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CORRELATION ESTIMATES FOR EARLINESSAND YIELD RELATED TRAITS IN COTTON (*GOSSYIUM HIRSUTUM L*)

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ABSTRACT: *Earliness is one the main important factor contributing to yield related traits. This present research was based on earliness and yield studies, determined in eight upland cotton cultivars. The ANOVA showed significant differences for the traits viz. days to 1st squaring, number of bolls formed at 80 days,the number of bolls opened at 80 days, internode length, node number to set 1st boll, plant height, number of bolls plant-1, sympodial branches plant-1, sympodial branch length, boll weight (g), seed cotton yield-1 and ginning outturn percentage were significant it P< 0.01. The variety Sadori gave significantly maximum bolls plant-1 and produced highest seed cotton yield plant-1, similarly produced minimum ginning out tum percentage. CRIS-134 measured minimum internode length and lowest node number to set first boll. Days to 1st squaring revealed non-significant positive correlation with seed cotton yield plant-1. However, the number of bolls formed and opened at 80 days, plant height, number of bolls plant-1, sympodial branches plant-1 and ginning outturn percentage were positively interrelated with seed cotton yield plant-1. While, inter node length, node number of 1st boll were negatively and non-significantly correlated with seed cotton yield. Sympodial branch length and boll weight had positive but non-significant correlation with seed cotton yield Hence it was concluded from the results that Sadori proved better among the varieties for yield. However, CRIS-134, NIAB-78, Shahbaz and Sadori revealed earliness which could be utilized for future selection program.*

Keywords: Cotton, correlation, earliness, seed cotton yield, quantitative traits.

INTRODUCTION

Cotton (*Gossyium hirsutum* L) is the chief leading fiber crops of Pakistan and other countries [1]. Due to its large production in agriculture and as a cash crop it is known as 'white gold' [2].The most crucial factor of cotton is the viral disease, which is drastically affecting the cotton growing areas of Pakistan [3]. For such implementation, earliness in cotton genotypes could be worth willing from such risks [1:4]. Earliness in cotton enhances efficient production and less damage to the crop [5]. Genetic and environmental interactions are also the main factors related to yield and its traits [2]. Late maturing cotton varieties produce low fibre quality, whereas short duration genotypes are economically sound [6]. Hence, breeders accomplish to develop desirable genotypes through selection. Yield is a complex polygenic character and is controlled by quantitative genes. Evolution of high yielding varieties is the primary aim of plant breeder and correlation of traits could be used as the criteria for selection, which is an indispensable tool for evolving better varieties. Correlation is the simultaneous variation in two variables. The change in one result into a proportionate variation in the other. Various scientists observed significant association with phenological and quantitative aspects with the dimension to evaluate earliness in cotton [6]. The yielding capacity of a variety in general has been observed to be governed by a large number of genes and is polygenic in nature [7]. Thus estimation of correlation analysis, among yield related morphological traits and earliness traits in upland cotton may provide effective selection criteria to improve cotton yield. Most of the scientists have reflected the studies of production and yield apparatus in high ground of Cotton (*Gossypium hirsutum* L) and have highlighted the nature of associations linked with seed cotton yield and its important contributing traits, besides being greatly influenced by environmental factors. The present research study was there for carrying out among eight cotton varieties to determine the extent of association between yield and its components and genetic diversity among the genotypes using the support information of early maturing and high yielding varieties of fiber crop.

MATERIALS AND METHODS

The genetic material was assessed at the Botanical Garden of the Department of Pant Breeding and Genetics, Faculty of Crop Production, Sindh Agriculture University Tando Jarn during 2014. Eight upland cotton cultivars viz. Sindh-81, Haridost, Shahbaz, CRIS-134, Koonj, Malmal, NIAB-78 and Sadori were studied. The experiment was laid out in RCBD with three replications. The distances between plant to plant and row to row were kept at 30 and 75 cm, respectively. The data was observed Days to first squaring, Earliness% (bolls formed at 80 days after sowing), Number of bolls opened at 80 days, inter node length (cm), node number of 1st boll , sympodial branch length, plant height (cm), No of sympodial branches per plant , total number of bolls per plant, boll weight (gm), seed cotton yield per plant(g), and ginning out turn percentage (GOT%). The data was recorded by Gomez and Gomez (1984). The statistical differences and correlation was presented as Cheema and Khan [8].

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RESULTS AND DISCUSSIONS

The current experiment was conducted to establish the correlations of yield related morphological and earliness characters in highland cotton, (*Gossypium hirsutum* L.) during 2014. The experiment was laid out at Botanical Garden Department of Plant Breeding and Genetic, Sindh Agriculture University Tando Jam, for assessing the interrelationship among days taken to 1st squaring. Number of bolls formed at 80 days, number of bolls opened at 80 days, internode length (cm), sympodial branch length (cm), plant height (cm), bolls plant^{-1}, sympodial branches plant^{-1}, boll weight (g), seed cotton yield plant^{-1} and GOT% in eight promising cotton cultivars. The analysis of variance revealed significantly different at P<0.01 for the traits viz. days to first squaring, Number of bolls formed at 80 days, number of bolls opened at 80 days, inter node length (cm), node number to 1st bolls, sympodial branch length, plant height (cm), number of bolls plant^{-1}, number of sympodial branches plant^{-1}, bolls weight (g), seed cotton yield plant^{-1} and G. O. T % (Table 1a & 1b). The mean values were presented in Table-2 in which the cultivar Haridost took maximum days for squaring (46.00) and Sindh-81 took minimum days (35.66) among the eight cultivars. However, other varieties like CRIS-134, NIAB-78 and Shahbaz also revealed maximum for this trait. Sadori set highest bolls at 80 days after sowing (40.33) followed by NIAB-78 produced second highest bolls (38.33) (Table 2a). These consequences were recorded by [9].[10] The cultivar Haridost set minimum bolls after sowing (20.33). NIAB-78 opened within 80 days among the cultivars however Haridost and Shahbaz opened the bolls late after sowing. Haridost produced longer internodes (9.33 cm) followed by Malmal (8.00cm), while NIAB-78 (33 crn), Koonj (6.33 cm) and Shahbaz (5.33 cm gave medium size internodes (Table 2a). However CRIS-134 produced shorter (4.66cm) internode length (Table 2a). Three cultivars Shahbaz, CRIS-134 and Sadori set first boll at 5.33 node number, whereas Haridost set at highest node of 9.33 among the cotton cultivars. These consequences suggest that the varieties set at lower nodes which could be assumed to be early in maturity. Haridost got maximum nodes, hence believed to be late maturity variety. These consequences were recorded [11]. [1] in which they predicted strong relationship between early maturity and lower branch node having effective bolls. Haridost, Sadori and NAB-78, measured the longer sympodial branches (45.33, 30.33, and 31.66 cm), and shorter sympodial branches (l8.33 cm) were measured from Koonj (Table 2a). Shorter sympodial branches are characterized as early maturing varieties and come researches have predicted this effect [12:13]. Significant variation was observed for the trait plant height (cm) in which maximum plant height (cm) was observed for Haridost (158.33 cm), Shahbaz (140.67 cm) and Sadori (140.33 cm) and Sadori produced highest number of bolls plant^{-1} (51.66) (Table 2b). The cultivars CRIS-134, NIAB-78 and Sadori produced maximum (26.33) sympodial branches plant^{-1}, while Haridost gave minimum (18.33) sympodial branches plant^{-1}. These consequences were recorded by [9][10]. The other varieties also produced desirable number of sympodial branches plant^{-1}. Maximum boll weight was produced with almost all genotypes, however highest boll weight was observed in Koonj (4.53g). Statistically significant difference was revealed by seed cotton yield plant^{-1} over the varieties, however Sadori produced highest (182.50 g) seed cotton yield plant^{-1}and Malmal received the lowest (108.60g) seed cotton yield plant^{-1}. Ginning outturn percentage showed that the cultivar NIAB-78 and Sadori ginned significantly highest lint percentage 39.16 and 39.66% respectively (Table 2b).

CORRELATION STUDIES

Studies on the relationship between yield and yield components provide important information available with cotton breeding for exploitation towards development of new improved cotton cultivars. Therefore present study included estimation of phenotype correlation coefficients (r) for the following characters. The correlation for the character days to 1st squaring vs seed cotton yield was positive (r=0.474) and significant as presented in table-3, which suggested that as days 1st squaring increased in cotton, the yield will eventually increase. Saeed *et al*., [5] reported positive significant association with yield of fibre. The phenotypic correlation between number of bolls formed and opened at 80 days with cotton yield plant^{-1} revealed positive and highly significant association (r= 0.85** r= 0.857**), indicating that the increase number of bolls formed and opened at 80 days significantly produce on the seed cotton yield plant-1 (Table-3). The association between internode length and node number of 1st bolls with seed cotton yield plant^{-1} (Table-3) exhibited negative and significant correlation (r=--0.46**; r= 0.584**) which revealed that as internode length and node number increases, seed cotton yield will decrease due to their negative association. The character sympodial branch length^{-1} exhibited positive but non-significant (r=0.248NS) with seed cotton yield plant^{-1}(Table-3) that suggested that there was no relationship between sympodial branch length and seed cotton yield plant^{-1}. The phenotypic correlation coefficient value for the character combination plant height and sympodial branch plant^{-1}vs seed cotton yield plant^{-1} (r=0.468**; r=0.584*) was positive and significant which suggested that increase in plant height also increases seed cotton yield due to their significant positive correlation. Significant positive association (r=0.742**) between number of bolls plant^{-1} and seed cotton yield plant^{-1} was recorded which exhibited that developed in the number of bolls plant^{-1} causes corresponding increase in seed cotton plant^{-1} also. The value of phenotypic interrelationship (r=0.262NS) between bolls weight and seed cotton yield plant^{-1} was positive but non-significant which revealed that increased boll weight will have no effect on yield (Table-3). However, the correlation coefficient value (r=0.723**) for the G.O.T% vs seed cotton yield plant^{-1}was positive and highly significant which revealed that ginning outturn percentage had positive impact indicating that higher the seed cotton yield per plant, more will be the seed cotton yield (Table-3). Ahmed *et al.*, [1] and

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Table-1a. Mean squares from analysis of variance for various quantitative characters in upland cotton

Source of variance	D.F	Days to first squaring	No. of bolls formed at 80 days after sowing	No. of bolls opened 80 days after sowing	Internode length	Node no. of 1st bolls	Sympodial branch length
Replication	2	3.79	0.79	1.16	1.156	0.66	0.37
Genotypes	7	26.04**	142.23**	120.89**	6.81**	6.80**	217.02**
Error	14	2.93	0.55	0.31	0.27	0.28	0.32

**Significant at 1% probability

Table-1b. Mean squares from analysis of variance for various quantitative characters in upland cotton

Source of variance	D.F	Plant height	No of bolls/ plant	No. of sympodial branch plant	Boll weight	Seed cotton yield/ plant	GOT%
Replication	2	4.93	0.50	0.50	0.01	15.60	0.51
Genotypes	7	541.59**	168.32**	35.32**	0.83**	1970.56**	8.14**
Error	14	0.22	0.38	0.31	0.03	7.22	0.28

**Significant at 1% probability

Table-2a. Mean performance of varieties for various quantitative traits in upland cotton

Varieties	Days to first squaring	No. of bolls formed at 80 days after sowing	No. of bolls opened at 80 days after sowing	Internodes Length (cm)	Node no 0f 1st boll	Sympodial Branch length
Sindh-81	35.66d	29.00c	10.33d	6.66d	6.33d	30.33d
Haridost	46.00a	20.00g	3.00h	9.33a	9.33a	45.33a
Shahbaz	40.66c	25.00f	5.33g	5.33ef	5.33e	25.33f
CRIS-134	38.33d	32.00c	15.33c	4.66f	5.33e	20.33g
Koonj	41.66b	30.33d	8.33e	6.33d	8.33b	18.33h
Malmal	40.33c	24.33f	6.66f	8.00b	7.33c	28.33e
NIAB-78	39.33bc	38.33b	20.33a	7.33b	6.33d	31.66c
Sadori	40.33.bc	40.33a	18.33b	5.83de	5.33e	34.33b
LSD. (5%)	2.99	1.30	0.97	0.91	0.93	1.02

Table-2$_b$ Mean performance of varieties for various quantitative traits in upland cotton

Varieties	Plant height (cm)	No. bolls/plant	No sympodial branch/plant	Boll weight (g)	Seed cotton yield/plant (g)	GOT%
Sindh-81	120.67f	45.33d	21.66e	3.03c	137.50d	36.00d
Haridost	158.33a	48.00c	18.33g	3.00c	144.00c	35.00e
Shahbaz	140.67b	40.33e	20.33f	3.53b	142.00c	37.16c
CRIS-134	135.33d	51.00ab	26.33b	3.46b	176.77b	38.16b
Koonj	130.67d	30.33g	25.33cc	4.53a	137.50d	35.83de
Malmal	116.00g	38.33f	24.33d	2.83d	108.60e	37.16c
NIAB-78	125.33e	50.00b	26.33b	3.53b	176.67b	39.16a
Sadori	140.33b	51.66a	26.33b	3.53b	182.50a	39.66a
LSD. (5%)	02.60	01.08	00.97	00.12	04.70	00.93

Table-3 association of various quantitative traits with seed cotton yield in upland cotton

Characters	r value
Days to 1st squaring vs seed cotton yield per plant	0474*
Bolls formation 80 days vs seed cotton yield per plant	0.85**
Bolls opened at 80 days vs seed cotton yield per plant	0.857**
Internodes length vs seed cotton yield per plant	-0.461*
Node number of 1st bolls vs seed cotton yield per plant	-0.584**
Sympodioal branch length vs seed cotton yield per plant	0.248 NS
Plant height vs seed cotton yield per plant	0.468*
Bolls /plant vs seed cotton yield per plant	0.794**
Sympodial branch vs seed cotton yield per plant	0.584*
Boll weight vs seed cotton yield per plant	0262 NS
G.O.T% vs seed cotton yield per plant	0.723**

**= significant at p<0.01*= Significant at p<0.05 NS=non-Significant

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CONCLUSION

Eight cotton cultivars were studied for earliness associated with its traits. From the results the cultivar Sadori revealed bolls plant^{-1} and produced highest seed cotton yield plant^{-1}. CRIS-134 produced a minimum internode length and contained lowest number to set first boll thus indicating earliness characters. Simultaneously, NIAB-78 and Shahbaz contributed earliness indicators as for days to first flower. The correlation studies showed strong positive association between number of bolls formed and opened at 80 days, plant height, number of bolls plant^{-1}, sympodial branches plant^{-1} and ginning outturn percentage were positively correlated with seed cotton yield plant^{-1}. Whereas, internode length, node number of 1st boll were negatively and non-significantly correlated with seed cotton yield. Hence, as for yield Sadori proved to be better cultivar and CRIS-134, NIAB-78, Shahbaz revealed earliness traits.

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