrument latest version 3 i.e. HVI-900 SAV-3 installed in the Department of Fiber Technology, University of Agriculture, Faisalabad.

RESULTS AND DISCUSSION

Mean differences among the genotypes for all the characters were highly significant (Table I). This reflected a considerable diversity of genotypes for all plant performance characters. Heritability estimates for lint percentage, lint index and seed cotton yield per plant were statistically significant (standard error value). Among these traits lint index had the maximum heritability followed by lint percentage (Singh *et al*., 1979). Magnitude of the genotypic coefficients of variations for different characters showed the maximum variability for seed cotton yield followed by lint index and fibre fineness. The phenotypic coefficients of variability were higher in magnitude than genotypic coefficients of variability, which was expected because of environmental influence for the character expression. Genotypic correlation coefficients were generally higher than the phenotypic ones, indicating that genetic causes were more active in the expression of correlation (Table II). Lint percentage had positive and significant genotypic correlation with lint index, fibre fineness and seed cotton yield (Khan *et al*., 1985). Lint index had positive and significant correlation with seed cotton yield and non-significant with staple length and fiber fineness. These results were supported by the findings of Singh *et al*. (1981) and Azhar *et al*. (1984). Staple length had positive and significant correlation with seed cotton yield, (Carvalho *et al*., 1994). Micronaire value and seed cotton yield were positively and significantly associated with each other at genotypic level. It may be concluded that coarse fibre could result selecting genotypes with high yield of seed cotton.

Table I. Mean values of genotypes, heritability and coefficient of genotypic variability of different traits of cotton

S.O.V	D.F	LP	LI	SL	FF	SCYPP
Reps	2	0.248	0.038	0.025	0.049	18.223
Genotypes	5	18.200**	2.348**	0.355**	0.901**	1374.891**
Error	10	0.392	0.027	0.01	0.025	34.973
h^2(%)		97.81	98.93	97.00	97.20	97.55
G.C.V.(%)		6.7355	19.2031	6.0783	10.0585	31.636
Genotypes						
CIM-435		39.04 a	6.130 a	30.50 a	4.880 b	94.65 a
CIM443		36.03 bc	4.668 b	28.00 bc	5.800 a	85.00 a
NIAB Krishma		36.51 b	4.522 bc	27.57 c	5.847 a	67.35 b
BH-95		35.23 c	4.552 bc	27.07 c	5.613 a	62.35 b
BH-36		38.18 a	4.239 c	25.33 d	5.580 a	57.50 b
CIM-1100		32.04 d	3.405 d	28.75 b	4.507 c	33.97 c

Genotypes are arranged according to descending order of their merit in seed cotton yield; The values sharing common letters are non-significantly different from each other; LP = Lint percentage; LI = Lint index; SL = Staple length; FF = Fibre fineness; SCYPP = Seed cotton yield per plant; DF = Degree of freedom

Table II. Phenotypic (P) and genotypic (G) correlation coefficients of traits in *G. hirsutum* L.

Variables		LI	SL	FF	SCYPP
LP	P	0.7924**	-0.0260ns	0.3629ns	0.7529**
	G	0.7972*	-0.0178ns	0.3646*	0.7550*
LI	P		0.5235ns	0.0741**	0.9160**
	G		0.5350ns	0.0642ns	0.9269*
SL	P			-0.6049ns	0.4000ns
	G			-0.6127ns	0.3949*
FF	P				0.3368ns
	G				0.3383

= Significant at 5% level of probability; ** = Significant at 1% level of probability; ns = Non-significant

Table III. Path coefficient and correlation coefficient analysis of seed cotton yield vs different fibre quality traits studied in *G. hirsutum* L.

Variables	LP	LI	SL	FF	rg
LP	1.7914	-1.8977	-0.0133	0.1202	0.7750
LI	1.4282	-2.3804	0.4035	0.0211	0.9269
SL	-0.0318	-1.2736	0.7542	-0.2020	0.3949
FF	0.6531	-0.1527	-0.4621	0.3296	0.3383

The direct effect of lint percentage (1.7914) on seed cotton yield was positive and high followed by staple length (0.7542) and fibre fineness (0.3296). Whereas, lint index had negative direct effect on seed cotton yield and had positive and highly significant genotypic correlation coefficient. Lint percentage had negative indirect effect via lint index and staple length, and positive through fibre fineness (Dhanda *et al*., 1984). The positive indirect effect of lint index was shown through lint percentage, staple length and fibre fineness. Staple length had negative indirect effect via lint percentage, lint index and fibre fineness (Table III). Fibre fineness showed positive indirect effect via lint percentage and negative via lint index and staple length.

CONCLUSION

It may be concluded from the present studies that seed cotton yield can be improved by selecting types having fine long fibres and high lint percentage. These types could be crossed to obtain different combinations of these traits for higher yielding segregants. Recurrent selection could be followed to accumulate genes for the said traits in any population.

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