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CORRELATION AND PATH COEFFICIENT ANALYSIS OF YIELD AND YIELD CONTRIBUTING CHARACTERS IN UPLAND COTTON *(GOSSYPIUM HIRSUTUM* LINN.)

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Abstract

Studies on correlation and path-coefficient analysis were conducted with twenty genetically diverse lines of upland cotton (*Gossypium hirsutum* Linn.). Genotypic correlation coefficients were higher than the corresponding phenotypic correlation coefficients in all cases. Seed cotton yield per plant exhibited positive and significant genotypic and phenotypic correlations with number of bolls per plant and boll weight. Path coefficient analysis revealed that the number of bolls per plant had the maximum positive direct effect on seed cotton yield per plant followed by boll weight. Selection for these two characters seemed to be most effective in the present materials.

Key words : Correlation, Path coefficient analysis, Upland cotton.

Introduction

The existing varieties of cotton are late, have a tendency to grow tall and are also susceptible to pests and diseases (Bhale 1988). For the improvement of cotton through breeding, it is very essential to know the nature of association between different yield contributing characters. Seed cotton yield is the cumulative effect of several component characters and the effect of each character on seed cotton yield could be known through correlation studies. The path co-efficient analysis developed by Wright (1921) measures the relative importance as well as direct and indirect influences of each of the yield components. A good number of research works have been reported by many scientists (Butany *et al.*, 1968 ; Balakotaiah 1973 ; Singh *et al.*, 1979 ; Roy and Malek 1987) but the studies on yield components are not always the same. An attempt was, therefore, made to determine the interrelationships among seed cotton yield and yield contributing characters and thereby to findout the appropriate plant attributes for selection towards development of high yielding varieties of upland cotton.

Materials and Methods

Twenty genetically diverse genotypes of upland cotton (viz. LB[2]CDCAS, UG-3774, S-71803985, Beli Izvor, UPL-CT-3, S-71803785, GARANT, TAMCOT-SP-37, BAC-

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798185, BLCDPS, LEBOCAS × Wilt, CABCS - 1 - 1 - 83, S-8484, OCAHUS, S-684, BLLEBOS, CACES-1-1-83, LEBOCAS, CABCS-1-83 and Rupali ; collected from different cotton growing countries and one local check) were grown in a randomized complete block design with four replications at Cotton Research Station, Bangladesh Agricultural Research Institute, Rangpur in 1989-90 during rabi season. Plot size was 2.4 × 6.0 m^2. Row to row and plant to plant distances were 60 cm and 30 cm, respectively. Recommended agronomic practices were followed during crop growth. Observations were recorded from 10 random plants in each plot on first sympodial node number, number of sympodia per plant, number of bolls per plant, boll weight (g), ginning percentage and seed cotton yield per plant (g). Phenotypic and genotypic correlations were calculated according to the method suggested by Al-Jibouri *et al.* (1958) and path-coefficient analysis was carried out using genotypic correlation coefficient as suggested by Dewey and Lu (1959).

Results and Discussion

Correlations :

Genotypic and phenotypic correlation coefficients are presented in Table 1. Genotypic correlation coefficients were higher than the corresponding phenotypic correlation coefficients in all cases, indicating little environmental influence on the traits. Waldia *et al.* (1979) reported similar result for tree cotton.

Seed cotton yield was found positively and significantly correlated with number of bolls and boll weight, which indicated that the yield can be increased through the increase of number of bolls and boll weight. Similar correlations between seed cotton yield and number of bolls was also observed by Singh *et al.* (1970) and Singh *et al.* (1989). Number of bolls was positively and significantly correlated with number of sympodia indicating that higher number of sympodia can produce higher number of bolls. Highly significant and negative correlation coefficients were observed between

Table 1. Genotypic (G) and phenotypic (P) correlation coefficients for different characters in upland cotton.

Characters		Number of sympodia/ plant.	Number of bolls/plant.	Boll weight.	Ginning percentage	Seed cotton Yield/plant.
First sympodia	G	-0.7298 **	-0.2812 *	0.2752 *	0.1818	-0.0057
node number	P	-0.5839 **	-0.2288	0.2589	0.1295	-0.0024
Number of	G		0.4435 **	-0.5532 **	-0.1592	-0.0640
sympodia/plant	P		0.3599 **	-0.4830 **	-0.1414	-0.0445
Number of	G			-0.0182	-0.4049 **	0.7209 **
bolls/plant	P			-0.0175	-0.3698 **	0.6493 **
Boll weight	G				0.0506	0.3884 **
	P				0.0502	0.3750 **
Ginning	G					-0.4161 **
percentage	P					-0.4043 **

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

number of sympodia and first sympodial node number which indicated that number of sympodia can be increased through the decrease of first sympodial node number. But number of sympodia was negatively and significantly correlated with boll weight indicating that higher number of sympodia can decrease the boll weight. Seed cotton yield and number of bolls were negatively and significantly correlated with ginning percentage. Evidently, seed cotton yield can be increased with the decrease of ginning percentage and ginning percentage can be decreased with the increase of number of bolls.

Path co-efficient analysis :

Number of bolls exhibited the highest (p=0.8198) direct effect and the highest correlation coefficient (r= 0.7209) with seed cotton yield (Table 2) indicating that this character had a outstanding contribution towards seed cotton yield. Waldia *et al.* (1979), Singh *et al.* (1979) and Roy and Malek (1987) also recorded the maximum contribution of number of bolls towards seed cotton yield. Number of bolls also showed positive indirect effect on seed cotton yield through ginning percentage and first sympodial node number. Boll weight manifested positive direct effect and higher correlation coefficient with seed cotton yield indicating an important factor contributing to the yield. Butany *et al.* (1968) and Waldia *et al.* (1978) also considered the boll weight to be an important factor towards the yield. Boll weight also showed poor positive indirect effect on seed cotton yield through number of sympodia. First sympodial node number, number of sympodia and ginning percentage showed negative direct effect towards seed cotton yield and their genotypic correlations with the yield were also negative. The highest indirect effect (p=0.3636) was found between number of sympodia and number of bolls towards seed cotton yield. Similar result was also reported by Singh *et al.* (1968) and Singh *et al.* (1979). This fact indicated that the yield can be increased indirectly by increasing number of sympodia.

Table 2. Path coefficient analysis showing direct and indirect effects of 5 variables on seed cotton yield per plant.

Characters	Effect through					Genotypic correlation with seed cotton yield
	1st sympodial mode number	Number of sympodia/ plant	Number of bolls/plant	Boll weight	Ginning percentage	
1st sympodial node number	**-0.1084**	0.3003	-0.2305	0.0585	-0.0256	-0.0057
Number of sympodia/plant	0.0791	**-0.4114**	0.3636	-0.1176	0.0224	0.0640
Number of bolls/plant	0.0305	-0.1825	**0.8198**	-0.0039	0.0569	0.7209
Boll weight	-0.0298	0.2276	-0.0149	**0.2127**	-0.0071	0.3884
Ginning percentage	-0.0197	0.0655	-0.3319	0.0107	**-0.1407**	-0.4161

Residual effect = 0.4908.
Diagonal (bold) values denote direct effects.

Thus, correlation and path co-efficient analysis revealed that number of bolls and boll weight to be the most important components of seed cotton yield. Selection based on these yield contributing characters might be effective to develop high yielding varieties of upland cotton.

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