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PHENOTYPIC CORRELATION AND REGRESSION ANALYSIS OF YIELD AND FIBRE TRAITS IN UPLAND COTTON (*GOSSYPIUM HIRSUTUM* L.)

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ABSTRACT

A field experiment to determine correlation and regression analysis between yield and fiber traits in cotton genotypes of *Gossypium hirsutum* L. was conducted at the experimental area of the Botanical Garden, Department of Plant Breeding and Genetics, Sindh Agriculture University Tandojam, during the year 2012. The experiment was laid-out in a Randomized Complete Block Design with four replications and eight varieties viz. NIAB-78, CIM-496, BH-160, CRIS-134, IR-1524, FH-113, MG-6, and CIM-534. The data were recorded on plant height (cm), sympodial branches plant^{-1}, bolls plant^{-1}, boll weight (g), seed cotton yield plant^{-1} (g), lint%, fiber length (mm), seed index (g) and micronaire value (µg/inch).The analysis of variance revealed significant differences among the genotypes for all the traits studied. Based on mean performance, variety FH-113 produced tallest plants; NIAB-78 produced highest number of sympodial branches plant^{-1}; IR-1526 recorded maximum bolls plant^{-1}; CIM-534 weighed bigger bolls and measured longer fibre length; CRIS-134 produced maximum seed cotton yield plant^{-1} and also gave desirable micronaire. While maximum lint% was ginned by MG-6 and more seed index was recorded by BH-160. The phenotypic correlation and regression analysis revealed significantly positive associations of sympodial branches plant^{-1} with bolls plant^{-1}; between bolls plant^{-1} and seed cotton yield plant^{-1} and the coefficient of determination (r^2) indicated that about 3.96% of total variation in bolls plant^{-1} was due to its association with sympodial branches plant^{-1}, while 78.49 % of total variation in seed cotton yield was due to its correlation with seed cotton yield. Bolls plant^{-1} demonstrated a highly significant but negative correlation with boll weight and r^2 revealed that 40.57 % of total variation in boll weight was due to its relationship with bolls plant^{-1}. These results indicated that increase in bolls plant^{-1} caused decrease in boll weight. The significant negative association between lint% and seed index suggetted that increase in seed index caused corresponding decline in lint% while r^2 determined about 50.41 % of the total variation in lint%. Results generally indicated that number of bolls plant^{-1} and lint% may be the means to obtain higher seed cotton yield.

Keywords: Correlation, regression analysis, upland cotton, yield and earliness traits.

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INTRODUCTION

World demand for cotton is growing at a rapid pace, far greater than the world population growth rate. The demand for cotton fiber that is suitable for modern yarn spinning and for high quality textiles is also increasing. Cotton improvement programmes have responded well to the needs of growers and industry such as combining higher yields with early maturity and good fiber quality. Modern cotton breeders and bioengineers have contributed to achieve these goals (Zia *et al*., 2011). Nevertheless, additional efforts for continued genetic improvement of cotton varieties are still required in order to increase productivity on per unit land area. Therefore, more attention must be paid to the development of varieties that can potentially meet forthcoming challenges. Cotton breeders have directed their efforts to improve the architecture of cotton plants and although considerable research in this regard is being carried out, Pakistan is still far behind in seed cotton yield as compared to other advanced countries.

Sustainable cotton production in the future will depend on the devlopment of cotton varieties with higher yield potential and quality of seed cotton as well as better tolerance to biotic and abiotic stresses. During the past few decades, little attention has been paid to broaden the genetic base of the cotton germplasm. Breeders used only a fraction of the available germplasm for breeding improved cultivars and most of the modern cultivars were developed by re-selection with a consequent drastic reduction in genetic variability (Bowman *et al*., 1996; Lewis, 2000). Although, remarkable progress has been made in both quantity and quality of cotton varieties, yet the demand of lint with longer staple length, more fiber fineness and fiber strength is increasing due to the introduction of high speed spinners in the local textile industry. Thus, in order to meet the increasing demand of fine cotton in local and international markets, cotton breeders ought to further exploit the potential of available germplasm through hybridization and selection programmes. To this end, it is important to investigate the associations between yield, its components and fibre quality traits because selection for one character may improve or deteriorate associated characters, depending on the nature and magnitude. Correlations among these traits have not been well addressed previously, thus justifying the importance of this study. Knowledge of the correlations between traits allows the measurement of the magnitude of the relationship between several traits and helps to set selection criteria to improve yield, earliness, and fibre quality in cotton (Iqbal *et al*., 2003). Salahuddin *et al*. (2010) devoted considerable emphasis to the inter relationship between yield and yield components in cotton. The objectives of the present study are to estimate correlation coefficients and regression analysis between yield and fiber traits in cotton.

MATERIALS AND METHODS

A field experiment was conducted at the experimental area of Botanical Garden, Department of Plant Breeding and Genetics, Sindh Agriculture University Tandojam, during the year 2012, in order to work-out correlation and regression analysis between yield and fibre traits in upland cotton (*Gossypium hirsutum* L.). The trial was carried-out in a randomized complete block design with four replications. Eight varieties included in the experiment were: NIAB-78, CIM-496, CIM-534, BH-160, IR-1524, FH-113, MG-6, and CRIS-134. The seeds were hand dibbled at the rate of three seeds per dibble. After 15 days of sowing, seedlings were thinned to one per hill so as to ensure uniform and reduced plant competition for optimum plant growth and development. The distance between plants was maintained at 30 cm, while row to row distance was kept at 75 cm. All the agronomic practices were done at proper time and inputs were given in recommended doses. At the time of maturity, the observations were recorded on plant height (cm), sympodial branches plant^{-1}, bolls plant^{-1}, boll weight (g), seed cotton yield plant^{-1}, lint%, fiber length, seed index (100-seed weight (g)) and micronaire (µg/inch). Fertilizer at the rate of 125 N and 75 kg ha $^{-1}$ P were applied in the form of urea and diammonium phosphate (DAP). Full dose of phosphorus with 1/3rd of nitrogen was applied at the time of land preparation while remaining nitrogen was applied in three equal split doses with first irrigation, peak flowering and boll setting stages. Other inputs like irrigation were applied at proper times and insecticides as and when required. All the cultural practices including weeding, etc. were adopted uniformly in the whole experiment throughout the growing period. Ten plants were randomly tagged from each replication per genotype, harvested individually and ginned on a single plant roller gin machine for recording the yield contributing and fibre quality traits. The data regarding different traits in each genotype were averaged and subjected to statistical analysis for determining significant differences between means (Gomez and Gomez, 1984). Correlation and regression analysis were determined according to methods developed by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Analysis of variance and mean performance

The mean squares for plant height, sympodial branches plant^{-1}, bolls plant^{-1}, boll weight, seed cotton yield plant^{-1}, lint (%), staple length, seed index and micronaire value were significantly different among genotypes (Table-1). The data in relation to mean values corresponding to all the traits studied are given in Table-2. The results for correlation and regression coefficients among yield traits of economic importance are shown in Table-3. The mean squares from analysis of variance revealed that all the traits were significantly different among the cotton genotypes. The mean comparison test by LSD (5%) suggested that varietal means were also different for the above mentioned traits. In cotton, medium-tall plants with production capacity of setting maximum number of bolls which is the ultimate result for obtaining higher yields are more desirable. The data presented in Table-2 revealed that genotype FH-113 produced tallest plants of 171.75cm, while BH-160 had shortest plants of 86.50cm as compared to the rest of the genotypes. Reta-sanchez and Fowler (2002) proposed that cultivars with reduced plant height, short branches, modified leaves, and combinations of these characteristics grown at high plant densities and in a narrow-row system could be a good alternative to increase yield of cotton. Sympodial branch is an important quantitative trait considered as is fruiting branch on which the bolls are set on cotton plant; this character therefore contributes directly towards seed cotton yield. It is believed that unit increase or decrease in the number of bolls will affect seed cotton yield which largely depends on this important trait. Thus, plant breeders and researchers recommend that sympodial branches do serve as a good criterion for selecting high yielding cotton varieties. The mean performance shown in Table-2 indicated that NIAB-78 produced the highest number of sympodial branches plant^{-1} (32.16), whereas BH-160 recorded the lowest number of sympodial branches plant^{-1} (17.75). Number of bolls plant^{-1} is the major yield contributing component with a strong association with seed cotton yield. It was generally observed that increase in boll number will eventually increase seed cotton yield. The mean performance of bolls plant^{-1} summarized in Table-2 revealed that variety IR-1524 produced the maximum number of bolls plant^{-1} (53.50) while the lowest number of bolls plant^{-1} was obtained from CIM-534 (29.50). Boll weight has a direct influence on seed cotton yield because as the boll weight increases, the yield also increases. Results in Table-2 demonstrated that variety CIM-534 gave the maximum boll weight (3.83g), yet the lowest boll weight was recorded for CRIS-134 (2.98g). Yield is considered as the most important character which is required to boost-up the yield production to its maximum level, because it plays a vital role in strengthening the socio-economic conditions of the growers and ultimately the country. The mean performance on seed cotton yield showed that variety CRIS-134 gave higher yield plant^{-1} (170.82g), while variety CIM-496 gave the lowest yield plant^{-1} (106.50g).

Table 1. Mean squares from analysis of variance for yield and fibre traits in upland cotton.

Traits	Mean squares		
	Replication D.F.=3	Varieties D.F.=7	Error D.F.=21
Pant height	32.280	3087.71 **	0.310
Sympodial branches plant^{-1}	30.208	125.820**	0.185
Bolls plant^{-1}	27.232	424.295 **	1.006
Boll weight	0.289	0.520 **	0.137
Seed cotton yield plant^{-1}	67.010	1689.56 **	28.20
Lint%	31.799	31.4199 **	0.1369
Staple length	29.903	7.5482 **	0.0938
Seed index	2.142	11.9845 **	0.0656
Micronaire	1.926	0.74669 **	0.004

** = Significant at 1 % probability level

Lint% is a complex polygenic trait which is largely affected by environmental factors. Primarily, it depends on lint weight, which has a direct effect on lint %. Selection for high ginning outturn often results in an increase in the production plant^{-1} and per unit area. Mean performance for lint% shown in Table-2 reveals that variety MG-6 ginned the highest lint (43.70%), whereas NIAB-78 had the lowest lint (36.25%). Fibre length has secured a unique importance among the quality parameters of cotton, because it is more useful for textile mills in yarn manufacturing. Based on mean performance in Table-2, results reveal that maximum staple length (30.50mm) was obtained from variety CIM-534 and the lowest (29.40mm) from CRIS-134. Seed index is one of the major components which contribute significantly towards increasing seed cotton yield. The mean performance revealed that variety BH-160 recorded the highest seed index (9.31g), whereas the lowest seed index (4.62g) was expressed by MG-6. Fiber fineness affects the yarn appearance, its uniformity and strength. Mean values of varieties indicated that variety CIM-496 demonstrated the highest value micronaire (5.21µg/inch) and the lowest (4.12µg/inch) in variety FH-113. Results from correlation analysis suggested that micronaire was negatively associated with plant height and boll weight. These results indicated that an increase in fibre fineness caused a corresponding decrease in micronaire value. Carvalho (2001) also noted that seed cotton yield was positively correlated with micronaire index.

Correlation and regression analysis

Correlation and regression analysis of seed cotton yield and its contributing components are very important in determining suitable selection criteria for the improvement of seed cotton yield. The data regarding simple correlation coefficient (r), coefficient of determination (r^2) and regression coefficient (b) of seed cotton yield, its components and fiber traits of eight varieties are presented in Table-3.

Plant height

The results from correlation of plant height indicated a significant positive association with sympodial branches plant^{-1}, bolls plant^{-1}, seed cotton yield plant^{-1}, lint% and revealed that increase in plant height will cause a corresponding increase in associated traits. On the contrary, its significant negative correlation with fibre fineness suggested that increase in plant height may cause an adverse effect on fibre fineness. Similar results were obtained by Hussian *et al.* (2000) who also reported that plant height has strong and positive correlation with number of sympodial branches, number of bolls plant^{-1} and lint %. The coefficient of determination (r^2) indicated that plant height caused 22.46% of total variability in sympodial branches plant^{-1}; 16.89% in bolls plant^{-1}; 17.12% in boll weight; 13.24% in seed cotton yield 15.36% in lint%; 3.88% in fibre length and16.72% in fibre fineness. While regression coefficient (b) suggested that unit increase in plant height caused associated increase of 0.111 in sympodial branches plant^{-1}; 0.1555 in boll plant^{-1}; 0.006g in boll weight; 0.277g in seed cotton yield; 0.047% in lint; 0.015cm in fibre length; however adversely unit increase in plant height caused 0.004g decrease in seed index and 0.009 (µg/inch) in fibre fineness.

Sympodial branches per plant

The correlation results revealed that sympodial branches plant^{-1} was significantly and positively correlated with bolls plant^{-1} and significantly but negatively associated with boll weight. Positive association of sympodial branches with bolls plant^{-1} suggested that increase in sympodial branches will cause simultaneous increase in boll number while negative association with boll weight indicated that increase in sympodial branches will reduce the boll size. The present results are in agreement with those of Iqbal *et al.* (2003) who conducted correlation analysis in upland cotton and found that sympodial branches plant^{-1} and bolls plant^{-1} were positively and significantly correlated with seed cotton yield. The coefficient of determination (r^2) indicated that sympodial branches plant^{-1} caused 39.67% of total variability in bolls plant^{-1}; 29.48% in boll weight; 77.80% in seed cotton yield plant^{-1}; 0.23% in lint%; 0.42% in fibre length; 3.92% in seed index and 1.02% in fibre fineness. While regression coefficient (b) revealed that a unit increase in sympodial branches plant^{-1} caused linked increase of 0.009 bolls plant^{-1}; 1.004g in seed cotton yield plant^{-1}; 0.027% in lint; 0.079cm in fibre length; 0.061g in seed index; 0.011µg/inch in fibre fineness yet 0.062 g decrease in boll weight.

Number of bolls per plant

Number of bolls plant^{-1} is the major yield contributing component having strong correlation with seed cotton yield. For the improvement of this trait, it was generally observed that an increase in boll number in cotton plant will eventually increase the seed cotton yield. The mean performance of bolls plant^{-1} is summarized in Table-2, which revealed that variety CRIS-134 produced the maximum number of bolls plant^{-1} (57.32), followed by IR-1524 (53.50) while the lowest number of bolls plant^{-1} was obtained from CIM-534 (29.50). Correlation results (Table-3) indicated a positive relationship of bolls plant^{-1} with seed cotton yield and seed index, yet exhibited a negative correlation with boll weight. These associations indicated that an increase in boll number will cause a corresponding increase in both seed cotton yield and seed index while its increase caused negative impact on boll weight by reducing its size. The present results clearly demonstrated that cotton production could be increased by increasing the number of bolls and not by boll weight. Hussian *et al.* (2000) revealed a positive correlation of seed cotton yield with number of bolls plant^{-1}. Present results are also in consonance with those obtained by Rauf *et al.* (2004) who observed that bolls plant^{-1} expressed maximum positive direct effect on seed cotton yield plant^{-1}. The coefficient of determination (r^2) indicated that bolls plant^{-1} caused 40.57% of total variability in boll weight; 78.49% in seed cotton yield plant^{-1}; 2.99% in lint%; 0.01% in fibre length; 27.77% in seed index and 0.0812% in fibre fineness. While regression coefficient (b) revealed that a unit increase in bolls plant^{-1} caused a corresponding increase of 0.041g in boll weight; 1.796g in seed cotton yield plant^{-1}; 0.056% in lint; 0.091g in seed index, however increase of one boll plant^{-1} caused non-significant decreases of 0.003cm in fibre length and 0.017µg/inch in fibre fineness.

Boll weight (g)

The present results are similar to those of Taohua and Haipeng (2006) and Meena *et al.* (2007) who evaluated different *hirsutum* varieties for yield and other economic characters and observed significant variations for boll weight and showed a positive effect on seed cotton yield. Therefore, it was concluded that boll weight is an important yield component and should be considered while breeding for seed cotton yield. Correlations indicated that boll weight was significantly and positively correlated with seed cotton yield but negatively correlated with fibre fineness. These correlations indicated that while improving boll weight, seed cotton yield may be increased to its maximum level, yet compromise could be made on fibre fineness. Similar to present results, Khadijah *et al*. (2010) also reported positive correlation of boll weight with seed cotton yield. The coefficient of determination (r^2) revealed that bolls weight caused 12.39% of total variability in seed cotton yield plant^{-1}; 0.24% in lint%; 0.79% in fibre length; 11.76% in seed index and 3.06% in fibre fineness. Whereas regression coefficient (b) demonstrated that a unit increase in boll weight caused analogous increase of 14.539g in seed cotton yield plant^{-1}; and 0.324% in lint yield; nonetheless boll weight caused a decrease of -0.394mm in fibre length; -1.209g in seed index and -0.214 µg/inch in fibre fineness.

Table 2. Mean performance for yield and fibre traits in eight cotton genotypes.

Traits	Genotypes								
	CRIS-134	NIAB-78	CIM-496	CIM-534	BH-160	IR-1524	FH-113	MG-6	LSD (5%)
PH	111.83	90.25	96.83	88.16	86.50	102.16	171.75	109.2	0.812
SB	29.16	32.16	26.83	19.75	17.75	26.16	31.25	20.00	0.631
BP	57.32	49.50	31.50	29.50	40.00	53.50	50.50	39.33	1.475
BW	2.98	3.03	3.38	3.83	3.69	3.03	3.13	3.77	0.5448
SCY	170.82	150.30	106.50	127.50	147.80	162.18	158.30	148.18	7.808
Lint%	39.25	36.25	41.50	42.50	36.50	40.95	42.49	43.70	0.544
SL	29.40	27.50	27.96	30.50	28.56	26.50	29.50	27.00	0.450
SI	7.68	8.31	5.06	4.81	9.31	6.81	6.81	4.62	0.376
MV	4.71	5.11	5.21	5.03	4.51	4.31	4.12	4.18	0.099

PH = Plant height, SB= Sympodial branch plant^{-1}, BP= bolls plant^{-1}, BW= boll weight (g), SCY= seed cotton yield plant^{-1} (g), SL= staple length (mm), SI=seed index (g) and MV= Micronaire value (µg/inch).

Seed cotton yield (g)

Seed cotton yield revealed a positive association with seed index but a negative correlation with fibre fineness. These results suggested that seed cotton yield could be increased by increasing seed index value but fibre fineness may be reduced, therefore care must be given to fibre fineness while improving seed cotton yield. The relationship between some plant traits and seed cotton yield for conventional cotton cultivars grown at medium to high plant densities have been reported by Preetha and Raveendran (2007) and Sekloka *et al.* (2008). Khadijah *et al*. (2010) reported that bolls plant^{-1}, and boll weight were positively correlated with seed cotton yield, however plant height was negatively correlated with seed cotton yield which could be due to lodging. The coefficient of determination (r^2) revealed that seed cotton yield plant^{-1} caused 2.22% of total variability in lint%; 1.40% in fibre length; 23.52% in seed index and 18.31% in fibre fineness. Whilst regression coefficient (b) demonstrated that a one gram increase in seed cotton yield plant^{-1} caused comparable increase of 0.050cm in fibre length; yet caused decrease of 0.024% in lint yield; 0.041g in seed index and 0.013µg/inch in fibre fineness.

Table 3. Correlation coefficients (r), regression coefficients (b) and coefficient of determinations (r^2) of yield and fibre traits in cotton genotypes.

Character association	Correlation coefficient (r)	Regression coefficient (b)	Coefficient of determi-nation (r^2)
Plant hight vs sympodial branches plant^{-1}	0.474**	0.100	0.2246
Plant height vs bolls plant^{-1}	0.411*	0.155	0.1689
Plant height vs bolls weight	-0,267 ns	-0.006	0.0712
Plant height vs seed cotton yield plant^{-1}	0.364*	0.277	0.1324
Plant height vs lint %	0.312*	0.047	0.1536
Plant height vs staple length	0.184 ns	0.015	0.0388
Plant height vs seed index	-0.059 NS	-0.004	0.0034
Plant height vs fiber fineness	-0.409*	-0009	0.1672
Sympodial branches plant^{-1} vs bolls plant^{-1}	0.630*	1.118	0.3967
Sympodial branches plant^{-1} vs boll weight	-0.543**	-0.062	0.2948
Sympodial branches plant^{-1} vs seed cotton yield plant^{-1}	0.279 ns	1.004	0.7780
Sympodial branches plant^{-1} vs lint %	0.048 ns	0.027	0.0023
Sympodial branches plant^{-1} vs staple length	0.205 ns	0.079	0.4200
Sympodial branches plant^{-1} vs seed index	0.98 ns	0.061	0.3920
Sympodial branches plant^{-1} vs fiber fineness	0.101 NS	0.011	0.0102
Bolls plant^{-1} vs boll weight	-0.637**	-0.041	0.4057
Bolls plant^{-1} vs seed cotton yield plant^{-1}	0.886**	1.796	0.7849
Bolls plant^{-1} vs lint%	-0.173 ns	-0.056	0.0299
Bolls plant^{-1} vs staple length	-0.014 ns	-0.003	0.0001
Bolls plant^{-1} vs seed index	0.527**	0.091	0.2777
Bolls plant^{-1} vs fiber fineness	-0.285 ns	-0.017	0.0812
Bolls plant^{-1} vs seed cotton yield plant^{-1}	0.352*	14.539	0.1239
Boll weight vs G.O.T. %	0.049 ns	0.324	0.0024
Boll weight vs staple length	-0.089 ns	-0.394	0.0079
Boll weight vs seed index	-0.343 ns	-1.209	0.1176
Boll weight vs fiber fineness	-0.175 ns	-0.214	0.0306
Seed cotton yield palnt^{-1} vs G.O.T %	-0.149 ns	-0.024	0.0222
Seed cotton yield palnt^{-1} vs staple length	0.120 ns	0.050	0.0140
Seed cotton yield palnt^{-1} vs seed index	0.485**	0.041	0.2352
Seed cotton yield palnt^{-1} vs fiber fineness	-0428*	-0.013	0.1831
Lint % vs staple length	0.480**	0.324	0.2304
Lint % vs seed index	-0.710**	-0.318	0.5041
Lint % vs fiber fineness	-0.191 ns	-0.036	0.0364
Staple length vs seed index	-0.005 ns	-0.004	0.0000
Staple length vs fiber fineness	0.129 ns	0.036	0.0166
Seed index vs fiber fineness	0.147 ns	0.051	0.0216

**,* = Significant at 1 and 5% probability levels respectively, N.S = Non significant.

Lint (%)

The correlations of lint% with staple length were recorded as significantly positive; nonetheless it was negatively associated with seed index. These results indicated that increasing lint% will correspondingly increase staple length but will cause a decline in seed index. Our findings are in agreement with those of Baloch (2002) who concluded that some of the F_2 hybrids were found to be better than their high parents. The percent increase of some F_2 hybrids against their high parent was 8.1 in lint percentage. The coefficient of determination (r^2) revealed that lint% caused 23.04% of total variability in fibre length; 50.41% in seed index and 3.64% in fibre fineness while regression coefficient (b) suggested that a 1% increase in lint yield caused comparable increase of 0.324mm in fibre length but caused a decrease of -0.318g in seed index and -0.036µg/inch in fiber fineness.

Fibre length (mm)

Results from correlation studies revealed that staple length was positively correlated with only lint%, while its correlation with other traits was non-significant. It could be inferred from the present results that significant improvement could be made in improving staple length along with lint% without causing an adverse impact on other important traits. These types of results are quite encouraging in cotton breeding. Khan and Azhar (2000) conducted correlation studies in cotton. They found a positive correlation of seed cotton yield with staple length and also with number of bolls plant^{-1}. The coefficient of determination (r^2) revealed that fibre length caused an increase of 0.036 µg/inch in fiber fineness while unit increase in staple length caused a decrease of -0.004 g in seed index.

Seed index (g)

The results from correlation studies indicated that seed index exhibited significantly positive association with bolls plant^{-1} and seed cotton yield, while they showed negative associations with lint%. These results revealed that increasing seed index will cause an associated increase in number of bolls and seed cotton yield yet it will reduce the lint%. Our results are in conformity with those of Santoshkumar *et al.* (2012) who noted that number of bolls plant^{-1}, boll weight, number of sympodia plant^{-1}, number of seeds per boll; seed index, lint index, and plant height have a significant positive association with seed cotton yield plant^{-1}. Correlation coefficient analysis showed that number of bolls plant^{-1} contributed maximum effect towards seed cotton yield plant^{-1} followed by boll weight and lint index. The highest positive effect on seed cotton yield plant^{-1} was also observed through number of bolls plant^{-1}. This indicated that seed cotton yield plant^{-1} was highly influenced by number of bolls plant^{-1}.

The coefficient of determination (r^2) revealed that fibre length caused no variability in seed index yet induced 1.66% in fibre fineness; while regression coefficient (b) indicated 1.0mm increase in fibre length caused corresponding increase of 0.004 in seed index and 0.036 µg/inch in fibre fineness.

Micronaire or fibre fineness (µg/inch)

Fiber fineness affects the yarn appearance, its uniformity and strength. Mean values of varieties indicated that variety CIM-496 demonstrated the highest value micronaire (5.21 µg/inch) and the lowest were observed in variety FH-113 (4.12 µg/inch). Results from correlation suggested that micronaire was negatively associated with plant height and boll weight. These results indicated that increase in fibre fineness caused corresponding decrease in fiber fineness. Carvalho (2001) also observed that seed cotton yield was positively correlated with micronaire index. The coefficient of determination (r^2) revealed that seed index caused 2.16% of total variability in fibre fineness; while regression coefficient (b) indicated unit increase in seed index caused corresponding increase of 0.0516 µg/inch in fibre fineness.

CONCLUSION

The analysis of variance revealed significant differences among the genotypes for plant height, sympodial branches plant^{-1}, bolls plant^{-1}, boll weight, seed cotton yield plant^{-1}, lint%, fiber length, seed index and micronaire value. Based on the mean performance, varieties CRIS-134, CIM-534 and IR-1524 performed very well in terms of seed cotton yield, bolls plant^{-1}, lint%, staple length and micronaire value, hence these varieties may be preferred for hybridization and selection programme to develop new promising cotton varieties. The phenotypic correlations revealed that bolls plant^{-1} and seed index were highly and positively associated with seed cotton yield, hence these yield components can be used as reliable selection criteria to improve seed cotton yield. While significant negative correlations between bolls plant^{-1} and boll weight suggested that bolls plant^{-1} may be given priority over boll weight when the objective is to improve yield production. Negative association of lint% with seed index indicated that although yield could be improved with bolder seeds the higher value of lint may not be too much compromised with seed index. Coefficient of determination revealed that maximum variations in seed cotton yield were caused by bolls plant^{-1} and sympodial branches plant^{-1}.

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