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PHENOTYPIC AND GENOTYPIC CORRELATION COEFFICIENTS FOR SOME YIELD AND FIBER QUALITY TRAITS OF SEGREGATING POPULATIOS (F_2, F_3 AND F_4) IN SOME EGYPTIAN COTTON CROSSES

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ABSTRACT

The present study was undertaken with a view to determine the extent of relationship between seed cotton yield and other economic traits of F_2, F_3 and F_4 generations in the two Egyptian cotton crosses i.e., cross I [({Giza 89 x Giza 85} x {Giza 86 x Giza 81}) x ({Giza 83 x Giza 80} x Giza 89)] and cross II [(Giza 85 x Giza 86) x ({Giza 83 x Giza 80} x Giza 89)]. The F_2, F_3 and F_4 generations in the two crosses were grown at Sakha Experimental farm, Cotton Research Institute, Agricultural Research Center, Egypt during 2008, 2009 and 2010 seasons, respectively. The mean squares obtained from analysis of variance showed highly significant ($P \leq 0.01$) differences for most studied traits of F_2, F_3 and F_4 generations in the two crosses. For the two crosses, the best mean values for boll weight (3.27 and 3.39 g) and 2.5% span length (33.22 and 32.84 mm) traits were detected in F_4 generation, seed cotton yield/plant (175.88 and 197.09 g) and uniformity index (87.01 and 86.54 %) traits in F_3 generation and fiber fineness (3.75 and 3.63) in F_2 generation. While, lint percentage (40.68 and 41.39 %) and fiber strength (10.32 and 10.44 g/tex) traits exhibited highest mean values of the crosses I and II in F_4 and F_3 generations, respectively. In general the magnitude of genotypic correlation coefficient was higher than those of phenotypic correlations coefficient of most studied traits for F_2, F_3 and F_4 generations in the two crosses. Seed cotton yield for the two crosses exhibited positive and highly significant associations with lint percentage, 2.5% span length, fiber fineness and fiber strength traits in F_2 generation and with lint percentage and 2.5% span length traits in F_3 and F_4 generations, while, the correlation changed for fiber fineness and fiber strength in F_3 and F_4 generations. 2.5% span length, fiber fineness, fiber strength and uniformity index for the two crosses in F_2, F_3 and F_4 generations had a highly significant positive correlations with boll weight. Lint percentage showed positive and highly significant associations with fiber fineness for F_3 generation in the cross I and with fiber fineness and strength traits for the three generations in the cross II. These results indicating that, the two crosses could be used in improving yield and fiber quality in Egyptian cotton.

Keywords: Phenotypic correlation, genotypic correlation, analysis of variance and F_2, F_3 and F_4 generations.

INTRODUCTION

Breeding programs continue to develop new cotton varieties to meet the requirements of both producers and consumers. The increase in yield can be possible if the existing genetic resources and information are properly utilized. Correlation between traits can be useful in developing selection criteria, but correlation can also present a morass of interrelationships (Kloth, 1998). Hybridization of two parents followed by five generations of intercrossing via insects improved yield by 9% and maintained fiber strength.

Only two cycles of inter-mating were used to reduce the correlation between lint yield and fiber strength from –0.54 to –0.38 (Meredith and Bridge, 1971). Improving yield and quality are important objectives for crop breeders. In cotton (*Gossypium spp*.), however, yield increases are often associated with reduced fiber quality (Meredith, 1984). Lancon *et al.*, (1993) observed negative association between fiber fineness and fiber strength. Tyagi (1994) found negative correlation of lint length with lint percentage and lint fineness. Larik *et al.*, (1997) demonstrated negative correlation for micronaire and lint length in cotton. Since there were large interactions between accessions generation for the yield and fiber traits studied. Azhar *et al.,* (2004) displayed negative correlation between staple length and fiber fineness, also between lint length and lint fineness. Gutiérrez *et al*., (2006) mentioned that, the negative association between yield and fiber quality has hampered breeding efforts for the improvement of multiple traits. These linkages between desirable and undesirable loci can slow down genetic progress through traditional breeding programs, such as selfing and selection. It is desirable to break the linkage blocks in cotton that associate undesirable traits with high yield and quality. Ulloa (2006) reported negative correlation between lint percentage and lint strength. Single plant selection in early generations would effectively improve the seed cotton yield and its various additively controlled components (Ali *et al*., 2008). Preetha and Raveendren (2008) stated that, the association of boll weight, seed cotton yield, lint percentage, 2.5% span length, fiber fineness, fiber strength and uniformity index traits has shown breakdown of linkage between high yield and poor quality and further the shift noticed in correlation coefficients values as generation advanced from F_3 to F_4 revealing unstabilized nature of the population. Basal, *et al*., (2009) denoted that, the most important fiber quality parameters, UHM, fiber strength, and UI, were negatively associated with the most basic within-boll lint yield components, L/S, and F/S. Chaudhary *et al*., (2010) found a wide variation in F_2, F_3 and F_4 generations for fiber quality traits, especially fiber strength and also for seed cotton yield and important yield components. Transgressive segregation was observed for fiber strength, length and other traits. The objective of the present study was to estimate phenotypic and genotypic correlation coefficients between some traits for F_2, F_3 and F_4 generations in two Egyptian cotton crosses (*Gossypium barbadense* L.).

MATERIALS AND METHODS

Plant materials, growing conditions and character measurements:

Two crosses, the cross I [({Giza 89 x Giza 85} x ({Giza 86 x Giza 81}) x ({Giza 83 x Giza 80} x Giza 89)] and cross II [(Giza 85 x Giza 86) x ({Giza 83 x Giza 80} x Giza 89)] were developed for this study. F_{1s} derived from the two intra-specific crosses were self-pollinated to developed F_2 populations. One hundred single plants from F_2 generation were phenotype for fiber quality traits as well as seed cotton yield and some important yield components. These single plants were self-pollinated to advance to further filial generations up to F_4 generation which constituted the material for the study. F_2, F3 and F_4 generations were raised along with the parents at Sakha experimental farm, Cotton Research Institute, Agricultural Research Center, Egypt during 2008, 2009 and 2010 seasons, respectively. The experimental design used in the three seasons was a randomized complete blocks design (RCBD) with three replications. The parents were grown in two row plots; the F_2's were raised in 10 rows, F_3's and F_4's in 5 row plots. Each row was 4 m long and 0.6 m wide. Hills were spaced at 0.4 m and thinned at one plant/hill. Selected plants in each single plant progeny were observed on their biometrical and fiber quality traits and recorded. All the recommended cultural practices of cotton production in the area were done. Measurements were taken on seven traits including boll weight (B.W. g), seed cotton yield/plant (S.C.Y. /P g), lint percentage (L. %), fiber length (mm) at 2.5 % span length (2.5 % S.L.), fiber fineness (F.F.), fiber strength (F.S. g/tex) and uniformity index (U.I. %). The fiber properties were measured using HVI according to (ASTMD – 4650 – 86) at the Lab. of Cotton Research Institute, Agricultural Research Center.

Statistical analysis:

The averages for each character were subjected to analysis of variance and covariance following the method of Sing and Chaudhary (1985). In all generations, the phenotypic and genotypic correlation coefficients were calculated to determine the degree of association among the different characters in the two Egyptian cotton crosses. The estimates of phenotypic and genotypic correlation coefficients were worked out by using the formulae suggested by Edhaie *et al.* (1993). Both genotypic and phenotypic correlation coefficients were compared against table r-values given in Fisher and Yates (1953) table at (n-2) degrees of freedom at the probability levels of 0.05 and 0.01 to test their significance.

RESULTS AND DISCUSSION

The estimates of correlation among traits are useful for planning a breeding programme to synthesize a genotype with desirable traits. The objective of the present study was to find correlation among the seed cotton yield trait and traits related to fiber in cotton.

I- Analysis of variance:

Results mean squares for P_1, P_2, F_2, F_3 and F_4 generations in the two crosses are Table 1 which demonstrated that, the two parents in the two crosses were insignificant traits except seed cotton yield/plant for P_1 in the cross II and 2.5% span length for P_2 in the two crosses which were exhibited highly significant differences ($P \leq 0.01$). On the other hand, boll weight, seed cotton yield/plant and lint percentage traits showed highly significant differences ($P \leq 0.01$) of F_2, F_3 and F_4 generations in the two crosses. As for 2.5% S.L. of F_2 generation in the cross I and F_3 generation in the cross II were highly significant and significant, respectively. However, mean squares for fiber fineness were highly significant for the three segregating generations in the two crosses except F_2 generation in the cross II which was insignificant. In the same time, the mean squares of F_2 and F_4 generations in the cross I and F_3 generation in the cross II were displayed highly significant differences for fiber strength. Finally, the uniformity index demonstrated highly significant differences for F_2 and F_3 generations in the cross II and the cross I, respectively. Meredith (1990) reported that F_2 hybrids had significantly longer and finer lint than the parents; however, the improvements were too small to be of practical value. He suggested that F_2 hybrids have the genetic potential for increasing cotton yields and fiber quality. McCarty *et al*., (2003) stated that, the analysis of variance for seed cotton yield, lint percentage, 2.5% span length, fiber fineness, fiber strength and uniformity index were significantly different in F_2 and F_3 generations. Srour *et al*., (2010) mentioned that, the analysis of variance for all traits studied manifested highly significant differences of F_3 generations in the two crosses, while, the F_2 generation exhibited highly significant for seed cotton yield/plant and uniformity index in the first cross, and boll weight, seed cotton yield/plant and uniformity index in the second cross.

Table 1: Mean squares for seven traits of P_1, P_2, F_2, F_3 and F_4 populations in the two Egyptian cotton crosses.

Traits	Generations / Crosses	P_1	P_2	F_2	F_3	F_4
B.W. (g)	Cross I	0.14	0.06	6.56**	0.17**	0.26**
	Cross II	0.05	0.06	0.26**	0.35**	0.31**
S.C.Y./P (g)	Cross I	1400.86	361.55	6660.48**	14213.55**	1095.01**
	Cross II	1687.45**	361.55	7861.72**	20386.44**	3696.99**
L. %	Cross I	0.57	3.84	8.15**	6.89**	4.68**
	Cross II	1.79	3.84	15.63**	4.76**	5.33**
2.5% S.L. (mm)	Cross I	0.25	0.45**	0.41**	22.04	0.59
	Cross II	0.49	0.45**	7.61	1.17*	0.29
F.F.	Cross I	0.05	0.13	0.38**	0.18**	0.06**
	Cross II	0.15	0.13	0.18	0.30**	0.56**
F.S. (g/tex)	Cross I	0.04	0.05	0.92**	0.35	0.29**
	Cross II	0.24	0.05	0.52	0.70**	0.05
U.I. (%)	Cross I	0.11	0.11	0.35	1.58**	0.55
	Cross II	0.96	0.11	1.49**	0.88	0.53

*** and **: The shifts were significant and highly significant, respectively.**

II- Mean performance:

Data on mean in respect of fiber quality traits, seed cotton yield and important yield components in P_1, P_2, F_2, F_3 and F_4 generations in the two crosses are given in Table 2. According to these obtained data, the F_4 generations had the highest means for boll weight and 2.5% span length traits in the two crosses (3.27 g – 3.39 g and 33.22 mm – 32.84 mm, respectively), and for lint percentage and fiber strength traits (40.68% - 10.32 g/tex, respectively) in the cross I. While, the maximum seed cotton yield/plant and uniformity index traits for the two crosses (175.88 g – 197.09 g and 87.01 % – 86.54 %, respectively) and the highest mean lint percentage (41.39 %) and fiber strength (10.44 g/tex) for the cross II were counted in F_3 generations. On the other hand, the best mean fiber fineness values of 3.75 – 3.63 were observed for F_2 generation in the two crosses, respectively. Data presented in Table 1 showed that, the cross II was superior for boll weight, seed cotton yield/plant, lint percentage and fiber fineness traits in five populations, but, the cross I was superior for 2.5% S.L. and uniformity index traits in P_1, P_2, F_2, F_3 and F_4 populations. Preetha and Raveendren (2008) reported that, the mean performance of F_3 and F_4 generations for boll weight, seed cotton yield, lint percentage, 2.5 percent span length, bundle strength, uniformity ratio and fiber fineness traits were found to be intermediate between parental values.

III- Genotypic and phenotypic correlation coefficients:

Selection for specific character is known to result in correlated response in certain other characters (Falconer, 1981). Generation, satisfactions progress in breeding programme depends much on the genetic variability of different traits under selection. Seed yield is the most important target character in most of the crop species and it is the most complex one. Improvement in the seed yield can be achieved by indirect selection through other easily observable characters. But this needs a good understanding of the association of different traits with seed yield and their possible association among themselves.

Table 2: Means of seven traits in P_1, P_2, F_2, F_3 and F_4 generations of the two Egyptian cotton crosses.

Traits	Generations / Crosses	P_1	P_2	F_2	F_3	F_4
B.W. (g)	Cross I	2.97	3.17	2.65	2.87	3.27
	Cross II	2.97	3.17	2.76	3.13	3.39
S.C.Y./P (g)	Cross I	100.85	114.07	107.03	175.88	102.45
	Cross II	77.89	114.07	126.92	197.09	130.76
L. %	Cross I	37.24	39.79	35.59	39.05	40.68
	Cross II	35.44	39.79	39.84	41.39	30.9
2.5% S.L. (mm)	Cross I	32.95	31.66	32.65	32.16	33.22
	Cross II	32.25	31.66	30.9	32.73	32.84
F.F.	Cross I	4.40	4.65	3.75	4.24	4.44
	Cross II	4.03	4.65	3.63	4.23	4.52
F.S. (g/tex)	Cross I	10.13	10.23	10.16	10.11	10.32
	Cross II	9.90	10.43	9.89	10.44	10.18
U.I. (%)	Cross I	86.37	85.81	84.59	87.01	86.83
	Cross II	85.95	85.81	83.55	86.54	86.13

The Genotypic and phenotypic correlation coefficients of seed cotton yield with other quantitative characters for the two crosses in different populations are presented in Tables 3, 4, 5, 6, 7 and 8. The genotypic correlation coefficients (r_g) were higher as compared to phenotypic correlation coefficients (r_p) in most of the traits indicating the effects of environment suppressed the phenotypic relationship between these traits. In few cases, moreover, phenotypic correlation coefficients were same with or higher than their genotypic correlation coefficients suggesting that both environmental and genotypic correlations in these cases acted in the same direction and finally maximize their expression at phenotypic level. Hussain *et al*., (2009) denoted that phenotypic correlation was usually different in magnitude or even in direction as compared with the correlation of component effects.

A- Cross I:

A general observation of data (Tables 3, 4 and 5) revealed that in segregating generation's seed cotton yield/plant showed a significant or highly significant associations with lint percentage (r_p= 0.30), 2.5% S.L. (r_g = -0.55 and r_p = -0.51), fiber fineness (r_g = -0.39 and r_p = -0.30) and uniformity index (r_g = -0.99) in F_2 generation, with lint percentage (r_g = 0.27), fiber strength (r_g = 1.00 and r_p= 0.65) and uniformity index (r_g = 0.51 and r_p= 0.43) in F_3 generation and with lint percentage (r_g = 0.44), 2.5% S.L. (r_g = 0.56 and r_p= 0.27), fiber fineness (r_g = -0.56 and r_p = -0.33), fiber strength (r_g = -0.97 and r_p = -0.58) and uniformity index (r_g = -0.51 and r_p = -0.35) in F_4 generation.

Boll weight had highly significant positive correlation with 2.5% S.L. (r_g = 0.41), fiber strength (r_g = 0.40 and r_p = 0.29) and uniformity index (r_g = 1.00) in F_2 generation, with 2.5% S.L. (r_g = 1.12 and r_p = 0.37), fiber strength (r_g = 0.80 and r_p = 0.46) and uniformity index (r_g = 0.56 and r_p = 0.43) in F_3 generation and with fiber fineness (r_g = 0.44 and r_p = 0.39) in F_4 generation. However, it was significant or highly significant negatively correlated with lint percentage (r_g = -0.33) in F_3 generation and with lint percentage (r_g = -0.55 and r_p = -0.45), fiber strength (r_g = -0.44 and r_p = -0.39) and uniformity index (r_g = -0.51 and r_p = -0.34) in F_4 generation.

Table 3:Estimates of genotypic (r_g) and phenotypic (r_p) correlation coefficients among seven traits for F_2 generation in cross I.

Traits	Traits / Parameters	B.W.	L. %	2.5%S.L.	F.F.	F.S.	U.I
S.C.Y.	r_g	-0.09	0.10	-0.55**	-0.39**	0.04	-0.99**
	r_p	-0.03	0.30**	-0.51**	-0.30**	0.10	0.06
B.W.	r_g		0.08	0.41**	0.08	0.40**	1.00**
	r_p		0.07	0.17	0.06	0.29**	0.10
L. %	r_g			-0.46**	-0.18	-0.05	-1.00**
	r_p			-0.13	-0.14	-0.02	-0.15
2.5%S.L.	r_g				-1.18**	0.61**	1.50**
	r_p				-0.13	0.24**	0.53**
F.F.	r_g					0.09	0.99**
	r_p					0.10	0.45**
F.S.	r_g						1.11**
	r_p						0.29**

*** and **: The shifts were significant and highly significant, respectively.**

Table 4: Estimates of genotypic (r_g) and phenotypic (r_p) correlation coefficients among seven traits for F_3 generation in cross I.

Traits	Traits / Parameters	B.W.	L. %	2.5%S.L.	F.F.	F.S.	U.I
S.C.Y.	r_g	0.26	0.27*	0.14	0.23	1.00**	0.51**
	r_p	0.24	0.26	0.06	0.20	0.65**	0.43**
B.W.	r_g		-0.33*	1.12**	0.11	0.80**	0.56**
	r_p		-0.25	0.37**	0.17	0.46**	0.43**
L. %	r_g			0.10	0.44**	0.01	0.15
	r_p			0.04	0.37**	0.09	0.06
2.5%S.L.	r_g				-0.27	1.50**	1.33**
	r_p				-0.10	0.63**	0.54**
F.F.	r_g					0.21	0.23
	r_p					0.08	0.14
F.S.	r_g						1.19**
	r_p						0.67**

*** and **: The shifts were significant and highly significant, respectively.**

Table 5: Estimates of genotypic (r_g) and phenotypic (r_p) correlation coefficients among seven traits for F_4 generation in cross I.

Traits	Traits / Parameters	B.W.	L. %	2.5%S.L.	F.F.	F.S.	U.I
S.C.Y.	r_g	0.22	0.44**	0.56**	-0.56**	-0.97**	-0.51**
	r_p	0.09	0.26	0.27*	-0.33*	-0.58**	-0.35**
B.W.	r_g		-0.55**	-0.15	0.44**	-0.44**	-0.51**
	r_p		-0.45**	-0.12	0.39**	-0.39**	-0.34*
L. %	r_g			-0.65**	-0.82**	-0.21	0.07
	r_p			-0.38**	-0.59**	-0.07	0.01
2.5%S.L.	r_g				-0.03	-0.37**	1.34**
	r_p				-0.18	-0.26	0.55**
F.F.	r_g					0.39**	0.38**
	r_p					0.35**	0.29**
F.S.	r_g						0.39**
	r_p						0.19

*** and **: The shifts were significant and highly significant, respectively.**

The genotypic and phenotypic correlation coefficients indicated that lint percentage had positive or negative and highly significant associations with 2.5% S.L. (r_g = -0.46) and uniformity index (r_g = -1.00) in F_2 generation, with fiber fineness (r_g = 0.44 and r_p = 0.37) in F_3 generation and with 2.5% S.L. (r_g = -0.65 and r_p = -0.38) and fiber fineness (r_g = -0.82 and r_p = -0.59) in F_4 generation.

Results indicate that fiber strength and uniformity index was correlated in F_2 [(r_g = 0.61 and r_p= 0.24) and (r_g = 1.50 and r_p= 0.53), respectively] and in F_3 [(r_g = 1.50 and r_p= 0.63) and (r_g = 1.33 and r_p= 0.54), respectively]. Meanwhile, uniformity index (r_g = 1.34 and r_p= 0.55) in F_4 generation had positive and highly significant correlations at genotypic and phenotypic level with 2.5% span length. However 2.5% span length demonstrated negative highly significant associations with fiber fineness (r_g = -1.18) in F_2 generation and fiber strength (r_g = -0.37) in F_4 generation.

The positive and highly significant associations were recorded between fiber fineness and uniformity index in F_2 generation (r_g = 0.99 and r_p= 0.45) and F_4 generation (r_g = 0.38 and r_p= 0.29), fiber fineness and fiber strength (r_g = 0.39 and r_p= 0.35) in F_4 generation, and fiber strength and uniformity index in F_2 generation (r_g = 1.11 and r_p= 0.29), F_3 generation (r_g = 1.19 and r_p= 0.67) and F_4 generation (r_g = 0.39).

B- Cross II:

The phenotypic (r_p) and genotypic (r_g) correlation coefficients (Tables 6, 7 and 8), indicated that the seed cotton yield/plant had positive and highly significant with lint percentage (r_p= 0.29), 2.5% span length (r_p= 0.27), fiber fineness (r_g = 0.52 and r_p= 0.27) and fiber strength (r_g = 0.47 and r_p= 0.35) in F_2 generation and with 2.5% span length (r_g = 0.66) in F_4 generation. However, seed cotton yield/plant was highly significant and negatively correlated with uniformity index (r_g = -1.17) in F_2 generation, with lint percentage (r_g = -0.52 and r_p= -0.49), 2.5% span length (r_g = -0.51 and r_p= -0.38), fiber fineness (r_g = -0.73 and r_p= -0.65) and fiber strength (r_g = -0.55 and r_p= -0.48) in F_3 generation and with lint percentage (r_g = -0.53 and r_p= -0.52) and uniformity index (r_g = -0.45) in F_4 generation. While, negative and significant associations were found between seed cotton yield/plant and boll weight (r_g = -0.29 and r_p= -0.29) in F_3 generation and with uniformity index (r_p= -0.33) in F_4 generation.

Boll weight revealed positive and significant or highly significant correlations with fiber fineness (r_g = 0.27) and uniformity index (r_p= 0.22) in F_2 generation, with 2.5% span length (r_g = 0.66 and r_p= 0.48), fiber strength (r_g = 0.38 and r_p= 0.31) and uniformity index (r_g = 0.71 and r_p= 0.48) in F_3 generation and with fiber strength (r_g = 0.33) in F_4 generation. However, boll weight was found to be negatively and highly significantly correlated with fiber fineness (r_g = -0.49 and r_p= -0.48) and uniformity index (r_g = -0.93 and r_p= -0.66) in F_4 generation.

Table 6: Estimates of genotypic (r_g) and phenotypic (r_p) correlation coefficients among seven traits for F_2 generation in cross II.

Traits	Traits / Parameters	B.W.	L. %	2.5%S.L.	F.F.	F.S.	U.I
S.C.Y.	r_g	0.06	-0.00	-0.02	0.52**	0.47**	-1.17**
	r_p	0.11	0.29**	0.27**	0.27**	0.35**	-0.06
B.W.	r_g		0.14	0.12	0.27**	0.12	-0.14
	r_p		0.16	0.11	0.07	0.10	0.22*
L. %	r_g			0.10	0.60**	0.31**	-0.39**
	r_p			0.04	0.19*	0.21*	-0.09
2.5%S.L.	r_g				0.02	0.31**	-0.64**
	r_p				0.03	0.08	-0.00
F.F.	r_g					0.01	-0.15
	r_p					-0.05	-0.01
F.S.	r_g						-1.17**
	r_p						0.03

*** and **: The shifts were significant and highly significant, respectively.**

Table 7: Estimates of genotypic (r_g) and phenotypic (r_p) correlation coefficients among seven traits for F_3 generation in cross II.

Traits	Traits / Parameters	B.W.	L. %	2.5%S.L.	F.F.	F.S.	U.I
S.C.Y.	r_g	-0.29*	-0.52**	-.51**	-0.73**	-0.55**	0.11
	r_p	-0.29*	-0.49**	-0.38**	-0.65**	-0.48**	0.07
B.W.	r_g		0.25	0.66**	-0.00	0.38**	0.71**
	r_p		0.24	0.48**	0.00	0.31*	0.48**
L. %	r_g			0.22	0.49**	0.37**	-0.01
	r_p			0.19	0.41**	0.29*	0.04
2.5%S.L.	r_g				0.39**	0.46**	1.02**
	r_p				0.34*	0.39**	0.70**
F.F.	r_g					0.13	-0.41**
	r_p					0.16	-0.16
F.S.	r_g						0.51**
	r_p						0.39**

*** and **: The shifts were significant and highly significant, respectively.**

Table 8: Estimates of genotypic (r_g) and phenotypic (r_p) correlation coefficients among seven traits for F_4 generation in cross II.

Traits	Traits / Parameters	B.W.	L. %	2.5%S.L.	F.F.	F.S.	U.I
S.C.Y.	r_g	-0.05	-0.53**	0.66**	-0.07	0.13	-0.45**
	r_p	-0.05	-0.52**	0.26	-0.07	0.08	-0.33*
B.W.	r_g		0.21	-0.13	-0.49**	0.33*	-0.93**
	r_p		0.20	-0.06	-0.48**	0.23	-0.66**
L. %	r_g			-1.33**	0.39**	-0.62**	-0.04
	r_p			0.54**	0.37**	-0.38**	-0.05
2.5%S.L.	r_g				-0.77**	1.59**	-1.47**
	r_p				-0.28*	0.31*	-0.28*
F.F.	r_g					-0.83**	0.78**
	r_p					-0.49**	0.53**
F.S.	r_g						0.41**
	r_p						0.05

*** and **: The shifts were significant and highly significant, respectively.**

Lint percentage showed positively significant or highly significant associations with fiber fineness [(r_g = 0.60 and r_p= 0.19) and (r_g = 0.49 and r_p= 0.41)] and fiber strength [(r_g = 0.21 and r_p= 0.31) and (r_g = 0.37 and r_p= 0.29)] in F_2 and F_3 generations, respectively, and with 2.5% span length (r_p= 0.54) and fiber fineness (r_g = 0.39 and r_p= 0.37) in F_4 generation. On the other hand, lint percentage observed negative and highly significant associations with uniformity index (r_g = -0.39) in F_2 generation and with 2.5% span length (r_g = -1.33) and fiber strength (r_g = -0.62 and r_p= -0.38) in F_4 generation.

2.5% span length exhibited significant or highly significant positive associations with fiber strength in F_2 (r_g = 0.31) and F_4 (r_g = 1.59 and r_p = 0.31) generations and fiber fineness (r_g = 0.39 and r_p = 0.34), fiber strength

(r_g = 0.46 and r_p = 0.39) and uniformity index (r_g = 1.02 and r_p = 0.70) in F_3 generation. While, 2.5% span length displayed significant or highly significant negative association with uniformity index (r_g = -0.64) in F_2 generation and with fiber fineness (r_g = -0.77 and r_p= -0.28) and uniformity index (r_g = -1.47 and r_p= -0.28) in F_4 generation.

Highly significant associations were observed between fiber fineness and uniformity index (r_g = -0.41) in F_3 generation, fiber fineness and fiber strength (r_g = -0.83 and r_p= -0.49) in F_4 generation, fiber strength and uniformity index (r_g = -1.17) in F_2 generation, fiber strength and uniformity index (r_g = 0.51 and r_p= 0.39) in F_3 generation, fiber fineness and uniformity index (r_g = 0.78 and r_p= 0.53) in F_4 generation and fiber strength and uniformity index (r_g = 0.41) in F_4 generation.

In other studies, Lancon *et al*., (1993) observed negative association between fiber fineness and fiber strength. Tyagi (1994) observed positive association between lint percentage with seed cotton yield and fiber fineness traits in their studies. While, negative associations were found between fiber length and seed cotton yield, lint percentage and fiber fineness traits. Shah (1995) revealed the existence of negative associations among boll weight and lint percentage traits. Azhar and Hussain (1998) reported positive association between seed cotton yield and boll weight. Kloth (1998) mentioned that correlations between fiber fineness and fiber strength were found at the phenotypic level, but were non-existent at the genotypic level. Both elongation and strength were correlated genotypically, but not phenotypically. Most traits were highly correlated in F_2 and F_3 generations; however, seed cotton yield and lint yield were not correlated in F_2 and F_3 (McCarty *et al*., 2003). Azhar *et al.*, (2004) detected negative correlation between staple length and fiber fineness. Naveed *et al.,* (2004) stated that association among boll weight and lint percentage was negative and similarly boll weight and lint percentage were found to have negative association with seed cotton yield. Rauf *et al*., (2004) revealed that boll weight had non–significant correlation at genotypic level but negative and significant correlation at phenotypic level with seed cotton yield. Positive association of fiber fineness and uniformity index, and negative association of uniformity index and fiber strength were in accordance with the results of Zhang and Xiao (2005). The study of phenotypic correlation indicated significant positive association of seed cotton yield per plant with number of bolls per plant, boll weight and lint yield per plant in F_2 generation (Basamma, 2007). Preetha and Raveendren (2008) noticed significant positive association of boll weight with seed cotton yield, and fiber length has shown significant negative association with fiber fineness, fiber strength and uniformity index traits for F_3 and F_4 generations. They added that, positive associations was significant boll weight and fiber length in F_3 generation but not in F_4 generation, and the significant negative association of uniformity index and fiber strength was observed in F_4 generation. Hussain *et al*., (2009) reported that a significant positive association with boll weight and seed cotton yield was found. Significant genotypic variation for lint yield and fiber quality including fiber bundle strength, span lengths, short fiber and fineness in the populations were found (Zeng *et al*., 2007 and Zeng and Meredith, 2009).

In general, the significant positive or negative inter-relationships of the two crosses in F_2, F_3 and F_4 generations showed that, there were good associations among traits, reflecting the effectiveness of indirect selection by breeders while making selection of desirable plants among segregating populations. The association between seed cotton yield and lint percentage was either positively significant or just positive of the cross I in F_2, F_3 and F_4 generations. In any case their correlation was regarded as favorable one as it indicates the possibility of having simultaneous improvements in both the traits and consequently yield per plant. A strong associations between uniformity index with boll weight, 2.5% span length and fiber strength of the cross I in the three generations, suggested that boll weight, 2.5% span length and fiber strength can be improved indirectly by selecting plants with higher uniformity index per plant. Boll weight was also important factor for improving seed cotton yield and lint percentage and 2.5% span length. Association between seed cotton yield and fiber fineness was not strong as evident from correlation coefficient values except the F_3 generation in the cross II.

CONCLUSION

The genotypic and phenotypic correlation coefficients among different pairs of plant traits for the two crosses in F_2, F_3 and F_4 generations indicated that seed cotton yield can be improved by increasing lint percentage and boll weight traits. The results revealed a possibility of selecting plants with desirable attributes of fiber fineness and seed cotton yield in the next segregating generations. Positive genetic associations between staple length and fiber strength of the two crosses indicated that selection for increased value of one trait will result an increase in value of other. The negative correlation between yield and quality traits were changed to positive in cross combination like indicating the possibility of improving yield and quality traits simultaneously.

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معاملات الارتباط الظاهري والوراثى لبعض صفات المحصول وجودة الألياف للأجيال الانعزالية (الثانى ،الثالث و الرابع) في بعض هجن القطن المصري

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أقيمت هذه التجربة لدراسة العلاقة بين المحصول و بعض الصفات الاقتصادية الاخرى للاجيال الثانى والثالث والرابع فى هجينيين من القطن المصرى، الهجين الاول [({جيزة 89 x جيزة 85}x{جيزة 86 x جيزة 81}) x({جيزة 83 x جيزة 80} x جيزة 89)] و الهجين الثانى [(جيزة 85 x جيزة 86) x({جيزة 83 x جيزة 80} x جيزة 89)]. تم زراع ة الأجيال الثاني والثالث والرابع لكلاً من الهجينيين بمزرعة التجارب بسخا – معهد بحوث القطن – مركز البحوث الزراعية – مصر خلال مواسم 2008 – 2009 – 2010 على التوالى. وأوضحت النتائج وجود اختلافات عالية المعنوية لمعظم الصفات محل الدراسة للثلاثة أجيال فى الهجينيين. أن أفضل قيم للمتوسطات وجدت لمتوسط وزن اللوزة(3.27 و 3.39 جم) و طول التيلة عند 2.5% (33.22 و 32.84 مم) فى الجيل الرابع و محصول القطن الزهر/نبات (175.88و 197.09 جم) و معدل الانتظام (87.01 و 86.54%) فى الجيل الثالث و لنعومة التيلة (3.75 و 3.63) فى الجيل الثانى، بينما أظهرت صفتى معدل الحليج (40.68 و 41.39%) و متانة التيلة (10.32و 10.44جم/تكس) قيم عالية للمتوسط للهجينيين الأول والثانى فى الجيليين الرابع والثالث على التوالى. وكانت قيم معامل الارتباط الوراثى أعلى من قيم معامل الارتباط الظاهرى لمعظم الصفات المدروسة للاجيال الثانى والثالث والرابع فى كلا الهجينيين. أظهرت صفة المحصول لكل من الهجينيين ارتباط عالى المعنوية وموجب بصفات معدل الحليج ، طول التيلة عند 2.5% ، نعومة التيلة ، متانة التيلة فى الجيل الثانى معدل الحليج وطول التيلة عند 2.5% فى الجيليين الثالث والرابع، بينما تغير الارتباط لنعومة ومتانة التيلة فى الجيليين الثالث والرابع. كما كان هناك ارتباط معنوياً موجباً بين صفات طول التيلة عند 2.5% ونعومة ومتانة التيلة و معدل الانتظام للهجينيين فى الثلاثة أجيال بمتوسط وزن اللوزة. وبين معدل الحليج و نعومة التيلة للجيل الثالث فى الهجين الأول ونعومة ومتانة التيلة للثلاثة أجيال فى الهجين الثانى. وأظهرت نتائج الدراسة امكانية استخدام هذين الهجينين فى برامج تربية وتحسين صفات المحصول والجودة فى القطن.

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