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

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Abstract: The correlation coefficient analysis showed that all the characters observed in this experiment have positive correlation with yield of seed cotton per plant. As regards the significance of correlation, these differ in respect as number of bolls per plant and average boll weight are highly significant while staple length has significant correlation and seed inde, lint index and ginning outturn are non significant. The value of coefficients of determination revealed that larger proportion of probability in yield was accounted for number of bolls per plant.

Key words: Correlation analysis, economic character *Gossypium hirsutm* L.

Introduction

The final product of cotton plant is a complex character because many yield components interact with each other under certain environment. The contribution of different components of yield vary in their extent and thus provide hinderance in the estimation of genetic potential of a plant. The correlation analysis of different plant characters provides an index to predict the corresponding change which occurs in one character at the expense of proportionate change in the other. Ample evidence on this aspect are accumulated in the literature where in yield has been reported to be positively and significantly correlated with number of bolls per plant (Channa and Ahmad, 1982; Mahla and Singh, 1988; Khan *et al*., 1991; Tariq *et al*., 1992; Arshad *et al*.,1993; Akber *et al*.,1994). Additional studies showed that seed and lint indices had also been observed to be positively associated with yield of seed cotton (Memon *et al*., 1988; Channa and Ahmad, 1982; Memon *et al*., 1988; Tyagi *et al*., 1998; Tariq *et al.,* 1992; Akber *et al*., 1994). Similarly the studies of Khan *et al*. (1980) and Memon *et al*. (1988) showed that ginning percentage and staple length were positively and significantly correlated with yield of seed cotton.

Such information about the nature and extent of correlation about the plant material studied here are not available in the literature. Thus collection of information about the present genetic material would be useful for continued efforts for breeding promising genotype in the depth, and thus with the same objective, the present studies were conducted under Faisalabad conditions.

Materials and Methods

The plant material for the present studies conducted at the Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad comprised of twelve advance progenies (Bulk) namely B-868, B-869, B870, B-871, B-872, B-873, B-874, B-875, B-876, B-877, B-878, B-879 and two standard commercial cultivars NIAB-78 and FH-682 of *hirsutum* sp. These genotypes were distinguishable for the characters studied. The seed of the twelve genotypes was field planted in rows during the crop season 1994-95, following randomized complete block design with three replications. The plants were later thinned keeping the distance of 75 cms between the rows and 30 cms with in the rows.

At maturity, central ten plants were kept for the collection of data while marginal plant on either side of the row was treated as discard. The data regarding yield of seed cotton (gm), number of bolls per plant in each progeny were recorded in the field. Other tests were carried 0ut in the laboratory. To calculate ginning outturn, total seed cotton obtained from a plant was ginned and seed lint ratio was determined. Staple length of each plant was calculated by tuft method by taking the average of two tufts of each sample. For seed index, random sample of one hundred seeds of each plant was weighed in grams. Lint index of each plant was determined by the following formula:

$$\text{Lint index: seed index} = \frac{5 \text{ Ginning outturn}}{100\text{-Ginning outturn}}$$

All the observations of each character were averaged for further statistical manipulation. Simple phenotypic correlation coefficients (r), coefficients of determination (r^2) and regression coefficients (byx) were computed.

Results and Discussion

The correlation coefficients given in Table 1 showed that number of bolls per plant was positively correlated with yield of seed cotton and the "r" value (0.95) was highly significant ($p<0.01$). This suggested that any change in number of bolls is directionally proportional to the effect in yield per plant. The high regression value of number of bolls upon yield of seed cotton further indicated that dependence and relationship between the two characters was correct. Similar suggestion had already been given by Channa and Ahmad (1982), Mahla and Singh (1988), Khan *et al*. (1991), Tariq *et al*. (1992), Arshad *et al*. (1993) and Akber *et al*. (1994) who also reported positive and significant correlation between the character pair in this plant Material. Coefficients of determination ($r^2 = 0.9025$) was also high and indicated that larger proportion of variability (90.25%) in yield was due to variation in number of bolls. These situations suggested that the present plant material might advantageously be exploited to bring improvement in yield of seed cotton by making of selection of plants bearing increased number of bolls on a plant.

Similar to number of bolls, boll weight also showed positive correlation with yield of seed cotton and $r = 0.62$ was highly significant. The correlation coefficient indicated that any improvement in boll weight may have a positive effect upon yield of the plant. The regression coefficient is moderate in magnitude revealing dependence of the character. Similar results about the relationship between the characters had already been reported by Channa and Ahmad (1982). The coefficient of determination revealed that 38.44% variability in plant yield was contributed by boll weight. Therefore, to increase the yield per plant, the selection for the larger boll size would need due care and attention while looking for a plant having increased yield.

Table 1: Correlation coefficients, coefficients of determination and regression coefficients of yield with its various economic characters of *Gossypium hirsutum* L.

Character pairs	Correlation coefficients (r)	Coefficients of Determination	Regression coefficients (byx)
1. Yield of seed cotton vs. No. of bolls per plant	0.950**	0.9025	3.48
2. Yield of seed cotton vs.average boll weight	0.620**	0.3844	19.17
3. Yield of seed cotton vs.seed index	0.220	0.0484	2.94
4. Yield of seed cotton vs. lint index	0.150	0.0225	2.03
5. Yield of seed cotton vs. ginning outturn	0.005	0.000025	0.03
6. Yield of seed cotton vs. staple length	0.330*	0.1089	2.81

* = Significant ** = Highly Significant

A perusal of the results presented in the Table revealed that yield of seed cotton and seed index were positively interrelated with each other. The positive correlation coefficient was non significant and accordingly, regression value was low which indicated little dependence on seed index. However, the previous observations of Memon *et al.* (1988) who observed positive and significant correlation between these characters. The coefficient of determination was very low which further revealed that selection for seed index may not be useful to improve yield of seed cotton. Nevertheless, there is some evidence variation is present in seed index and the breeder will have to make vigorous selection of the character. These findings partially agreed with those of early studies conducted by Memon *et al*. (1988). The observations made in this material concluded that lint index had low contribution for improvement in yield. The "r^{2}" value indicated that lint index caused only little variation in yield which suggested that chances for the improvement of yield on the basis of the lint index were very low. A critical examination of the results in Table 1 revealed positive relationship between yield of seed cotton and ginning outturn. The "r" value was non significant which revealed that increase in ginning outturn had no impact to increase the yield of seed cotton. The results obtained about the material appeared to disagree with those results as already had been recorded and reported by Memon *et al.* (1988). The "r^{2}" value was very low which exhibited that variation due to this character is negligible. The correlation between seed cotton and staple length was positive and significant. The correlation coefficient (r = 0.33) was significant with a regression value (2.31). These results revealed positive tendency of yield of seed cotton with staple length , meaning thereby increase in staple length corresponds to the increase in yield of seed cotton. The coefficient of determination value further revealed that variation up to 10.89% was possible in yield.

The situations of the associations is again not confirmed from the studies of Gesos and Pulatove (1979) who reported negative and significant correlation between these characters, however, the present results were Supported by those of Khan *et al*. (1980), who claimed positive correlation between these two characters. Staple length is an important quality character which can not be ignored at the cost of quantity, hence efforts should be made to improve the quality while working for quantity.

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