RESPONSE TO SELECTION FOR SOME YIELD COMPONENTS AND FIBER PROPERTIES IN SOME EGYPTIAN COTTON CROSSES

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Abstract

This research was conducted to determine genetic gain of predicted response to selection (genetic advance), realized response to selection (observed), generalized selection and selection differential as well as heritability, phenotypic and genotypic coefficients of variation to improve for boll weight, lint percentage, fiber length, fiber strength and fiber fineness. The materials used were the three generations F_2, F_3 and F_4 of the three Extra -Long cotton crosses Giza 87 x C. B 58 (pop. I), Giza 93 x Giza 71 (pop.II) and Giza 92 x Pima High Lint percentage (pop.III) were grown at Sakha Agricultural Research Station during (2013 – 2015) seasons. The results could be summarized as follows: The realized means of F_4 were higher than the realized means of F_3 and F_2 but lower than the means of the selected families of the three cycles indicating response to selection and subsequently improvement for all traits. Predicted response to selection (G.A) was greater than realized response to selection for boll weight, fiber length and fiber strength indicating that dominance gene effects were controlling the inheritance of these traits .For lint %, the realized response was higher than the predicted response to selection in the first cycle of (pop. II). The realized response was higher than the predicted response to selection for fiber fineness in second cycle of (pop. III), indicating that additive gene effects were predominant in the inheritance of lint% and fiber fineness. The low value of micronaire readings were desirable in (pop. II). This finding was harmony with the high value of heritability in F_2 and F_3 for lint % and fiber fineness respectively. Realized selection differential values were greater than predicted selection differential for lint % in (pop. I) and (pop .II), while in (pop. I) for fiber strength, boll weight and fiber length in (pop. II). Heritability values were high for lint % in the three generations and boll weight in F_3 of (pop. III), as well as fiber traits in F_2 and F_3 generations of (pop. II) and (pop. III). Phenotypic coefficients of variation were larger than genotypic coefficients of the three populations. It could be concluded that of the effective breeding method for improving lint % and fiber fineness of the two populations, (Giza 93 x Giza 71) and (Giza 92 x Pima High Lint percentage) because of the high heritability values and additive gene effects.

INTRODUCTION

The main objective of the cotton breeder is to improve yield and fiber quality through selection in breeding programs. Several selection methods were used for

improving several traits in cotton. The Egyptian commercial cultivars are results of hybridization followed by pedigree selection. Several investigators studied the type of selection effect in Egyptian cotton genotypes. Ahmed *et al.* (2003) compared actual and predicted genetic principle selection gains in two cotton crosses and found that the actual selection gain, in general, coincided with predicted one for most studied traits in first cross, while the actual gain values for the second cross were not correlated with predicted values. Abdel-Hafez *et al.* (2003) estimated the magnitudes of the genetic advance from selection indices in two populations and found that the genetic gains selection for lint percentage in population (I) was large and appeared important in the improvement of lint percentage. The predicted advances from F_4 generation were higher than those obtained from F_3 /F_4 generations and the actual advances were higher than expected for all indices in the other study. Abd El-Salam (2005) used pedigree selection in three populations and found that the means of F_2 were lower than F_4 for lint percentage and halo length. Also he found that phenotypic and genotypic coefficients of variation in F_2 were higher than those of F_3 and F_4, except for halo length and lint percentage in (pop. II), while the coefficients of variations in F4 were higher than F_3 generation, heritability ratios were high for lint percentage and halo length for the three populations in different generations. Gooda (2006) studied improvement in two populations and found that, P.C.V. and G.C.V. were decreased from F_2 to F_3 generations for all studied traits and heritability estimates in broad sense increased from F_2 to F_3 generations for the same studied traits. Improvement of halo length, fiber length at 2.5%, Pressley index and micronaire value were achieved by using direct phenotypic selection for seed cotton yield, lint yield, boll weight, seed index and lint index. El-Lawendey *et al.* (2008) used all possible matings among four F_2 selections in three populations and found highest predicted genetic advance values for lint yield/ plant, number bolls/plant, lint/seed and seed index in the three populations. High to low genetic advances were found to be associated with high to low values of GCV for most studied characters Also, Abou El-Yazied *et al.* (2008) using pedigree selection in two populations reported that the means of F_2 were lower than F_3 and F_4 generations for all studied traits except fiber fineness trait. Phenotypic and genotypic coefficients of variability were larger in F_2 generation than those of the succeeding generations for all the studied traits. High heritability values in broad sense were observed for all studied traits. The predicted genetic advance estimates were obviously higher in F_4 generation than those in F_3 generation for most studied traits except for fineness and boll weight in population (I) as well as fiber strength and boll weight in population (II). Abou El-Yazied *et al.* (2014) suggested that dominance effects were lacking or of relatively minor importance, while additive genetic effects would appear to predominate in the two populations. Hence, the breeder can depend on the estimate of predicted selection.

The present study aimed to estimate predicted response (genetic advance) and realized response to selection for the efficiency of pedigree selection procedures to improve lint percentage, boll weight, fiber length, fiber strength and fiber fineness in three cotton crosses as well as to estimate heritability, phenotypic and genotypic coefficients of variation.

MATERIALS AND METHODS

The genetic materials used in this study included three crosses belonging to *G. barbadense L.* taken from Extra- Long varieties breeding programme. The first population was derived from the cross between (Giza 87 x C. B 58), the second population was derived from the cross (Giza 93 x Giza 71) and the third population was derived from the cross (Giza 92 x Pima high percentage.) The three populations were sown at Sakha Agricultural Research Station Kafr El-Sheikh Governorate during the three seasons (2013 – 2015).

In 2013 season plants of F_2 generation and original parents of the three populations were sown in rows 7.0 m length and 0.65 cm width. After full emergence, seedlings were thinned to single plant per hill. Each row contained 10 single plants spaced 70 cm apart to facilitate self pollination for each plant. Selection was carried out on F_2 plants to obtain the desirable individual plants in the field mainly on the basis of plant type. Self pollination was made for selected plants. At harvest, all bolls of open pollination were harvest to evaluate the studied traits. While selfed seed were used in sowing for next generation. The 5% intensity of the superior plants having the highest performance in each selection for lint percentage, boll weight, fiber length, fiber fineness (Micronaire value) and fiber strength (Pressley index) were selected.

In 2014 season, the selfed seeds of each F_3 generation single plant were planted widely spaced in two replicates every one contained two rows and all single plants were selfed. The natural seeds were planted narrowly spaced in three rows, 4.0 m. in length and 0.65 m. width and contain 20 hills with two plants were left per hill at thinning time, each was regarded as a family. Selection was done between families (natural) and within families single plants) to select best plants inter best families. In 2015 season the selfed seeds of each selected plants F_4 were sown in two replicates every one contain two rows as well as the natural seeds were sown with narrow spaces in three rows 4.0 m. in length and 0.65 m. in width and used to evaluate the five later traits.

Genetic and selection parameters:

Genetic parameters

1- Heritability (h_2b %) in broad sense was estimated according to Falconer (1989) using: $h^2b\ \% = \sigma^2g / \sigma^2p \times 100$

Where: σ^2g =genetic variance σ^2P = phenotypic variance.

2- The phenotypic and genotypic coefficients of variation according to Singh and chaudhury (1985)

Phenotypic coefficient of variance PCV % = σ^2 ph / $\overline{X}$ x 100

Genotypic coefficient of variance GCV% = σ^2 g / $\overline{X}$ x 100

Where: σ^2g = genotypic variance

σ^2 ph = phenotypic variance $\overline{X}$ = mean of a trait.

Selection parameters

Predicted response:

The predicted genetic advance and realized selection response was calculated with the methods of Sharma (1998)

1-Predicted expected selection response (G.A= Genetic advance)

PR= i. $h_2$bs / 100. σp

Where: i= constant = 2.06 at 5% selection intensity

$h_2$bs =heritability in broad sense

σp = Standard deviation

2- Percentage proportion of PR in $\overline{X}$ P

PR%=PR / $\overline{X}$ p .100 Where: $\overline{X}$ p =Mean of selected plants any in generation

3- Expected generalized selection response

Pg R = P R / σp

4- Expected selection differential

PS= i. σp

Realized response:

1-Realized selection response rR = $\overline{X}$ g - $\overline{X}$ o

2- Percentage proportion rR %= rR / F of any in generation.100

3- Realized generalized selection response in generation

rgR =rR . σp

4- Realized selection differential rS = $\overline{X}$ p –X0

Note this relates to the same generation

$\overline{X}$ p = Mean of 5% selected plants

RESULTS AND DISCUSSION

The estimates of broad sense heritability (h_2b), phenotypic (PCV %), genotypic (GCV %) coefficient of variability, means and standard errors for all traits of the three populations are presented in Table (1).

Table (1) showed high values of broad sense heritability (over 50%) for boll weight in F_3 of (pop. III), for lint % in the three generations of (pop. III), F_2 and F_4 generations in (pop. II) and (pop. I), respectively. Also high heritability values were found for fiber length in F_4 of the (pop .I), F_2, F_3 in ((pop. II) and F_3 generation in

(pop. III). Micronaire value in F_2 and F_3 in (pop. II)and F_3 in (pop. III) and fiber strength in F_2 and F_3 generations of (pop. II) and F_2 in (pop. III) exhibited high estimates of broad sense heritability. While heritability values were moderate (30 - 50%) for boll weight in F_2 and F_4 generations in (pop. I) as well as F_4 in (pop. III). Lint % in F_2, F_3 and F_4 generations in (pop. I and pop. II) respectively, exhibited moderate heritability values. Fiber length in F_3,F_4 (pop. I), ((pop.II) and (pop. III), respectively. In addition, micronaire value in F_3 and F_4 generations of (pop. I) and fiber strength in F_4 of (pop. II) exhibited moderate broad sense heritability. On other hands, low heritability values (less 30%) were found for boll weight in F_2 and F_3 generations of (pop .III) and (pop. I), respectively beside in the three generations of (pop. II). Also lint % in F_3 of (pop. I). Fiber length in F_2 for (pop. I) and micronaire value in F_2 generation of (pop. I), (pop. III) and F_4 generation of (pop. II) and (pop. III) and fiber strength in the three generations of (pop. I) and F_3 generation in (pop. III) exhibited lower broad sense heritability. These results suggested negligible values of heritability for some studied traits which may be due to insignificant genetic variance. These results agreed with those obtained by Abd El-Salam (2005) who used pedigree selection in three populations and found that heritability were high for lint % and halo length for the three populations in different generations.

The Data in Table (1) showed that phenotypic variability values were larger than genotypic variability for all studied traits in the three populations. The genetic coefficients of variability for most traits were low for the three populations indicated more homogeniety and uniformity than the basic population. These results are in harmony with those obtained by Johanson *et al.* (1955) who indicated that the genetic coefficient of variability (GCV %) is important in plant breeding since it helps in assessment of the range of genetic variability in characters and helps in comparing the genetic variance of various characters, Meena *et al.* (2001), El-Lawendy (2003) and Gooda (2006) studied improvement in two populations and found that, PCV and GCV were decreased from F_2 to F_3 generations for all studied traits. Table (1) revealed that mean values were increased for both F_3 and F_4 generations compared with the F_2 for all studied traits .This attributed to obtained by Meena *et al.* (1991) and Meena et al (2001). El-Lawendy (2003) and Abou El-Yazied *et al.* (2008) who indicated that the means of F_2 were lower than F_3 and F_4, generations for all studied traits except fiber fineness trait.

Table1. Estimated heritability ($h_2b\%$), phenotypic (PCV), genotypic (GCV) coefficients of variability, means and standard errors in F_2, F_3 and F_4 generations through three populations.

Traits		Heritability ($h_2b\%$)			PCV%			GCV%			Means± S d		
		Population			Population			Population			Population		
	Gen.	I	II	III	I	II	III	I	II	III	I	II	III
Boll weight (g)	F_2	45.7	24.7	18.8	4.02	1.64	3.83	1.84	0.40	0.72	2.87±0.34	3.07±0.22	2.98±0.34
	F_3	29.3	21.7	54.9	2.99	1.54	6.72	0.88	0.33	3.69	2.96±0.30	3.15±0.22	3.06±0.45
	F_4	31.7	10.7	49.7	2.67	1.30	5.98	0.85	0.14	2.97	3.43±0.30	3.26±0.21	3.08±0.43
lint%	F_2	48.2	52.5	87.4	5.90	3.47	12.05	2.85	1.82	10.54	36.93±1.5	35.01±1.10	36.64±2.10
	F_3	23.4	47.3	57.7	3.96	3.01	3.51	0.93	1.43	2.02	37.23±1.2	36.29±1.05	37.34±1.14
	F_4	57.0	35.5	55.5	7.03	2.46	3.30	4.01	0.87	1.83	37.33±1.6	36.30±0.94	37.70±1.12
Fiber length (mm)	F_2	23.4	73.4	44.5	3.79	5.39	1.63	0.88	3.96	0.73	34.83±1.2	34.92±1.37	36.24±0.77
	F_3	34.1	66.0	79.7	4.39	3.40	4.44	1.50	2.25	3.54	34.89±1.2	35.15±1.09	36.28±1.27
	F_4	53.2	33.5	49.0	6.06	1.70	1.76	3.23	0.57	0.86	35.62±1.5	35.94±0.78	36.57±0.80
Fiber fineness	F_2	26.0	58.7	7.1	1.02	0.60	0.38	0.27	0.35	0.03	3.76±0.33	3.65±0.35	3.75±0.37
	F_3	45.8	68.0	78.1	1.41	0.79	1.65	0.65	0.54	1.29	3.88±0.32	3.39±0.47	3.02±0.22
	F_4	31.1	11.6	19.1	1.09	0.28	0.44	0.34	0.03	0.08	3.72±0.34	3.51±0.28	3.76±0.19
Fiber strength	F_2	20.5	56.2	72.5	2.97	3.45	3.68	0.61	1.94	2.67	11.03±0.5	11.04±0.42	11.18±0.47
	F_3	13.9	79.4	22.2	2.65	6.65	1.62	0.37	5.28	0.36	11.19±0.4	11.18±0.46	11.34±0.45
	F_4	21.8	41.7	zero	3.04	2.27	0.98	0.66	0.95	zero	11.26±0.4	11.40±0.34	11.40±0.36

The selection procedure

The means of realized and predicted response to selection for boll weight in the three cycles of selection are presented in Table (2). Results showed that F_2 selected families were higher than F_3 realized means. The results showed that predicted expected genetic advance (PR)) in F_2 to F_3 of the three populations were greater than realized genetic advance (rR) in F_3. The results of observed mean F_3 were higher than the observed means of F_2 indicating the response of pedigree selection. Also predicted generalized (pgR) of F_2 were higher than realized generalized selection (rgR) in F_3. The data showed that the realized means F_3 were higher than the realized F_2 indicating improvement for this trait. The predicted response to selection for boll weight was greater than realized response indicating that dominance gene effects was involved in the inheritance of that trait. The results of predicted selection differential (ps) were lower than the realized differential response (rs) in (pop. I and pop. III), while in (pop.II) this predicted differential response (ps) parameter was higher ones.

In the second cycle of selection (predicted in F_3 and realized in F_4) the data in Table (2) showed that the realized mean of F_4 generation was lower than the mean of selected families in F_3 generation, but the realized mean of F4 generation was higher than realized mean of F_3 generation . Similar results were obtained by Abou El-Yazied *et al*. (2008).

The predicted genetic advance (PR) values of F_3 were lower than realized genetic advanced (rR) of F_4 generation in (pop.I) and (pop.II), while in (pop.III) the predicted (PR) was higher than realized (rR) in F_4 generation. These results indicated greater progress for boll weight in the second cycle of selection than in the first one (Table 2). The greater response in second cycle versus first cycle of selection is attributed to major genes effecting in second cycle of selection and for minor genes in first cycle (Avery *et al.*, 1982). Predicted generalized response (pgR) selection were higher than realized generalized selection response (rgR) in F_4 generation for (pop.III), while predicted (pgR) were lower than rgR in (pop.I) and (pop.II).The selection differentials of the predicted response were higher in (pop.I) and (pop.III), while the observed response was higher in (pop.II). These results were in agreement with those obtained from first cycle where the non additives were predominant in inheritance of the boll weight.

For third cycle the data in Table (2) showed that the families means were (3.6, 3.9 and 4.0) in (pop. I), ,(pop. II) and (pop.III), respectively and the predicted genetic advance (PR) in F_4 were 0.20, 0.05 and 0.44 for the three populations, respectively.

The generalized selections were 0.65, 0.22 and 1.02, respectively. The selection differentials of the predicted were 0.62, 0.42 and 0.88, respectively.

Table 2. Predicted and realized response to selection in F_2, F_3 and F_4 generations through three populations for boll weight

Selection Parameters	Predicted response in F_2			Realized response in F_3			Predicted response in F_3			Realized response F_4			Predicted response in F_4		
	Population			Population			Population			Population			Population		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Selection response ((G.A),PR, rR)	0.32	0.11	0.13	0.10	0.08	0.08	0.18	0.10	0.51	0.47	0.11	0.02	0.20	0.05	0.44
Percentage proportion (Pr%, rR %)	8.84	3.28	3.50	3.23	2.56	2.56	5.07	2.73	12.99	13.7	3.35	0.56	5.46	1.17	10.98
Generalized selection response (pgR, rgR)	0.94	0.51	0.39	0.32	0.37	0.17	0.60	0.45	1.13	1.55	0.53	0.04	0.65	0.22	1.02
Selection differential response (Ps, rs)	0.70	0.46	0.70	0.75	0.41	0.76	0.61	0.45	0.93	0.19	0.62	0.92	0.62	0.42	0.88
Realized mean	2.9	3.1	3.0	3.0	3.2	3.1				3.4	3.3	3.1			
Mean Selected family	3.6	3.5	3.7				3.6	3.6	4.0				3.6	3.9	4.0

Table 3. Predicted and realized response to selection in F_2, F_3 and F_4 generations through three populations for lint percentage.

Selection Parameters	Predicted response in F2			Realized response in F3			Predicted response in F3			Realized response F4			Predicted response in F4		
	Population			Population			Population			Population			Population		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Selection response ((G.A),PR, rR)	1.47	1.19	3.78	0.30	1.27	0.70	0.59	1.02	1.36	0.10	0.01	0.36	1.90	0.69	1.28
Percentage proportion (Pr%, rR%)	3.82	3.24	9.30	0.80	3.51	1.88	1.49	2.76	3.34	0.26	0.03	0.95	4.70	1.78	3.19
Generalized selection response (pgR, rgR)	0.99	1.08	1.80	0.24	1.22	0.61	0.48	0.97	1.19	0.06	0.01	0.32	1.17	0.73	1.14
Selection differential response (Ps, rs)	3.04	2.27	4.33	1.51	1.79	4.04	2.50	2.15	2.36	3.13	2.54	2.30	3.34	1.95	2.30
Realized mean	36.9	35.0	36.6	37.2	36.3	37.3				37.3	36.3	37.7			
Mean selected family	38.4	36.8	40.7				39.4	36.9	40.8				40.5	38.8	40.0

Table (3) presented means, predicted and realized response to selection for lint % in the three cycles of selection. The data showed that the means of F_2 selected families were higher than the realized means of F_3 in (pop.I) and (pop.III), while in (pop.II) the difference was insignificant.

In first cycle of selection the results showed that predicted genetic advance (PR) in F_2 to F_3 generation of (pop. I) and (pop.III) were greater than realized genetic

advanced (rR) in F_3, while in (pop.II) the realized genetic advanced (rR) was higher than predicted genetic advance (PR) . Also, predicted generalized (pgR) values of F_2 generation were higher than realized generalized selection (rgR) in (pop.I) and (pop.III), while in (pop. II) the realized was higher than predicted generalized selection. The results of predicted selection differential response) (ps) in F_2 generation were higher than the realized differential response (rs) in F_3 generation of the three populations. These results suggested that the additive genetic effects would appear to predominate in (pop.II). The dominance gene effects were effective in (pop. I) and (pop.III) for lint%. The realized means of F_3 were higher than the realized of F_2 generation indicating the response of selection to improvement.

In the second cycle of selection (predicted in F_3 generation and realized in F_4 generation), the data in Table (3) showed that the realized means of F_4 were (37.3, 36.3, and 37.7) in the three populations, respectively. The realized means were lower than the mean of selected families in F_3 (39.4, 36.9 and 40.8) except for (pop. II) in which the difference was insignificant, but the realized means of F_4 generation were higher than realized means of F_3 generation in (pop. I) and (pop.III, while it were closed in (pop. II). These results indicating that additive genetic effects were effective in (pop.III) while the dominance were effective in (pop. I) and (pop. II). Similar results were obtained by Abd El-Salam (2005) and Abou El-Yazied *et al.* (2008). Data in Table (3) showed that predicted genetic advances (PR) of F_3 were higher than realized genetic advanced (rR) of F_4 generation in the three populations, also predicted generalized (pgR) selection were higher than realized generalized selection (rgR) of F_4 generation in the three populations. On the other hand, the predicted selection differential (ps) of F_3 generation were lower than realized (rs) of F_4 generation in (pop.I) and (pop.II), while the differences between the predicted and realized selection differential response was insignificant in ((pop.III). These results agreed with these obtained by El-Lawendy (2003) who found highest predicted response to selection for lint % in F_4 generation.

For third cycle the data in Table (3) showed that the means of selected families (40.5, 38.8 and 40.0) in (pop. I), (pop. II) and (pop.III), respectively, were effective and sufficient to subsequently improvements. Similar results were obtained by Abd El-Salam (2005) and Abou El-Yazied *et al.* (2014). The predicted genetic advances (PR) in F_4 were 1.90, 0.69 and 1.28 for the three populations, respectively. The generalized selections were 1.17, 0.73 and 1.14 respectively. The predicted selection differential (ps) exhibited 3.34, 1.95 and 2.30 for the three populations, respectively. Generally, the predicted gains in the three cycles were nearly higher than the realized in three

populations for lint %. This study demonstrates the efficacy of selection procedure and available genetic variability to improvement in the three populations. These results are in agreement with those obtained by El-Lawendy (2003), Abd El-Salama (2005), Gooda (2006) and Abou El-Yazied *et al.* (2008).

Table 4. Predicted and realized response to selection in F_2, F_3 and F_4 generations through three populations for fiber length

Selection Parameters	Predicted response in F_2			Realized response in F_3			Predicted response in F_3			Realized response F_4			Predicted response in F_4		
	Population			Population			Population			Population			Population		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Selection response ((G.A),PR, rR)	0.55	2.07	0.71	0.06	0.23	0.04	0.87	1.49	2.08	0.72	0.79	0.29	1.61	0.54	0.81
Percentage proportion (Pr%, rR%)	1.48	5.76	1.86	0.17	0.66	0.12	2.36	3.99	5.40	2.03	2.20	0.79	4.24	1.41	2.08
Generalized selection response (pgR, rgR)	0.48	1.51	0.92	0.05	0.21	0.03	0.70	1.36	1.64	0.49	1.01	0.36	1.10	0.69	1.01
Selection differential response (Ps, rs)	2.37	2.83	1.58	2.52	1.11	1.73	2.55	2.25	2.62	2.38	2.44	2.35	3.03	1.61	1.65
Realized mean	34.8	34.9	36.2	34.9	35.2	36.3				35.6	35.9	36.6			
Mean selected family	37.4	36.0	38.0				36.9	37.3	38.6				38	38.4	38.9

Table 5. Predicted and realized response to selection in F_2, F_3 and F4 generations through three populations for fiber strength.

Selection Parameters	Predicted response in F_2			Realized response in F_3			Predicted response in F_3			Realized response F_4			Predicted response in F_4		
	Population			Population			Population			Population			Population		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Selection response ((G.A),PR, rR)	0.39	0.16	0.49	0.16	0.14	0.16	0.22	0.31	0.43	0.06	0.23	0.06	0.10	0.29	0.12
Percentage proportion (Pr%, rR%)	3.26	1.38	4.04	1.46	1.21	1.43	1.84	2.55	3.61	0.56	1.98	0.53	0.82	2.41	0.99
Generalized selection response (pgR, rgR)	0.88	0.39	1.04	0.41	0.29	0.36	0.55	0.67	0.96	0.17	0.66	0.17	0.28	0.86	0.33
Selection differential response (Ps, rs)	0.92	0.87	0.97	1.00	0.86	0.94	0.82	0.95	0.93	0.96	0.80	0.60	0.75	0.70	0.74
Realized mean	11.0	11.0	11.2	11.2	11.2	11.3				11.3	11.4	11.4			
Mean selected family	12.0	11.9	12.1				11.9	12.1	12.0				12.2	12.2	12.0

Table 6. Predicted and realized response to selection in F2, F3 and F4 generations through three populations for fiber fineness.

Selection Parameters	Predicted response in F2			Realized response in F3			Predicted response in F3			Realized response F4			Predicted response in F4		
	Population			Population			Population			Population			Population		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Selection response ((G.A),PR, rR)	0.14	0.41	0.56	0.12	-0.27	-0.73	0.09	0.78	0.10	-0.15	0.12	0.74	0.15	0.24	-0.01
Percentage proportion (Pr%, rR %)	4.77	13.88	18.98	3.04	-7.89	-24.4	2.75	30.5	2.91	-4.13	3.52	19.7	5.00	9.06	-0.34
Generalized selection response (pgR, rgR)	0.42	1.16	1.49	0.37	-0.56	-3.32	0.29	1.63	0.46	-0.46	0.44	3.9	0.45	0.86	-0.06
Selection differential response (Ps, rs)	0.69	0.73	0.77	-0.8	-0.69	-0.83	0.66	0.98	0.46	-0.70	-0.83	-0.6	0.69	0.58	0.40
Realized mean	3.8	3.7	3.8	3.9	3.4	3.0				3.7	3.5	3.8			
Mean selected family	3.0	3.0	2.9				3.3	2.6	3.5				3.02	2.7	3.2

For fiber length and fiber strength the means, predicted and realized response to selection in the three cycles of selection are presented in Tables (4) and (5). The data showed that the means F_2 generation selected families were higher than the realized means of F_3 generation in the three populations for the two traits

In first cycle of selection the results showed that predicted genetic advance (PR) in F_2 generation to F_3 generation for the three populations were greater than realized genetic advanced (rR) in F_3 generation for fiber length and fiber strength. Also predicted generalized (pgR) of F_2 generation were higher than realized generalized selection (rgR) of F_3 generation in the three populations for fiber length and fiber strength indicating that dominance gene effect was involved in the inheritance for of these traits .The predicted selection differential response (ps) values in F_2 generation were lower than the realized differential response (rs) in F_3 generation in (pop.I) and (pop.III), while in (pop.II) it was higher for fiber length. These results indicating that additive genetic effect was effective in (pop.I) and (pop.III), while the dominance was effective in (pop.II) for this trait. Data in Table (5) showed that predicted

selection differential response (ps) in F_2 generation were greater than the realized differential response (rs) of F_3 generation in (pop.II) and (pop.III), while in (pop.I) higher realized differential response was found for fiber strength. The realized means of F_3 generation were higher than the realized means of F_2 generation indicating the response of selection to improvement.

In the second cycle of selection (predicted in F_3 generation and realized in F_4 generation) the data in Table (4) and (5) showed that the realized means of F_4 generation were lower than selected families means for fiber length and fiber strength in the three populations. The results showed that predicted genetic advance (PR) in F_3 of the three populations were greater than realized genetic advanced (rR) of F_4 generation in the three populations for fiber length and fiber strength. The predicted generalized (pgR) selection was higher than realized generalized selection (rgR) of F_4 generation in the three populations for fiber length while in (pop.II) the realized generalized selection (rgR) difference was insignificant for fiber strength. These results suggested that fiber length and fiber strength controlled by were dominance gene effects .The predicted selection differential response (ps) values in F_3 generation were higher than the realized differential response (rs) in F_4 generation in (pop.I) and (pop.III), while in (pop.II) realized differential response (rs) was higher for fiber length indicating that additive genetic effects would appear to predominate in (pop.I). On the other hand the dominance gene effects were effective in (pop.II) and (pop.III) for fiber length. Data in Table (5) showed that the predicted selection differential response (ps) in F_3 generation were higher than the realized differential response in F_4 generation of (pop.II) and (pop.III), while higher realized differential response was found in (pop.I) indicating that additive genetic effects were effective in (pop.I) for improvement.

For third cycle the data in Table (4)) showed that the means of the selected families were (38.0, 38.4 and 38.9) in (pop. I), (pop.II) and (pop.III), respectively for fiber length. Table (5) exhibited the families means of fiber strength were (12.2, 12.2, and 12.0) indicated that third cycle of selection reflects improvements for the two traits. The predicted genetic advances (PR) in F_4 generation were (1.61 0.54 and 0.81), respectively for fiber length while PR were (0.10, 029, 0.12) for fiber strength. The generalized selections were (1.10, 0.69 and 1.01), respectively for fiber length and (0.28, 0.86, 0.33), respectively for fiber strength. The predicted selection differential (ps) exhibited (3.03, 1.61 and 1.65), respectively for fiber length while it were (0.75, 0.70, 0.74), respectively for fiber strength. Generally, the predicted gains in the three cycles were nearly higher than realized in the three populations for fiber

length and fiber strength. These results indicated that dominance gene effect existed and controlled the inheritance of these traits.

Regarding micronaire value, the means, of predicted and realized responses to selection in the three cycles of selection are presented in Table (6). The means of F_2 generation selected families were less than means of F_3 realized mean for the three populations. The means of F_2 generation selected families were (3.0, 3.0 and 2.9) respectively for the three populations, while realized means were (3.9, 3.4 and 3.0) respectively for the three populations. These results indicating that additive gene effect existed in the inheritance of this trait.

In first cycle of selection, the results showed that predicted genetic advance (PR) in F_2 to F_3 generation of the three populations were greater than realized genetic advanced (rR) in F_3 generation. The results indicating that negative realized genetic advanced (rR) of F_3 generation were desirable in (pop.II) and (pop.III), while in (pop.I) the differences were positive for this parameters. Also predicted generalized (pgR) of F_2 generation were higher than realized generalized selection (rgR) of F_3 generation in the three populations as the same trend of genetic advance. The results of predicted selection differential response (ps) were greater than the realized differential response (rs) in the three populations but the realized differential response showed negative desirable change in the three populations. The realized mean of F_3 generation were finer than the realized mean of F_2 generation except for (pop.I) indicating the response of selection to improvement in (pop.II) and (pop .III) , while in (pop.I) the realized mean of F_3 generation was coarser than realized mean of F_2 generation.

In the second cycle of selection (predicted in F_3 generation and realized in F_4 generation) the data in Table (6) showed that the selected families means of F_4 generation were (3.3, 2.6 and 3.5) in the three populations, respectively when were less than realized mean of F_4 generation was (3.7, 3.5 and 3.8) in the three populations, respectively. The results suggested that the selection was responded and sufficient subsequently improvements. Similar results were obtained by Younis (1999) an Abou El-Yazied *et al.* (2008). This result indicated that additive gene effect was predominant in inheritance of this trait. This finding was in harmony with high value of heritability in F3 Table (1).

Data in Table (6) revealed that the predicted genetic advance (PR) values in F_3 generation were greater than realized genetic advance (rR) of F_4 generation in (pop.I) and (pop.II), while (pop.III) was lower. The results indicating that negative realized genetic advance (rR) of F_4 generation was -015 desirable in (pop.I), while the

differences were positive in (pop.II) and (pop.III) 0.12and 0.74, respectively. Also predicted generalized (pgR) of F_3 generation were greater than realized generalized selection (rgR) of F_4 generation in two populations (pop.I) and (pop.II), while in (pop.III) it was lower and had the same trend of genetic advance. The results cleared that (rgR) the (pop.I) was negative. The results of predicted selection differential response) (ps) were greater than the realized differential response (rs) in the three populations but the realized differential response showed negative desirable estimates in the three populations.

For third cycle the data in Table (6) exhibited selected families means were (3.0, 2.7 and 3.2) in the three populations respectively for micronaire value. This reflects the improvement for this trait in third cycle. The predicted genetic advances (PR) in F_4 generation were (0.15 0.24 and -0.0), respectively. The generalized selections were (0.45 0.86 and -0.0), respectively. The selection differential of the predicted (ps) exhibited (0.69, 0.58 and 0.41), respectively. These results are agreement with those obtained by El-Lawendy (2003), Abd El-Salam (2005) and Abou El-Yazied *et al.* (2008).

It could be concluded from the above results that selection could improve lint % and fiber fineness in two populations, (Giza 93 x Giza 71) and (Giza 92 x Pima high percentage e) because of the high heritability values and additive gene effects.

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الاستجابة للانتخاب لبعض صفات المحصول ومكوناته وصفات التيلة لبعض هجن القطن المصري

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أجريت هذه الدراسة بهدف تقدير التحسين الوراثي المتوقع بالانتخاب والتحسين الوراثي الفعلي و الفارق الانتخابي وكذلك نسبة التوريث ومعامل التباين الوراثي والمظهري لبعض صفات مكونات المحصول (وزن اللوزة وتصافى الحليج) وبعض صفات التيلة (الطول والمتانة والنعومة) بعد ثلاث دورات من الانتخاب في الجيل الثاني والثالث والرابع لثلاثة هجن من الأقطان فائقة الطول ، وهما (جيزة ٨٧ x C. B 58) العشيرة الأولى و (جيزة 93 x جيزة ٧١) العشيرة الثانية و (جيزة ٩٢ x بيما عالي التصافي) العشيرة الثالثة. وأقيمت التجربة بمحطة البحوث الزراعية بسخا خلال ثلاثة مواسم (٢٠١٣ – ٢٠١٥). ويمكن تلخيص نتائج هذه الدراسة فيما يلي :

كان متوسط العائلات المنتخبة في الجيل الرابع اعلي من الجيل الثاني والثالث في جميع الصفات المدروسة والمتوسط الفعلي كان مرتفعا في الدورة الثالثة من الانتخاب مقارنة بالدورة الأولى والثانية مما يدل على الاستجابة للانتخاب.

لوحظ إن التحسين الوراثي المتوقع اكبر من التحسين الوراثي الفعلي في معظم الصفات المدروسة مما يؤكد إن تأثير التباين السيادي هو الذي يتحكم في هذه الصفات ماعدا صفة تصافى الحليج ونعومة التيلة حيث كان تأثير التباين المضيف الذي ظهر تحكمه في هذه الصفات وخاصة في العشيرتين الثانية والثالثة ويوضح ذلك ارتفاع نسبة التوريث في هاتين الصفتين مما يمكن المربى الاستمرار في عملية الانتخاب والاستجابة للتحسين.

كان الفارق الانتخابي المتوقع اكبر من الفارق الانتخابي الفعلي في نسبة تصافى الحليج ونعومة التيلة في الثلاثة عشائر ووزن اللوزة وطول التيلة في العشيرة الثانية ومتانة التيلة في العشيرة الثانية والثالثة . بينما كان الفارق الانتخابي الفعلي اكبر من الفارق الانتخابي المتوقع في صفات وزن اللوزة في العشيرة الأولى وطول التيلة في العشيرة الثالثة .

تباينت تقديرات نسبة التوريث في المدى الواسع من المنخفضة إلى العالية تبعا للصفات والعشائر وكانت قيم معامل التوريث عالية لصفة نسبة تصافى الحليج في الجيل الثاني والثالث والرابع ووزن اللوزة في الجيل الثالث وذلك في العشيرة الثالثة.وأيضا بالنسبة صفات التيلة كانت مرتفعة في الجيل الثاني والثالث في العشيرتين الثانية والثالثة ، وكان معامل الاختلاف المظهري اكبر من الوراثي في جميع الصفات المدروسة .

نستخلص من هذه النتائج فاعلية الانتخاب بالنسبة لتحسين صفات نسبة التصافي ونعومة التيلة وذلك نتيجة درجة التوريث المرتفعة مع ارتفاع نسبة التحسين الوراثي الفعلي وفعالية فعل الجين المضيف مما يدل على كفاءة عملية الانتخاب وذلك في العشيرتين الثانية والثالثة وبالتالي يستطيع المربى تطبيق دورات من الانتخاب على تلك العشيرتين في الأجيال التالية.