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Research Article

Correlation for Economic Traits in Upland Cotton

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Abstract

The study was conducted to find correlation between various economic traits in upland cotton (*Gossypium hirsutum* L.) using ten parental genotypes and their 45 F1 hybrid progeny. The data were recorded for different yield contributing traits i.e. plant height, number of sympodial branches per plant, number of bolls per plant, boll weight, number of seeds per boll, ginning out turn, fiber length, fiber strength, fiber fineness and seed cotton yield per plant. The study revealed that plant height showed positive correlation with number of sympodial branches per plant (r = 0.359), number of bolls per plant (r = 0.255), fiber length (r = 0.220) and yield of seed cotton (r = 0.206) while plant height negatively correlated with fiber fineness (r = -0.299). Number of sympodial branches per plant had positive correlation with number of bolls per plant (r = 0.397) and yield of seed cotton (r = 0.163). Number of bolls per plant had positive correlation with yield of seed cotton (r = 0.596), while number of bolls per plant had negative association with fiber length (r = -0.158). Boll weight exhibited positive correlation with number of seeds per boll (r = 0.613) and yield of seed cotton (r = 0.527). Number of seeds per boll had positive correlation with fiber length (r = 0.201) and yield of seed cotton (r = 0.243). Ginning out turn showed positive correlation with fiber length (r = 0.184) while this trait had negative correlation with fiber fineness (r = -0.194). Fiber length showed positive correlation with fiber strength (r = 0.220) while fiber length showed negative association with fiber fineness (r = -0.548). Fiber strength had negative correlation with fiber fineness (r = -0.188). It was concluded that for improvement in yield careful selection should be done for the traits which control yield.

Keywords: Upland Cotton; Correlation; Yield Contributing Traits; Seed Cotton

Introduction

Cotton crop is grown in many countries of the world. It is simultaneously a fiber as well as food crop. In addition to fiber, it also provides cotton seed cake which is used for animal feed. It is considered as white gold as it contributes in industrial, economic and agricultural development of a country. Cotton crop contributes 1.0% to the GDP and 5.2% in the value addition of agriculture in Pakistan [1]. About 1.5 million population of Pakistan earn their livelihood from the cultivation of cotton [2]. In Pakistan it was cultivated on an area of 2.489 million hectares from which the production recorded was 10.671 million bales [1].

There are many factors which influence the seed cotton yield. Therefore, improvement in yield a throughput knowledge of correlation of different traits is essential. For the selection criteria of plants, it is necessary to know about direct or indirect correlation [3]. The correlation between different yield contributing traits may be useful to enhance the yield of seed cotton. The correlation estimates show the specific trait response with its related traits and it also provides the estimate that what extent of change may occur in one trait due to the change in other trait [4]. To produce high yielding varieties is the prime objective of plant breeders. The seed cotton yield depends on many factors such as height of plant, monopodia plant-1, sympodia plant-1, bolls

number plant-1, weight of boll, seeds number boll-1 and ginning out turn etc. It is necessary for plant breeders to know the extent of association between yield and its components which helps selecting the plants with required traits. For improvement of seed cotton yield and quality of fiber the knowledge about the association is exploited [5,6]. Before starting the successful breeding program, it is necessary for cotton breeders to have the knowledge of traits association with yield and fiber quality [7].

This study was designed with the objective to find the association among various yield and yield contributing traits of upland cotton.

Materials and Methods

The research was conducted during 2013 - 2014 at the experimental area of Department of Plant Breeding and Genetics, University of Agriculture Faisalabad, Pakistan. Ten genotypes of upland cotton viz., CIM-600, CRS-456, MNH-586, PB-38, Gumbo Okra, VH-57, Coker-100/A2, L.A. Fregobract, PB-52-NC-63 and PB-896 were included in this study. These parental genotypes were planted in pots in green house in November-December 2013 and crossed to produce forty-five F1 hybrids. During May 2014 the parental genotypes along with their F1 hybrids were planted under randomized complete block design with 3 replications. The plant to plant and row to row spacing were kept 30 and 75 cm, respectively. All the recommended agronomic practices were followed from sowing till harvest. The data were recorded from randomly selected five guarded plants/genotype from each replication for yield and yield related traits including; plant height (cm), number of sympodia plant^{-1}, number of bolls plant^{-1}, boll weight (g), number of seeds boll^{-1}, ginning out turn (GOT%), fiber length (mm), fiber strength (g/tex), fiber fineness (µg/inch) and yield of seed cotton (g). The collected data was subjected to analysis of variance following the method proposed by Steel., *et al.* [8] in order to determine significant differences in plant characters among the genotypes/F_1 generations under study. The characters showing significant differences were further analyzed for correlation coefficients by the formula as outlined by Dewey and Lu [9] using Minitab program of computer.

Results and Discussion

The mean squares from the analysis of variance (Table 1) showed that all the traits i.e. plant height, number of sympodia plant^{-1}, number of bolls plant^{-1}, boll weight, number of seeds boll^{-1}, ginning out turn, fiber length, fiber strength, fiber fineness and yield of seed cotton shows significant differences. Our results are in accordance with Abbas., *et al.* [4] who reported significant differences for plant height, number of sympodial branches, number of bolls, staple length and fiber fineness. Rehman., *et al*. [10] reported significant differences for number of sympodia per plant and ginning out turn. Dinakaran., *et al*. [11] also reported significant differences for bolls number plant^{-1}, weight of boll, ginning out turn and yield of seed cotton plant^{-1}.

SOV	DOF	PH	SB	BN	BW	SPB	GOT%	FL	FS	FF	SCY
Replications	2	9.55	44.71**	138.56*	0.004	0.086	32.05*	0.487*	8.73**	0.52	2.91
Varieties	54	508.90**	5.77**	91.38**	0.39**	23.54**	204.53**	4.07**	2.91**	26.49**	1365.17**
Error	108	10.76	2.64	36.83	0.012	0.159	10.24	0.153	1.64	0.79	1.69

Table 1: Mean squares from ANOVA for various morphological plant traits upland cotton.

** = Significant at 0.05 and 0.01 Probability levels, respectively.

Ns = Non-Significant.

Source of Variation (SOV); Degree of Freedom (DOF); Plant Height (PH); Number of Sympodial Branches Per Plant (SB); Number of Bolls Per Plant (BN); Boll Weight (BW); Number of Seeds Per Boll (SPB); Ginning Out Turn (GOT); Fiber Length (FL); Fiber Strength (FS); Fiber Fineness (FF) and Seed Cotton Yield (SCY).

Correlation Studies

Studies on correlation (Table 2) revealed significant positive association of plant height with number of sympodia plant^{-1} (r = 0.359), number of bolls plant^{-1} (r = 0.255), fiber length (r = 0.220) and yield of seed cotton (r = 0.206) while plant height negatively correlated with fiber fineness (r = -0.299). Rahman., *et al.* [12] also reported positive association of yield of seed cotton with number of sympodia plant^{-1} and number of bolls plant^{-1}. Plant was height positively correlated with number of bolls plant^{-1}, boll weight and yield of seed cotton. Sympodial branches plant^{-1} had positive cor-

relation with number of bolls plant^{-1} (r = 0.397) and yield of seed cotton (r = 0.163). Farooq., *et al.* [13] reported positive association of number of sympodia plant^{-1} with number of bolls plant^{-1}. Number of bolls plant^{-1} positively correlated with yield of seed cotton (r = 0.596). Kamrul., *et al.* [14] also reported number of boll plant^{-1} and yield of seed cotton was positively correlated. While number of bolls plant^{-1} had negative correlation with fiber length (r = -0.158). Boll weight showed positive correlation with number of seeds boll^{-1} (r = 0.613) and yield of seed cotton (r = 0.527). It was also confirmed by Rao and Gopinath [15] that boll weight positively influenced the yield of seed cotton. Number of seeds boll^{-1} had positive correlation with fiber length (r = 0.201) and yield of seed cotton (r = 0.243). Number of seeds boll^{-1} and yield of seed cotton were positively correlated [16]. Ginning out turn percentage showed positive correlation with fiber length (r = 0.184) while this trait had negative correlation with fiber fineness (r = -0.194). Ginning out turn showed positive association with lint index [17]. Fibre length showed positive correlation with fiber strength (r = 0.220) while fiber length showed negative association with fiber fineness (r = -0.548). El-Yazied., *et al.* [18] also reported that fiber length had positive association with fiber strength. Fiber strength had negative correlation with fiber fineness (r = -0.188). Negative association of fiber length, fiber strength and elongation of fiber with micronaire value was observed [19].

	PH	SB	BN	BW	SPB	GOT%	FL	FS	FF
SB	0.359**								
BN	0.255**	0.397**							
BW	0.013	-0.004	0.133						
SPB	0.151	0.102	-0.005	0.613**					
GOT	0.124	0.071	-0.101	0.021	0.075				
FL	0.220**	-0.054	-0.158*	0.151	0.201**	0.184*			
FS	-0.057	0.007	-0.093	-0.146	-0.074	-0.029	0.220**		
FF	-0.299**	-0.012	-0.028	0.078	-0.049	-0.194*	-0.548**	-0.188*	
SCY	0.206**	0.163*	0.596**	0.527**	0.243**	0.073	-0.110	-0.117	-0.010

Table 2: *Correlation Matrix Among Yield Contributing Traits.*

** = p < 0.05*

*** = p < 0.01*

Plant Height (PH); Number of Sympodial Branches (SB); Number of Bolls Per Plant (BN); Boll weight (BW); Number of Seeds Per Boll (SPB); Ginning Out Turn (GOT); Fiber Length (FL); Fiber Strength (FS); Fiber Fineness (FF) and Seed Cotton Yield (SCY).

Conclusion

Positive correlation of yield of seed cotton with plant height, number of sympodial branches plant^{-1}, number of bolls plant^{-1}, boll weight and number of seeds boll^{-1} suggested that during selection priority should be given to these traits and careful selection should be done for those traits which was associated negatively with seed cotton yield.

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