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CORRELATION ANALYSIS OF SEED COTTON YIELD WITH SOME QUANTITATIVE TRAITS IN UPLAND COTTON (*GOSSYPIUM HIRSUTUM* L.)

SHAZIA SALAHUDDIN[1], SAIFULLAH ABRO[2], A. REHMAN[3] AND KHALID IQBAL[1]

[1]*Agriculture Research Institute, Tando Jam, Sindh, Pakistan*
[2]*Nuclear Institute of Agriculture (NIA), Tando Jam 70060, Sindh, Pakistan*
[3]*International Center for Chemical and Biological Sciences, NIA, TandoJam, Pakistan*.

Abstract

Correlation and regression studies of cultivars of *Gossypium hirsutum* L., were analysed for quantitative characters. Results revealed that highly significant positive correlation (r=0.567) was displayed by sympodial branches with seed cotton yield, which showed that seed cotton yield was greatly influenced by sympodial branches. The coefficient of determination (r^2=0.321) revealed 32.1% variation in the seed cotton yield per plant, due to its relationship with sympodial branches per plant. Regression coefficient (b=5.66) showed that a unit increase in sympodial branches per plant resulted into a proportional increase of 5.66 gms in seed cotton yield per plant, whereas bolls per plant exhibited strong positive association with seed cotton yield (r=0.959). The coefficient of determination (r^2=0.92) revealed 92% of the total variation in seed cotton yield attributable to the variation in number of bolls per plant. The regression coefficient (b=3.37) indicated that for a unit increase in bolls per plant, there would be a proportional increase of 3.37 gms in seed cotton yield per plant. Boll weight displayed a highly significant positive correlation (r=0.597) with seed cotton yield per plant. The coefficient of determination (r2=0.356) determined that boll weight was responsible for 35.6% variation in seed cotton yield per plant. The regression coefficient (b=53.479) indicated that a unit increase in boll weight resulted into corresponding increase of 53.48 gms in seed cotton yield per plant. However, the plant height and monopodial branches per plant showed non significant association with the yield per plant.

Introduction

Cotton (*Gossypium hirsutum* L.) occupies a prime position as fibre crop of masses of the world in general and of Pakistan in particular. The sufficient production of cotton for meeting the fibre requirements of the world's exploding population is now universally realized. Keeping in view the future needs of the country, cotton research needs to be versatile and accelerated to develop more productive cotton genotypes for various agro–ecological production areas of Pakistan. It is desirable for plant breeder to know the extent of relationship between yield and its various components which will facilitate him in selecting plants of desirable characteristics.

Expression of various traits is oftenly changed as the changing breeding material and environment. Therefore the information of character associations between the traits themselves and with the yield is important for the breeding material subjected to selection for high yielding genotypes. Considerable emphasis has been given upon the inter relationship between yield and yield components in cotton. Fonseca & Paterson (1968) found that correlation coefficient analysis measures the magnitude of relationship between various plant characters and determins the component character on which selection can be based for improvement in seed cotton yield. The true picture of correlation between seed cotton yield and traits is reflected from direct effect of that trait which will help for identifying the trait that contribute directly to improve seed cotton yield.

The understanding of the correlation of factors influencing yield is a pre-requisite for designing an effective plant breeding programme. It helps in the identification of the yield components, yet they do not provide precise information regarding the relative importance of direct and indirect influence of each componential character (Baluch *et al*., 1992). Significant positive correlation of seed cotton yield per plant with number of sympodia, plant height and bolls per plant were also observed by Ansari (1978). Number of sympodia, boll weight and bolls per plant were significantly and positively correlated with seed cotton yield per plant (Iqbal *et al*., 2006).

The present study of correlation and regression analysis involves 15 genotypes of cotton for the information of interrelationship between yield and other important yield components which could be used as selection criteria in the breeding programme.

Materials and Methods

The data were collected from an experiment conducted at the experimental farm of Nuclear Institute of Agriculture, Tandojam, during Kharif Season 2001, in order to find out the linear correlation and regression analysis of cultivars of *Gossypium hirsutum* L. The seeds of nine intra-specific F_2 hybrids, developed through crossing six genotypes (Chandi-95, AEC-76/3/89, Sohni, NIAB-98, NIAB-801 and LRA-5166) of cotton by line x tester method, alongwith their parents were sown in a randomized complete block design with three replications. For each F_2 population, plot size was 20'x15' (300 Sq. feet). Row to row space was kept 75 cm and plant to plant distance was 30 cm. All the recommended agronomic practices and plant protection measures were adopted to obtain healthy plants.

Correlation and regression studies have been carried out in *Gossypium hirsutum* L., genotypes between seed cotton yield and other quantitative characteristics. Correlation coefficients (r), coefficients of determination (r^2), regression coefficients (b) and their significance have been determined after Snedecor & Cochran (1980) between character combinations as follow:

1. Plant height and seed cotton yield per plant
2. Monopodial branches per plant and seed cotton yield per plant
3. Sympodial branches per plant and seed cotton yield per plant
4. Bolls per plant and seed cotton yield per plant
5. Boll weight and seed cotton yield per plant

Results and Discussion

The analysis of variance (ANOVA) presented in Table 1 showed that all the genotypes differed significantly at $p<0.01$ for all the characters. This provided the evidence for the significant genetic variability present for these traits among the genotypes.

Correlation coefficients (r), coefficients of determination (r^2), regression coefficients (b) and their regression lines developed on Figs. 1 to 5 are presented in Table 2.

Table 1. Mean squares corresponding to various sources of variation for seed cotton yield and other quantitative traits in *Gossypium hirsutum* L.

S/V	D.F	Plant height (cm)	Monopodia no. /plant	Sympodia no. /plant	Boll weight (g)	No. of bolls /plant	S.C. yield (g)
Genotypes	14	581.91**	0.11**	6.70**	0.09**	53.93**	667.59**
Replication	2	9.34	0.05	0.47	0.03	2.5	16.89
Error	28	17.02	0.03	0.44	0.003	1.30	7.03

**Significant at $p<0.01$ percent level of probability

Table 2. Correlation coefficient (r), coefficient of determination (r^2), regression coefficient (b) and their significance for seed cotton yield and other quantitative traits in *Gossypium hirsutum* L.

S. No.	Character combination	r	r^2	b	Remarks
1.	Plant height and seed cotton yield per plant	0.202	0.041	0.216	N.S
2.	Monopodial branches per plant and seed cotton yield per plant	0.220	0.048	17.020	N.S
3.	Sympodial branches per plant and seed cotton yield per plant	0.567	0.321	5.660	H.S
4.	Bolls per plant and seed cotton yield per plant	0.959	0.92	3.373	H.S
5.	Boll weight and seed cotton yield per plant	0.597	0.356	53.479	H.S

HS= Highly significant, N.S. = Non-significant

1. Plant height and seed cotton yield: Plant height exhibited Positive but non-significant correlation co-efficient (r=0.202) with yield per plant (Table 2). The coefficient of determination (r^2=0.041) revealed 4% of the total variation in seed cotton yield attributable to the variation in plant height. The regression coefficient (b= 0.216) indicated that for a unit increase in plant height, there would be a proportional increase of 0.216 gms in seed cotton yield per plant. However, the results are fully supported by Surriya (1996) who conducted experiments in cotton to find out the correlations of yield with various plant characters and found that non-significant associations between plant height and yield per plant. It is therefore, suggested that breeder should very careful in the selection programme based on the association of plant height and seed cotton yield.

2. Monopodial branches per plant and seed cotton yield per plant: Table 2 and Fig. 2 reveals that a non-significant positive correlation (r=0.220) of monopodial branches with seed cotton yield per plant has been found. The coefficient of determination (r^2=0.048) revealed 4% of the total variation in seed cotton yield due to the variation in monopodial branches. The regression coefficient (b= 17.02) showed that for increase in number of monopodial branches there would be a proportional increase of 17.02 gms in seed cotton yield. The findings observed by the author in present research work are in agreement to the results found by Ansari *et al.*, (1989) and Killi (1995). They calculated the correlation of yield with monopodial branches per plant and reported non-significant correlations between these two characters. Nevertheless the results of the author are not supported by the findings reported by Surriya (1996) and Murthy (1999). They found positive and significant relationship between monopodial branches and seed cotton yield per plant. This may be due to different genetic makeup of the experimental material. It is concluded that the relationship of monopodial branches with seed cotton yield per plant is weak and it could not be a criterion for selection.

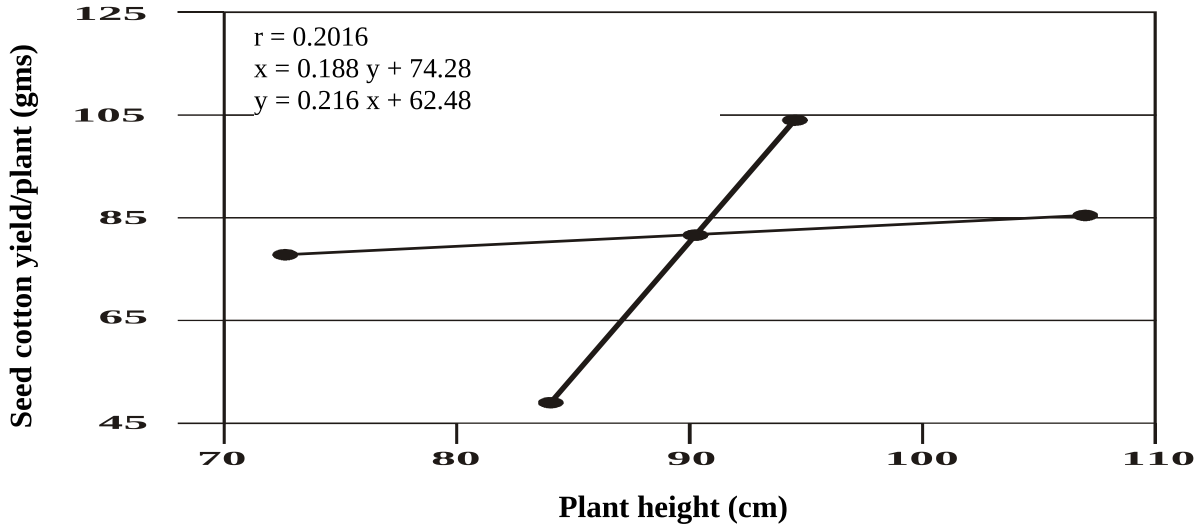

Fig. 1. Relationship between plant height and seed cotton yield in *Gossypium hirsutum* L.

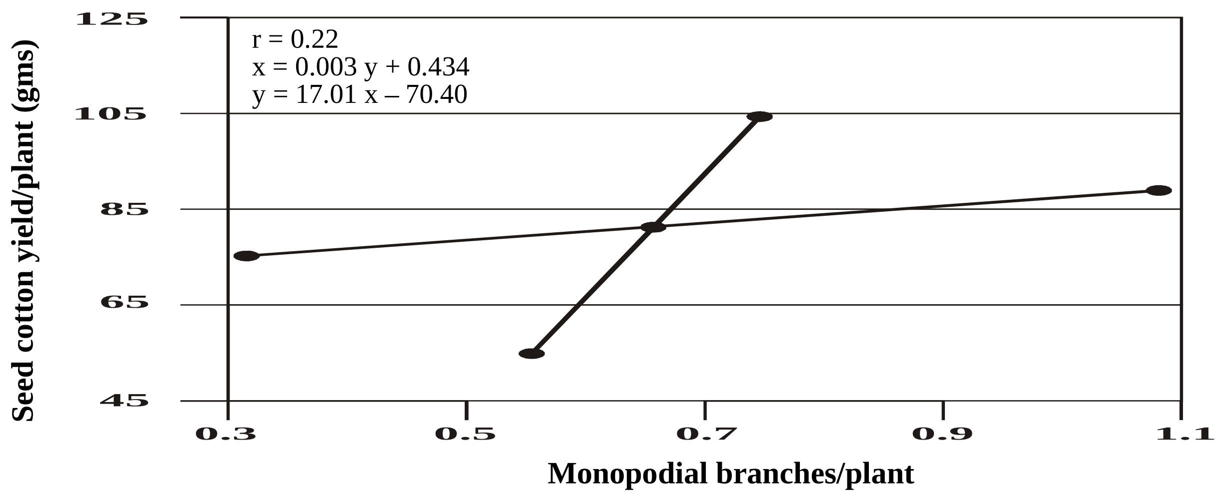

Fig. 2. Relationship between monopodial branches and seed cotton yield in *Gossypium hirsutum* L.

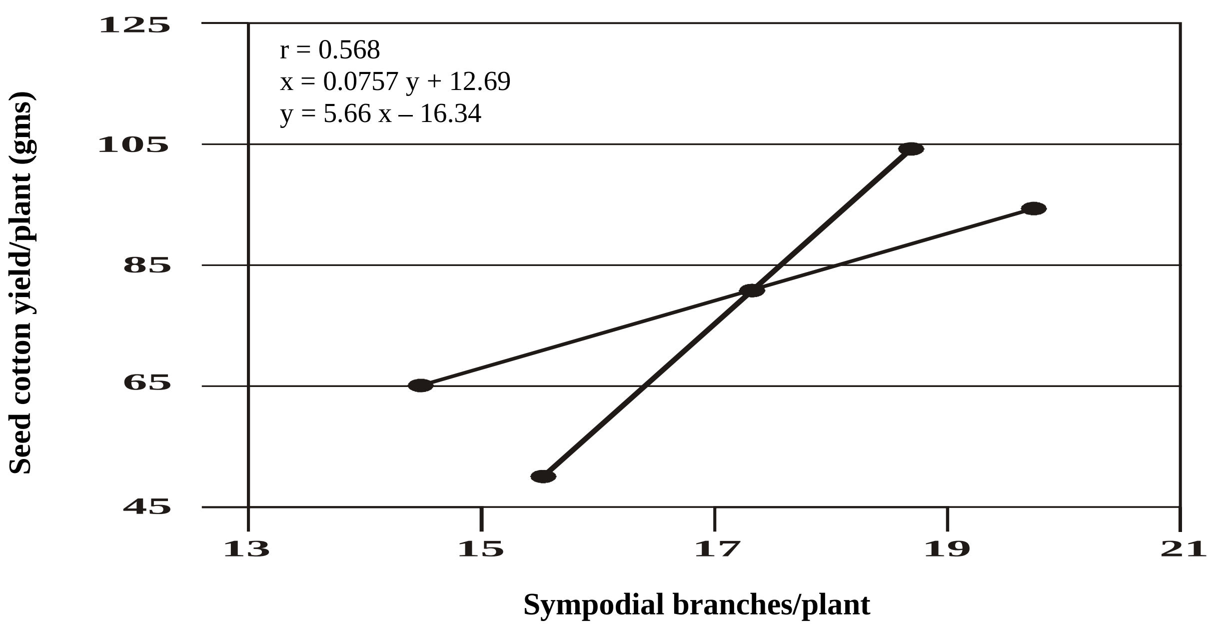

Fig. 3. Relationship between sympodial branches and seed cotton yield in *Gossypium hirsutum* L.

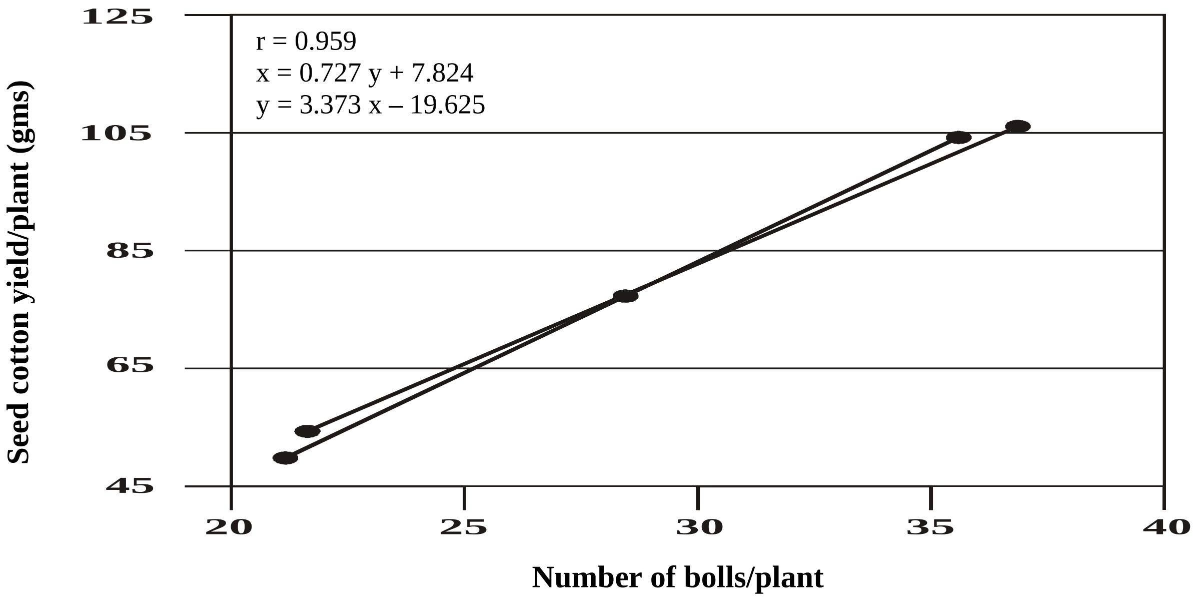

Fig. 4. Relationship between number of bolls and seed cotton yield in *Gossypium hirsutum* L.

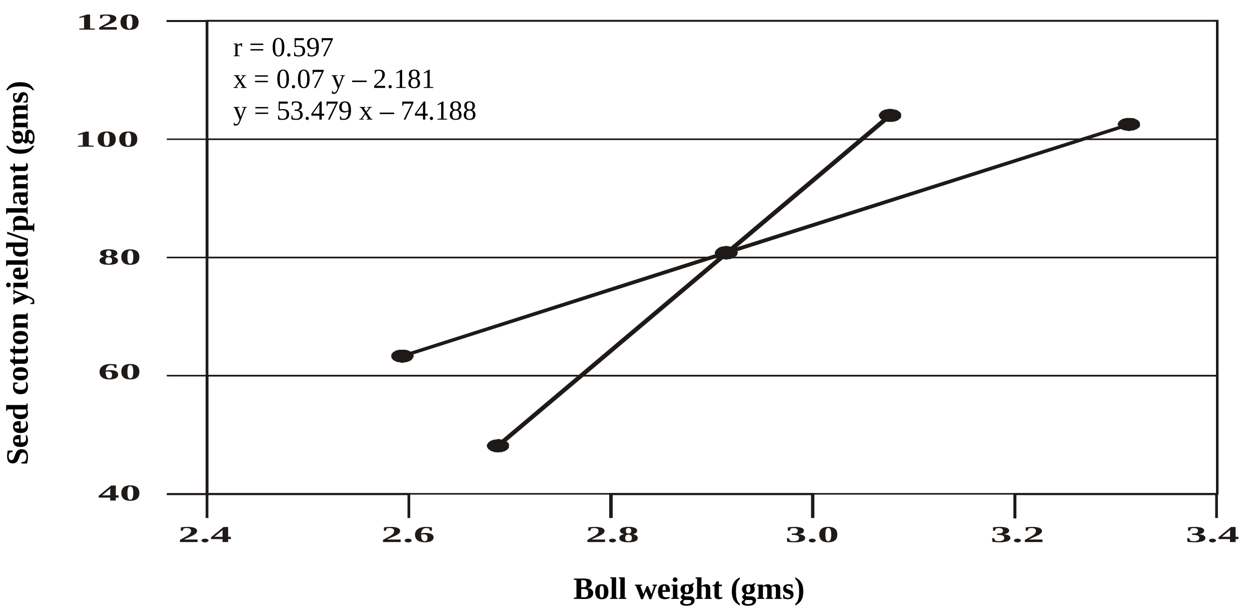

Fig. 5. Relationship between boll weight and seed cotton yield in *Gossypium hirsutum* L.

3. Sympodial branches per plant and seed cotton yield per plant: Highly significant positive correlation (r=0.567) was displayed by sympodial branches with seed cotton yield which showed that seed cotton yield was greatly influenced by sympodial branches. The results found by the author are in complete agreement with Ansari *et al*., (1991b), Qayyum *et al*., (1992), Arshad *et al*., (1993), Surriya (1996), Larik *et al*., (1999), Murthy (1999), Sultan *et al*., (1999), Satange *et al*., (2000) and Soomro (2000) who also worked with cotton and found that sympodial branches were highly significantly correlated with seed cotton yield per plant. The coefficient of determination (r^2=0.321) revealed 32.1% variation in the seed cotton yield per plant, due to its relationship with sympodial branches per plant. Regression coefficient (b=5.66) showed that a unit increase in sympodial branches per plant resulted into a proportional increase of 5.66 gms in seed cotton yield per plant(Table 2 and Fig.3).The results observed in present study exhibited highly significant positive correlation between sympodial branches and seed cotton yield per plant. This indicates that selection based on sympodial branches per plant will be useful for increasing the seed cotton yield per plant in present material. This fruitful correlation can be helpful in selection programme for improvement of cotton varieties towards the yield.

4. Bolls per Plant and Seed Cotton Yield per Plant: It is clear from Table 2 and Fig.4 that bolls per plant exhibited strong positive association with seed cotton yield (r=0.959). The coefficient of determination (r^2=0.92) revealed 92% of the total variation in seed cotton yield attributable to the variation in number of bolls per plant. The regression coefficient (b=3.37) indicated that for a unit increase in bolls per plant, there would be a proportional increase of 3.37 gms in seed cotton yield per plant.

The present experimental study revealed that there had been positive and highly significant association between bolls per plant and seed cotton yield per plant. This exhibited that selection for high seed cotton yield per plant based on bolls per plant would be beneficial. Surriya (1996), Murthy (1999), Soomro (1999), Azhar *et al.*, (1999), Larik *et al.*, (1999), Sultan *et al.*, (1999), Satange *et al.*, (2000), Afiah & Ghoneim (2000) and Hussain *et al.*,(2000) conducted research studies with cotton (*Gossypium hirsutum* L.) and obtained positive and highly significant association between bolls per plant and seed cotton yield per plant.

5. Boll weight and seed cotton yield per plant: Boll weight displayed a highly significant positive correlation (r=0.597) with seed cotton yield per plant. This shows close association of the two characters and this meaningful association can be exploited in selection programme leading towards the improvrment of cotton varieties. The result obtained by Jehangir & Krishnaswamy (1990), Dedaniya & Pethani (1994), Sambamorthy *et al*., (1994), Bhatnagar (1995), Larik *et al*., (1999), Sultan *et al*., (1999), Afiah & Ghoneim (2000), Soomro (2000), Hussain *et al*., (2000) and Satange *et al.*, (2000) are in accordance with the results presented here in. The coefficient of determination (r^2=0.356) determined that boll weight was responsible for 35.6% variation in seed cotton yield per plant. The regression coefficient (b=53.479) indicated that a unit increase in boll weight resulted into corresponding increase of 53.48 gms in seed cotton yield per plant (Fig. 5 and Table 2).

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