http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (9): 1399-1400, 2000

Path Coefficient and Correlation Analysis of Some Important Plant Traits of *Gossypium hirsutum L.*

Syed Sarfraz Hussain, Faqir Muhammad Azhar and Ishtiaq Mahmood
Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad, Pakistan

Abstract: The correlation studies showed that in the plant material studied, plant height, monopodial branches and No. of bolls per plant were revealed to be significantly correlated with seed cotton yield at genotypic level. The correlation between No. of bolls per plant and plant yield appeared to be strong as compared with other combinations. In addition, plant height showed positive and significant relationship with No. of sympodial branches, No. of bolls per plant and ginning %age. Path coefficient analysis revealed that No. of monopodial branches, No. of bolls per plant had maximum positive direct effect on yield of seed cotton. Therefore, it may be suggested that negative direct effects of plant height, No. of sympodial branches and ginning out turn may be considered as selection criteria to effect indirect improvement in yield of seed cotton and quality in the present breeding material.

Key words: path coefficient, correlation, *Gossypium hirsutum L.* plant traits.

Introduction

The development of cotton varieties of (*Gossypium hirsutum L.*) having greater yield potential with acceptable fibre characteristics is the main objective of cotton breeders. Seed cotton yield of a plant is affected by genetic and environmental factors and thus interaction between these components makes it difficult to select the plant with improved genetic potential of seed cotton yield. In addition, the task of breeder becomes more easier if he also gained some understanding with the relative contribution of each of components towards final yield of a plant. The previous reports on this aspect of a plant showed that yield had positive and significant correlation with plant height, No. of monopodial branches, No. of sympodial branches (Arshad, 1993; Akbar, 1994). It was also revealed that No. of bolls per plant were positively and significantly correlated with yield of seed cotton (Walida *et al.*, 1979; Soomro *et al.*, 1982; Azhar *et al.*, 1984). Similarly, ginning out turn displayed positive association with yield of seed cotton per plant (Khan *et al.*, 1980).

In the present studies, the effort was made to study the degree of correlation among yield and its components in the plant material developed at the campus and also to ascertain cause and effect relationship. The information derived from these studies may be helpful to the other research workers using the genetic material investigated here.

Materials and Methods

In the present study conducted at the University of Agriculture Faisalabad, twelve genotypes developed at the campus namely, B-868, B-869, B-871, B-872, B-873, B-874, B-875, B-876, B-877, B-878, B-879 and two commercial cultivars NIAB-78 and FH-682 were involved . The seed of twelve entries was field planted in single row plot having twelve plants in a row. The seeds were space planted at 75 cm between the rows and 30 cm within the row. The experimental layout was randomized complete block design with three replications.

During the growth and development of plants, the possible plant protection measures and agronomic practices were also followed. At maturity, the data on middle ten consecutive plants were taken, one plant on either end of each row was treated as guarded plant. The data on individual plant were collected and recorded on plant height, number of monopodial branches, number of sympodial branches, number of bolls per plant, ginning out turn and yield of seed cotton per plant.

The mean values of the six characters were subjected to ordinary analysis of variance technique (Steel and Torrie, 1980) in order to determine whether the genotypic differences are significant. The coefficient of genotypic correlation "rg" among six traits were computed following Kwon and Torrie (1964). The "rg" were partitioned into casual components by path coefficient technique described by Deway and Lu (1959).

Results and Discussion

The mean squares from analysis of variance (Table 1) showed that all the genotypes were different for the characters studied except number of monopodial branches in which case variance was reduced to non significant.

The genotypic correlation coefficient (Table-2) shows that number of sympodial branches, number of bolls per plant, ginning out turn and yield of seed cotton were positively correlated with plant height, the "rg" being 0.236, 0.145 and 0.186 which were also statistically significant. However, number of monopodial branches was found to be negatively correlated with plant height (rg =0.313).The correlation coefficients between number of bolls and monopodial branches (0.397) and between yield of seed cotton and monopodial branches (0.444) were positive and significant whilst number of sympodial branches and ginning out turn were negatively and non significantly correlated with monopodial branches. Number of sympodial branches showed negative correlation with number of bolls, ginning out turn and yield of seed cotton, however, the "rg" were non significant. The association between plant height and number of bolls per plant with (rg = 1.0) was strong and complete. The relationship between yield of seed cotton and ginning out turn was although positive, it was non significant. Similar nature of correlation of plant height with number of bolls, ginning out turn and seed cotton yield had been reported in the literature, Thomson, 1973., Dhanda *et al.*1984; Arshad *et al* 1993. However, the previous studies which showed negative correlation of number of sympodial branches with number of bolls per plant, ginning out turn and plant yield did not exist in the literature. Similar was the case of correlation between number of bolls and ginning out turn. The references, which are available, showed positive association of number of bolls and ginning out turn (Butany *et al.*, 1966). However, positive and complete correlation between number of

bolls and plant

Table 1: Mean squares for analysis of variance for different traits in cotton (*Gossypium hirsutum L.*)

Sq	df	Plant height	No. of Monopodial Branches	No.of Sympodial Branches	No. of Bolls per Plant	Ginning out turn	Yield of seed per Plant
Replication	2	0.580	0.01	0.288	0.03	2.935	72.134
Genotype	13	455.931**	1.25n.s	6.546**	8.719**	3.529**	117.534**
Error	26	3.181	0.04	0.429	0.475	1.219	12.454

n.s = Non significant ** = Highly significant

Table 2: Genotypic correlation coefficients among yield and its components

Trait	No. of Monopodial Branches	No. of Sympodial Branches	No. of Bolls per Plant	Ginning out turn	Yield of seed cotton per Plant
Plant height	-0.313	0.236*	0.254*	0.145*	0.186*
No. of Monopodial Branches		-0.377	0.397*	-0.092n.s	0.444*
No. of Sympodial Branches			-0.208n.s	-0.418n.s	-0.203n.s
No. of Bolls per Plant				0.097n.s	1.018*
Ginning out turn					0.009n.s

n.s = Non significant = Significant

Table 3: Path Coefficient analysis depicting direct (Parenthesis) and indirect effects of yield components on yield of seed cotton

Trait	Plant height Branches	No. of Monopodial Branches	No.of Sympodial per Plant	No. of Bolls	Ginning out turn	Genotypic Correlation with yield
Plant height	(-0.064)	-0.00014	-0.0017	0.264	-0.012	0.186
No. of Monopodial Branches	0.199	(0.00045)	0.0027	0.413	0.0078	-0.444
No. of Sympodial Branches	-0.015	-0.00017	(-0.00734)	-0.216	0.035	-0.003
No. of Bolls per Plant	-0.016	0.00018	0.0015	(1.041)	-0.0082	1.018
Ginning out turn	-0.0093	-0.0004	0.0031	(-0.085)	0.009	

yield was confirmed by previous studies (Christidis and Hurrison, 1955; Dhanda *et al,* 1984) . Similarly reports of Christidis and Hurrison (1955) and Azhar (1984) were in agreement with the information reported here about the degree of association between plant yield and ginning out turn.

The partitioning of genotypic correlation coefficients (rg) revealed (Table-3) that although correlation between plant height and yield of seed was positive, plant height showed negative direct effect on the plant yield. Plant height effected yield of seed cotton via number of bolls per plant (0.264). The direct effect of number of bolls per plant upon final plant yield was positive and great. The characters monopodial, sympodial branches and ginning out turn also contributed negatively to plant yield through plant height. Similarly, direct effects of these characters on yield were also negative.

Direct and indirect effects of different components of yield on final productivity of plant had been studied by Walida *et al.*, 1979 in *arboreum sp.* and khan *et al.*, 1991 and reported that number of sympodial branches, number of bolls per plant and ginning out turn had direct positive effect on seed cotton yield. From these results, it may be concluded that in the plant material studied here, it was the number of bolls which directly contributed towards the yield of seed cotton and to a lesser extent, number of monopodial branches. However, the indirect effects through number of monopodial branches appeared to be substantial and suggested some importance of number of monopodial branches. This nature of genetic constitution of the breeding may advantageously be exploited by imposing strong selection pressure only on the number of bolls per plant and chances of success in identification of a high yielding genotype may be more than using plant material in which yield may be affected by multidirectional interactions of different components.

References

Akbar, M., J. Ahmed and F. M. Azhar, 1994. Genetic correlation, Path coefficient and heritability estimates of some important plant traits in upland cotton. Pak. J. Agric. Sci., 31:47-50.

Arshad, M., M. Hanif, I. Noor and S. M. Shah, 1993. Correlation studies on some commercial cotton cultivars of *Gossypium hirsutum L.* Sarhad. J. Agric., 9:49-53.

Azhar, F. M., A. R. Abid and M. A. Khan, 1984. Association of yield with various economic characters in *Gossypium hirsutum L.* The Pak. Cottons, 28:134-137.

Butany, W. T., A. D. Munshi and A. S. Chopra, 1966. Interrelationship between some characters in *Gossypium hirsutum L.* Ind. J. Gen., 26: 262-268.

Christidis, B. G. and G. J. Hurrison, 1955. Cotton growing problems.McGraw Hill Book, Co., Inc.New york.

Dewey,R. D. and K. H. Lu., 1959. A correlation and Path coefficient analysis of components of crested wheat grass seed production. Agron. J., 51: 515-518.

Dhanda, S. S., A. A. Tyagi and D. S. Jatasra, 1984. Character association among quantitative and quality attributes of upland cotton. Ind. J. Agric. Sci., 54: 24-29.

Giri, A. N. and U. C. Upadhyay, 1980. Correlation and Path coefficient analysis of yield components in upland. Crop Imp, 8: 23-27.

Khan, M. A., H. A. Sadaqat and M. Tariq, 1991. Path coefficient analysis in cotton (*Gossypium hirsutum L.*) . J. Agric. Res., 29: 177-184.

Kwon, S. H. and J. H. Torrie, 1964. Heritability and intrrealationship among trials of two soyabean populations. Crop Sci., 4:194-198.

Soomro, B. A., M. M. Channa and M. Ahmad, 1982. Correlation studies *in Gossypium hirsutum L.* The Pak. Cottons, 26: 39-51.

Steel, R. G. D. and J. H. Torrie, 1980. Principles and procedures of statistics; a biological approach., IInd Ed. McGraw Hill Co., Inc. Newyork, USA.

Thomson, N. J., 1973. Invarietal variability and response to single plant selection in *Gossypium hirsutum L.* Phenotypic variability. Agric. Sci. Cabb., 80:125-145.

Walida, R. S., D. S. Jatasra and B. N. Dahiya, 1979. Correlation and Path coefficient analysis of yield components in cotton (*Gossypium hirsutum L.*) Ind. J. Agric. Sci., 49:32-34.