J. Agric. Sci. Mansoura Univ., 29 (12): 6949 - 6960, 2004

GENETICAL STUDIES ON RELATIVE EFFICIENCY OF SOME SELECTION PROCEDURES IN IMPROVING ECONOMICAL TRAITS IN COTTON

Abd El-Maksoud, M.M.*; Z.M. El-Diasty*; Z.A. Kosba*; A.A. Okasha and M.A. Al-Ameer****

*** Dept. of Genetics, Faculty of Agric., Mansoura Univ., Egypt.**

**** Cotton Research Institute, Agriculture Research Center, Egypt.**

ABSTRACT

The purpose of this study is to investigate the relative efficiency of single-seed descent, pedigree and bulk population selection procedures in improving economical traits in cotton and in the same time maintaining genetic variation.The genetic materials used in the present study included five cotton varieties. These varieties were Giza 45, Giza 85, Giza 88, TNB_1, and karshanseky ($Kar._2$). All these varieties belong to *Gossypium barbadens L.* The different selection procedures were practiced on three crosses [(Giza 88 X TNB_1), (Giza 85 X TNB_1) and (Giza 45 X $Kar._2$)] in order to comparing the efficiency of these methods for improvement of Egyptian cotton traits. The results could be summarized as follows :

Tests of significance of the mean squares cleared that the differences among lines derived by pedigree procedure were significant for all the studied traits except for fiber strength for the lines derived from second cross (Giza 85 X TNB_1). Although the mean squares of lines derived from first cross (Giza 88 X TNB_1) and third cross (Giza 45 X $Kar._2$) by bulk population (BP) procedure were significant in all studied traits, it was significant in the cases of lint percentage %, boll weight, seed index, lint index, fiber length at 2.5% Span length, fiber fineness and fiber strength traits for the lines selected from the second cross (Giza 85 X TNB_1). While, the differences among lines derived by the single seed descent procedure were not significant for most of studied traits with respect to the three populations.

Lines selected by the pedigree method (PD) exhibited a wide ranges for all studied traits compared to the ranges of the bulk population selection method (BP) and the single seed descent method (SSD) lines should the some trend except for number of the opening bolls/plant and uniformity ratio, which gave a wide ranges in the bulk population selection method (BP).

The best ratio of superior lines over the mid-parents for most the studied traits in the 1st and 3rd crosses was detected in the pedigree selection procedure (PD) and the bulk population selection procedure (BP). With respect to the cross (Giza 85 X TNB_1) the percentage values of this parameter was low or equal to zero in the populations derived by either SSD or PD procedures. This result indicated that the bulk population procedure (BP) is more efficient in the improvement of most yield component traits with respect to this cross.

The relative number of superior lines derived by each procedure than the standard variety (Giza 88) in the three crosses recorded that the PD procedure is more efficient in the improvement most as traits with respect to, the first cross (Giza 88 X TNB_1). On the other hand, BP procedure exhibited superiority over the other procedures in the improving lint yield/plant and seed cotton yield/plant.

Highly significant values of genotypic variance ($\sigma^2 g$) were detected in the pedigree selection procedure (PD) than in the bulk population selection procedure (BP) and single seed descent procedure (SSD), for most studied traits in the three crosses.

High values of expected genetic gain (ΔG) were found to be associated with high and moderate values of heritability estimates in broad sense in most of studied traits, indicating that the phenotypic expression of these traits were indicative of their genetic behaviour. So, selection for these traits may be highly effective.

INTRODUCTION

Genetical studies and cotton breeding programs on cotton are aimed to increase fiber quality as well as improving yield capacity to improve commercial varieties and to produce new lines. Plant breeders have been continually searching for more efficient methods to screen and evaluate the large segregating populations.The pedigree method has been widely used, but it is limited by the amount of materials, which a plant breeder can handle. The procedure is to select superior progenies from segregating generations, and maintaining records of all parent-progeny relationships.

Plant breeders must be concerned with the total array of economic traits, not just one trait. Thus, the importance of knowing how the change in one trait by selection may cause simultaneous changes in other economic traits. The results of this study were generally in agreement with the results reported by Salamah (1977),Younis (1986), Mahdy *et al.* (1987-a), Mahdy *et al.* (1987-b), Ghoneim (1989), Gooda (2001) and Lasheen (2003). Younis (1986) found that the pedigree selection was the most efficient procedure for improving lint yield/plant and number of bolls/plant in intraspecific population. While, it was more efficiency for improving boll weight in interspecific population. He added that phenotypic and genotypic variances uses decreased rapidly after two cycles of selection. In addition, Shaheen *et al.* (2000) found that high narrow sense heritability in F_3 families were detected for most yield components and fiber properties, indicating good expected response to selection in the fourth (F_4) generation. Furthermore, Lasheen (2003) and Lasheen *et al.* (2003) revealed that it is worth to notice that no detectable changes occurred in the mean performance of lint yield or any of its components and fiber properties due to selection and it is useful for breeder to consider these traits in formulating his breeding programmes to obtain gain in selection for single plant yield.

The purpose of this study was to investigate the relative efficiency of single seed descent, pedigree and bulk population selection procedures in improving of some economic traits in cotton and maintaining genetic variation.

MATERIALS AND METHODS

The genetic materials used in the present study included five cotton varieties. These varieties were Giza 45, Giza 85, Giza 88, TNB_1, and karshanseky ($Kar._2$). All these varieties belong to *Gossypium barbadens L.* These varieties included three Egyptian cotton varieties (Giza 45, Giza 85 and Giza 88), one Indian cotton variety (TNB_1) and one Russian cotton variety ($Kar._2$). This study was carried out at Sakha Agricultural Research Station, Kafr EL- Sheikh Governorate, Cotton Research Institute, Agricultural Research Center, during the successive growing seasons of 1999, 2000, 2001, 2002 and 2003 to compare the efficiency of different selection methods in improving some economic traits in cotton.

In the 1999 summer season, three hybrids belong to Egyptian and exotic varieties were used as the starting materials for selection procedures. These hybrids were Giza 88 X TNB_1 (I), Giza 85 X TNB_1 (II) and Giza 45 X $Kar._2$ (III). In the growing season of 2000, the three populations of selected plants were self-pollinated to obtain the F_2 seeds of these crosses. In the growing season of 2001, the seeds of individual plants were sown separately and at the flowering time, 5% of superior plants were selected and self-pollinated in order to obtain the seeds of the F_3 generation as starting materials for application the first cycle of selection for single seed descent, pedigree and bulk populations selection procedures. In the growing season of 2002, the three selection procedures were applied in each population on the plants having highest values for the important economic characters from selected F_3 plants. To comparing respective lines derived by SSD, PD and BP procedures, field experiment was set up in the growing season of 2003. The selected lines by each method were evaluated in a randomized complete blocks design with three replications. Each replication consisted of 206 plots, which included 19 SSD, 145 PD and 42 BP lines and Giza 88 cultivar as standard variety. The plot consisted of one row, five meter long and 65 cm wide. Hills were spaced at 25 cm a part. Therefore, each row had 20 hills. Land preparation, fertilizer applications, irrigation and all other agricultural practices were applied as recommended for cotton crop.

The data were recorded on ten guarded plants randomly chosen per plot for all entries on the following traits: Seed cotton yield per plant (S.C.Y./P), Lint yield per plant (L.Y./P), Boll weight (B.W.), Number of the opening bolls per plant (N.O.B./P), Lint percentage % (L.P.%), seed index (S.I.), Lint index (L.I.) as yield and its component traits, Fiber fineness (F.F.), Fiber strength (F.S.), Fiber length (F.L.), which measured as 2.5% 50% span length and uniformity ratio as fiber properties.

Analysis of variance was conducted for all characters and differences between the different lines were tested for significance according to the "F" test.

Means, ranges and partitioning of phenotypic variances were conducted for each character in each experiment. Significance of means differences were made using the least significant difference values (L.S.D.) at 0.05 level of probability according to the following equation,as suggested by Steel and Torrii (1980):

$$L.S.D.\ (5\%) = t_{0.05, Edf} \cdot X\ \underline{S}_d$$

Estimates of heritability were determined according to the following equation:

$$\text{Heritability in broad sense } (H^2_b\ \%) = \frac{\sigma^2 g}{\sigma^2 ph} X\ 100 \quad \{\text{Allarad (1960)}\}$$

Where: $\sigma^2 g$ = the genotypic variance of the generation.

$\sigma^2 ph$ = the phenotypic variance of the generation.

The expected genetic gain was measured according to Johnson *et al.* (1955) and Allard (1960) as follows:

$G_s = K. \sigma A.H^2_b$

G_s = expected genetic gain

K = selection differential and its value equal to 2.06 at the 5% intensity of selection

σA = phenotypic standard deviation

H^2_b = heritability value in broad sense

The expected genetic gain (ΔG) represented as a percentage of lines mean for the trait (Grand mean) was calculated according to Miller *et al.* (1958)

$$(\Delta G) = \frac{G_s}{\overline{X}} X \quad 100$$

where $\underline{X}$ = lines mean for a giving

RESULTS AND DISCUSSION

Tests of significance of the mean squares which appear in Tables 1 & 2, respectively cleared that the differences among lines derived by pedigree procedure were significant for all the studied traits except for fiber strength for the lines derived from second cross (Giza 85 X TNB_1). However, the mean squares of lines derived from first cross (Giza 88 X TNB_1) and third cross (Giza 45 X $Kar._2$) by BP procedure were significant for where, all studied traits, it was significant in the cases of lint percentage %, boll weight, seed index, lint index, fiber length at 2.5% S.L., fiber fineness and fiber strength traits for the lines selected from the second cross (Giza 85 X TNB_1). While, the differences among lines derived by SSD procedure were not significant in most of studied traits with respect to the three populations. The significance of mean squares of lines selected by each procedure suggested that the planned comparisons to determine the efficiency of selection procedures for all studied trait were valid.

The results revealed that the pedigree selection method (PD) in Table 3 proved to be the best among the three procedures applied in the present study, while the single seed descent method (SSD) maintained higher mean performance lines for fiber properties when compared to the pedigree selection method (PD) and the bulk population selection method (BP). The pedigree selection method (PD) lines exhibited a wide ranges for all studied traits compared to both the ranges of the bulk population selection method (BP) lines and the single seed descent method (SSD) lines except for number of the opening bolls/plant, and uniformity ratio, which showed a wide range values in the bulk population selection method (BP). All the previous results indicated that the pedigree selection method (PD) proved to be the best among the three selection procedures applied for the most studied characters in the present investigation. Moreover, the results showed that the pedigree selection method (PD) was the most efficient in testing of the progeny compared with the single seed descent method (SSD) and the bulk population selection method (BP).The results were generally in agreement with the results reported by Younis (1986), Mahdy *et al.* (1987-a), Mahdy *et al.* (1987-b), Ghoneim (1989), Gooda (2001) and Lasheen (2003).

Table 1:- Analysis of variance and the mean squares of lines selected by each procedure for all studied characters in the three crosses for yield and components.

S.O.V	Proc.	d.f	Yield and yield components																				
			LY./P			S.C.Y/P			L.P.%			B.W.			N.O.B/P			S.I.			L.I.		
			I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Replications	BP	2	3.3	4.1	7.3	47.7	17.6	71.0	4.3**	1.2	0.3	0.1	0.1	0.1	0.7	6.3	4.7	0.1	0.1	0.1	0.1	0.0	0.0
	SSD	2	628**	121**	110**	5891**	1067**	1184**	1.3**	4.5**	6.5**	0.1	0.4**	0.1	528**	69.5**	168**	0.8**	1.3**	0.1	0.0	0.0	0.7
	PD	2	35.6*	41.9*	1.8	218.9*	281.8*	23.4	5.5**	0.8	1.5	0.3*	0.1	0.2**	25.2*	22.2	10.7	1.2*	0.5*	0.3	0.0	0.1*	0.1
Lines	BP	6	31.1	2.1	18.5	193.8	10.5	133.8	8.8**	4.9**	15.5**	0.1	0.0	0.2	24.6*	1.9	14.2	2.2**	0.2	1.0	0.3*	0.2*	0.6
	SSD	59	18.1*	28.6**	29.3**	152.8*	210.4*	229.7**	7.5**	3.9**	14.3**	0.1**	0.1**	0.2**	15.7**	16.7*	22.10*	1.8**	0.7**	2.9**	0.3**	0.3**	0.4
	PD	14	22.5**	10.3	43.8**	160.5*	83.7	356.1**	4.3**	5.3**	7.0**	0.0	0.1*	0.1	14.2*	10.9	32.2**	1.4**	0.8**	1.3**	0.2*	0.2**	0.5
Error	BP	12	11.1	13.7	7.7	91.9	96.5	68.6	0.3	0.5	0.3	0.1	0.1	0.1	5.8	11.1	10.9	0.1	0.1	0.3	0.1	0.1	0.1
	SSD	118	12.3	15.3	12.8	105.7	127.9	108.2	0.3	0.5	0.5	0.0	0.0	0.0	8.3	10.4	13.0	0.1	0.2	0.3	0.0	0.0	0.0
	PD	28	7.7	9.8	9.7	64.9	70.0	95.1	0.5	0.4	0.8	0.1	0.0	0.0	6.7	7.6	9.5	0.3	0.1	0.2	0.1	0.0	0.0

*,** Significant at 0.05 and 0.01 levels of probability, respectively.

Table 2 : Analysis of variance and the mean squares of lines selected by each procedure for all studied characters in the three crosses for Fiber properties

S.O.V	Proc.	d.f.	Fiber properties														
			50%S.L.			2.5% S.L.			U.R.%			F.F.			F.S.		
			I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Replication	BP	2	0.0	0.3	0.3	0.0	1.1	0.4	0.3	0.0	0.5	0.4**	0.5*	0.4	0.1	2.0*	0.1
	SSD	2	0.1	2.4*	0.1	0.8	5.5*	0.2	0.2	2.4	0.2	3.4**	2.3**	0.7**	6.9**	0.8	0.6
	PD	2	0.6	0.7	0.2	1.8	0.0	0.0	0.3	6.6	1.8**	0.6**	0.1**	0.2	1.9	0.1	0.1
Lines	BP	6	2.3**	1.9**	1.9**	5.9**	4.7**	5.5**	3.2**	4.1**	3.7**	0.2**	0.1	0.7**	0.6	0.2	0.9
	SSD	59	2.7**	2.9**	2.2**	8.2**	7.0**	6.2**	2.8**	6.0**	2.9**	0.1**	0.2**	0.2**	0.7**	0.7	0.7**
	PD	14	4.1**	1.1	2.5**	8.2**	4.3*	6.9**	5.7**	3.4	5.9**	0.1	0.2**	0.2	0.6	0.8*	0.1
Error	BP	12	0.2	0.2	0.2	0.5	0.6	0.5	0.6	0.4	0.1	0.0	0.1	0.1	0.3	0.5	0.4
	SSD	118	0.4	0.6	0.4	0.6	1.3	1.0	1.3	1.8	0.5	0.0	0.1	0.1	0.4	0.5	0.3
	PD	28	0.5	0.8	0.2	1.4	2.0	0.8	0.4	2.2	0.3	0.0	0.0	0.1	0.6	0.3	0.6

*,** Significant at 0.05 and 0.00 levels of probability, respectively.

Table 3: Means, standard errors (S.E.) and ranges of lines selected by each procedure for all the studied characters in the three crosses.

Characters		Single seed descent (SSD)		Pedigree method (PD)		Bulk population (BP)		Giza 88
		Mean ± S.E.	Range	Mean ± S.E.	Range	Mean ± S.E.	Range	
Yield and yield componants								
L.Y./P	I	15.4 ± 1.3	10.1 - 19.5	16.6 ± 0.4	10.7 –22.7	16.2 ± 0.7	10.8 – 21.4	16.8
	II	18.4 ± 1.4	17.2 - 19.4	18.3 ± 0.5	8.6 – 26.1	18.8 ± 0.8	15.8 – 22.1	16.8
	III	15.3 ± 1.2	11.9 - 18.9	13.4 ± 0.6	8.6 – 22.1	12.6 ± 0.9	6.7 – 20.0	16.8
S.C.Y./P	I	45.3 ± 3.6	31.9 - 55.1	49.4 ± 1.3	33.6 – 65.2	47.6 ± 2.1	32.4 – 61.1	46.2
	II	50.4 ± 3.7	49.0 - 54.3	51.2 ± 1.6	24.6 – 75.3	52.2 ± 2.2	42.9 – 60.9	46.2
	III	45.5 ± 3.7	35.9 - 54.2	40.4 ± 1.8	27.5 – 63.8	40.4 ± 2.8	22.1 – 57.0	46.2
L.P.%	I	33.9 ± 0.2	31.5 - 35.9	33.7 ± 0.1	29.6 – 38.4	33.9 ± 0.2	31.4 – 35.7	36.5
	II	36.6 ± 0.3	34.9 - 38.2	35.7 ± 0.1	33.0 – 38.1	36.1 ± 0.2	33.4 – 39.1	36.5
	III	33.7 ± 0.3	29.9 - 35.6	33.2 ± 0.1	29.2 – 37.9	30.9 ± 0.2	29.1 – 35.1	36.5
B.W.	I	3.4 ± 0.1	3.18 - 3.67	3.4 ± 0.0	3.0 – 3.9	3.5 ± 0.1	3.1 – 3.6	3.3
	II	3.3 ± 0.1	3.2 - 3.5	3.3 ± 0.0	3.1- 3.8	3.4 ± 0.0	3.1 – 3.6	3.3
	III	3.1 ± 0.1	2.8 - 3.5	2.9 ± 0.0	2.4 – 3.4	3.2 ± 0.0	2.9 – 3.3	3.3
N.O.B./P	I	13.4 ± 0.9	9.2 - 17.5	14.6 ± 0.4	10.1 – 19.9	13.9 ± 0.7	9.8 – 18.1	14.1
	II	15.4 ± 1.3	14.3 - 17.0	15.5 ± 0.4	8.1 – 21.2	15.5 ± 0.7	12.1 – 19.7	14.1
	III	9.4 ± 0.2	8.3 - 9.7	9.9 ± 0.1	7.9 – 12.0	10.7 ± 0.1	9.8 – 11.8	10.8
S.I.	I	10.9 ± 0.1	9.8 - 12.0	11.4 ± 0.0	9.6 – 13.0	11.4 ± 0.1	10.6 – 12.8	10.8
	II	9.9 ± 0.1	9.4 - 10.2	10.8 ± 0.1	9.9 – 12.1	10.6 ± 0.1	9.8 – 11.4	10.8
	III	9.4 ± 0.2	8.3 - 9.7	9.9 ± .01	7.9 – 12.0	10.7 ± 0.1	9.8 – 11.8	10.8
L.I.	I	5.5 ± 0.1	5.2 - 5.9	5.8 ± 0.0	4.9 – 6.6	5.8 ± 0.1	5.3 – 6.3	6.2
	II	5.7 ± 0.1	5.3 - 6.1	5.9 ± 0.0	5.5 – 6.8	5.9 ± 0.0	5.4 – 6.3	6.2
	III	4.8 ± 0.1	4.1 - 5.2	4.9 ± 0.0	4.2 – 5.9	4.8 ± 0.1	4.2 – 5.6	6.2
Fiber properties								
50%S.L.	I	16.7 ± 0.2	15.3 - 17.7	16.6 ± 0.1	13.9 – 18.4	16.5 ± 0.2	14.8 – 18.8	17.8
	II	14.9 ± 0.1	13.9 - 16.4	14.7 ± 0.1	11.9 – 16.5	14.5 ± 0.2	13.4 – 15.8	17.8
	III	16.5 ± 0.2	15.2 - 17.3	16.1 ± 0.1	14.5 – 17.8	15.7 ± 0.1	14.1 – 17.1	17.8
2.5%S.L.	I	34.7 ± 0.3	32.0 - 35.9	34.5 ± 0.1	30.5 – 37.5	34.3 ± 0.3	31.9 – 36.8	36.6
	II	30.4 ± 0.3	28.6 - 32.4	30.8 ± 0.2	25.8 – 34.5	30.5 ± 0.4	28.9 – 33.5	36.6
	III	34.4 ± 0.3	32.7 - 36.4	33.8 ± 0.2	31.4 – 37.1	33.2 ± 0.2	31.2 – 35.7	36.6
U.R.%	I	48.2 ± 0.3	46.7 - 49.7	48.1 ± 0.1	45.5 – 50.0	47.9 ± 0.2	46.2 – 51.1	48.7
	II	49.2 ± 0.2	46.9 - 50.7	47.5 ± 0.2	44.2 – 50.4	47.6 ± 0.4	45.5 – 49.1	48.7
	III	48.0 ± 0.2	46.4 - 49.5	47.5 ± 0.1	45.5 – 49.9	47.3 ± 0.1	43.3 – 48.5	48.7
F.F.	I	4.1 ± 0.1	3.7 - 4.4	4.0 ± 0.0	3.6 – 4.5	4.1 ± 0.1	3.7 – 4.5	3.5
	II	3.9 ± 0.1	3.6 - 4.2	4.2 ± 0.0	3.7 – 4.9	4.2 ± 0.0	3.6 – 4.7	3.5
	III	3.4 ± 0.1	3.0 - 4.2	3.2 ± 0.0	2.7 – 4.0	3.4 ± 0.1	3.1 – 3.9	3.5
F.S.	I	10.4 ± 0.2	9.7 - 11.0	10.4 ± 0.1	9.3 – 11.4	10.4 ± 0.2	9.8 – 11.4	11.4
	II	9.9 ± 0.3	9.4 - 10.3	9.4 ± 0.1	8.2 – 10.4	9.2 ± 0.1	8.1 – 9.9	11.4
	III	10.0 ± 0.3	9.4 - 10.8	9.7 ± 0.1	8.7 – 10.8	9.5 ± 0.2	8.4 – 10.4	11.4

The relative number of lines with significantly higher (H) or lower (L) means than the mid-parents in the first, second and third populations were calculated for the studied traits and the results are presented in Table 4. The best ratio of superior lines than the mid-parents for most studied traits was detected in the pedigree selection procedure (PD) and the bulk population selection procedure (BP). With respect to the cross (Giza 85 X TNB_1), the percentages values of this parameter was low or equal to zero in the populations derived by either SSD or PD procedures. On the other hand, BP population showed superiority over mid-parents by 50% of lines in the case of seed index (S.I.) compared by 21.21% in the PD population and 0.00% in SSD populations for the third cross. These results indicated that the bulk population procedure (BP) is more efficient in the improvement of most yield component traits with respect to this cross. Therefore, it could be concluded that the efficient of selection procedure depend on the genetic constitution of starting material (the crosses) as well as the trait under studies.

Table 4: The relative number of lines with significantly higher (H) or lower (L) values than the mid-parents of the three crosses for all the studied characters.

Characters		Single seed descent (SSD)		Pedigree method (PD)		Bulk population (BP)	
		H%	L%	H%	L%	H%	L%
Yield and yield components							
L.Y./P	I	00.0	14.3	00.0	41.7	00.0	13.3
	II	00.0	00.0	3.8	3.8	6.7	00.0
	III	20.0	00.0	15.1	00.0	00.0	25.0
S.C.Y./P	I	00.0	14.3	00.0	23.3	00.0	6.7
	II	00.0	00.0	1.9	3.8	20.0	00.0
	III	20.0	00.0	6.1	00.0	00.0	8.3
L.P.%	I	00.0	85.7	00.0	96.7	00.0	86.7
	II	28.6	28.6	9.6	38.5	6.7	66.7
	III	60.0	20.0	39.4	39.4	8.3	91.7
B.W.	I	00.0	00.0	00.0	26.7	00.0	00.0
	II	00.0	00.0	9.6	00.0	00.0	6.8
	III	00.0	20.0	9.1	18.1	00.0	00.0
N.O.B./P	I	28.6	14.3	00.0	26.7	00.0	6.7
	II	00.0	00.0	3.8	3.8	13.3	00.0
	III	00.0	00.0	15.1	00.0	00.0	8.3
S.I.	I	00.0	57.1	41.7	15.0	20.0	00.0
	II	00.0	00.0	15.4	3.8	13.3	20.0
	III	00.0	20.0	21.1	24.2	50.0	00.0
L.I.	I	00.0	85.7	00.0	75.0	00.0	53.3
	II	00.0	28.6	15.4	17.3	00.0	33.3
	III	40.0	20.0	12.1	12.1	8.3	41.7
Fiber properties							
50%S.L.	I	00.0	42.9	1.7	41.7	13.3	46.7
	II	00.0	57.1	00.0	38.5	00.0	46.7
	III	20.0	20.0	9.1	27.3	00.0	58.3
2.5%S.L.	I	00.0	28.8	6.7	48.3	00.0	53.3
	II	00.0	85.7	1.9	50.0	00.0	73.3
	III	20.0	20.0	6.1	30.3	8.3	58.3
U.R.%	I	28.6	14.3	00.0	20.0	40.0	00.0
	II	85.7	00.0	3.8	13.5	00.0	13.3
	III	20.0	20.0	6.1	30.3	00.0	41.7
F.F.	I	00.0	71.4	00.0	31.7	00.0	20.0
	II	00.0	00.0	00.0	30.8	13.3	13.3
	III	00.0	20.0	9.1	6.1	00.0	8.3
F.S.	I	00.0	71.4	5.0	1.7	00.0	6.7
	II	00.0	00.0	00.0	15.4	00.0	80.0
	III	00.0	00.0	3.0	12.1	00.0	8.3

The relative number of lines derived by each procedure with significantly higher (H) or lower (L) values than the standard variety (Giza 88) in the three populations for the studied characters are shown in Table 5. The relative number of superior lines derived by each procedure than the standard variety (Giza 88) in the three crosses recorded that the PD procedure is more efficient in the improvement of most traits with respect to, the first cross (Giza 88 X TNB_1).

Table 5: The relative number of lines with significantly higher (H) or lower (L) values than the standard variety (Giza 88) of the three crosses for all the studied characters.

Characters		Single seed descent (SSD)		Pedigree method (PD)		Bulk population (BP)	
		H%	L%	H%	L%	H%	L%
Yield and yield components							
L.Y./P	I	00.0	14.3	00.0	11.7	13.3	00.0
	II	00.0	00.0	1.9	3.8	33.3	00.0
	III	00.0	00.0	00.0	63.6	8.3	16.7
S.C.Y./P	I	00.0	00.0	00.0	5.0	26.7	00.0
	II	00.0	00.0	1.9	3.8	26.7	00.0
	III	00.0	00.0	00.0	51.5	8.3	8.3
L.P.%	I	00.0	85.7	6.7	90.0	00.0	93.3
	II	14.3	28.6	9.6	25.0	6.7	40.0
	III	00.0	100.0	00.0	84.8	00.0	100.0
B.W.	I	00.0	00.0	20.0	3.3	00.0	00.0
	II	00.0	00.0	3.8	00.0	6.7	00.0
	III	00.0	20.0	00.0	63.6	00.0	00.0
N.O.B./P	I	14.3	14.3	00.0	8.3	13.3	00.0
	II	00.0	00.0	00.0	3.8	20.0	00.0
	III	00.0	00.0	00.0	12.1	00.0	00.0
S.I.	I	57.1	28.6	46.7	10.0	26.7	00.0
	II	00.0	42.9	7.7	17.3	00.0	26.7
	III	00.0	60.0	6.1	48.5	8.3	33.3
L.I.	I	00.0	71.4	1.7	51.7	00.0	46.7
	II	00.0	42.9	5.8	38.5	00.0	60.0
	III	00.0	100.0	00.0	93.9	00.0	00.0
Fiber properties							
50%S.L.	I	00.0	42.9	00.0	53.3	00.0	66.7
	II	00.0	100.0	00.0	100.0	00.0	100.0
	III	00.0	40.0	00.0	78.8	00.0	00.0
2.5%S.L.	I	00.0	57.1	00.0	55.0	00.0	60.0
	II	00.0	100.0	00.0	98.1	00.0	100.0
	III	00.0	80.0	00.0	66.7	00.0	91.7
U.R.%	I	14.3	14.3	00.0	20.0	00.0	60.0
	II	54.1	14.3	00.0	25.0	00.0	13.3
	III	20.0	40.0	00.0	33.7	00.0	66.7
F.F.	I	00.0	85.7	00.0	91.7	00.0	26.7
	II	00.0	71.4	00.0	90.4	00.0	46.7
	III	00.0	20.0	21.1	3.0	16.7	00.0
F.S.	I	00.0	85.7	00.0	10.0	00.0	40.0
	II	00.0	100.0	00.0	69.2	00.0	100.0
	III	00.0	100.0	00.0	75.8	00.0	83.3

On the other hand, BP procedure exhibited superiority over the other procedures in improving lint yield/plant and seed cotton yield/plant, where the percentages of lines with higher significant values than the standard variety (Giza 88) ranged from 13.33% to 26.7% compared by zero in the PD and SSD populations. Therefore, the BP procedure is more efficient for improvement of cotton yield in the first cross (Giza 88 X TNB_1). The proportions of lines derived by PD procedure with significantly higher values than the standard variety (Giza 88) were 7.7% and 5.8% for seed index (S.I.) and lint index (L.I.), respectively, compared to zero in the BP and SSD populations in the second cross (Giza 85 X TNB_1). The previous results indicated that the three selection procedures appeared to be effective for improving different characters depending on the started genetic materials (crosses). In this respect, many investigators draw similar conclusions. Among them, Salamah (1977), Yousef (1979), Younis (1986), Mahdy *et al.* (1987-a), Mahdy *et al.* (1987-b) and Gooda (2001).

The values of genotypic variance ($\sigma^2 g$) and expected genetic gain (ΔG) as percentage of mean of selected lines by each procedure for all studied traits in the three populations are found in Table 6. Highly significant values of genotypic variance ($\sigma^2 g$) were detected in the pedigree selection procedure (PD) than in the bulk population selection procedure (BP) and single seed descent procedure (SSD), respectively for all studied traits in the three crosses. Some traits showed negative values for genotypic variance ($\sigma^2 g$) in the single seed descent procedure (SSD), due to the large magnitude of the experimental error (environmental variance), which masked the genetic variations and led to inaccurate estimates of genetic parameters. On the other hand, magnitudes of genotypic variance ($\sigma^2 g$) maintained among the lines within most of the three selection procedures for most traits were sufficient to lead to further appreciable improvement in the economic characters. The results suggested that genotypic variance ($\sigma^2 g$) values would give the best indication of the amount of genotypic variance ($\sigma^2 g$) to be expected from selection procedures. Also, the magnitude of the genetic variability presented in these materials was sufficient for providing rather substantial amounts of improvement through the selection of superior progenies for the economic characters in the three populations. The values of expected genetic gain (ΔG) as percentage of mean in the pedigree selection procedure (PD) and the bulk population selection procedure (BP) were higher than their corresponding values in the single seed descent procedure (SSD) indicating that the applied selection procedures were effective and successful for selecting the best lines and maintaining the characters on high standard levels. These results were generally in agreement with the results reported by Abo-EL-Zahab and Abd-Alla (1972), Younis (1986), Mahdy *et al.* (1987-a), Mahdy *et al.* (1987-b), Ghoneim (1989), Tian *et al.* (1993), Gomaa *et al.* (1999), Shanti *et al.* (1999), Shaheen *et al.* (2000), Gooda (2001) and Lasheen (2003).

Table 6: Estimates of genotypic variance (σ^2g) and expected genetic gain (ΔG) for 5% of selected lines by each procedure for all studied characters in the three crosses.

Characters		Single seed descent (SSD)		Pedigree method (PD)		Bulk population (BP)	
		σ^2g	ΔG	σ^2g	ΔG	σ^2g	ΔG
Yield and yield componants							
L.Y./P	I	6.7	27.7	1.9*	9.8	4.9**	22.9
	II	0.00+	0.00+	4.4**	16.2	0.2	1.1
	III	3.6	19.4	5.5**	26.9	11.4**	48.6
S.C.Y./P	I	34.0	19.2	15.7*	9.18	31.8*	18.8
	II	0.00+	0.00+	27.5*	13.2	4.5	3.4
	III	21.7	14.7	40.5**	23.6	86.9**	40.7
L.P.%	I	2.8**	10.1	2.4**	9.3	1.3**	6.5
	II	1.5**	6.5	1.1**	5.7	1.6**	7.0
	III	5.0**	13.6	4.6**	13.0	2.1**	9.1
B.W.	I	0.00+	0.00+	0.0**	9.3	0.00+	0.00+
	II	0.00+	0.00+	0.0**	4.3	0.0*	5.3
	III	0.0	11.7	0.0**	11.8	0.0	4.1
N.O.B./P	I	6.2*	33.6	2.1**	13.2	2.5*	17.0
	II	0.00+	0.00+	2.1*	11.7	1.1	7.8
	III	1.1	6.9	3.0*	16.7	7.6**	36.7
S.I.	I	0.7**	15.3	0.6**	13.1	0.4**	9.7
	II	0.0	2.2	0.2**	7.5	0.2**	8.4
	III	0.2	9.0	0.8**	18.3	0.4**	10.7
L.I.	I	0.1*	8.9	0.1**	8.7	0.1*	5.8
	II	0.0*	6.9	0.1**	8.9	0.1**	7.9
	III	0.2*	16.9	0.1**	13.2	0.2**	15.5
Fiber properties							
50%S.L.	I	0.7**	9.9	0.8**	10.3	1.2**	12.9
	II	0.6**	10.2	0.8**	10.8	0.1	2.6
	III	0.6**	9.3	0.6**	9.1	0.7**	10.8
2.5%S.L.	I	1.8**	7.6	2.5**	9.1	2.3**	8.2
	II	1.4**	7.4	1.9**	8.3	0.8*	4.2
	III	1.7**	7.4	1.7**	7.3	2.1**	8.4
U.R.%	I	0.8**	3.6	0.5**	2.2	1.8**	5.5
	II	1.3**	4.5	1.4**	4.3	0.4	1.6
	III	1.2**	4.6	0.8**	2.6	1.9**	5.8
F.F.	I	0.0**	11.8	0.0**	6.8	0.0	4.5
	II	0.0	3.3	0.0**	9.2	0.1**	11.7
	III	0.2**	24.6	0.0**	11.5	0.0	6.2
F.S.	I	0.1	3.9	0.1**	4.2	0.00+	0.00+
	II	0.00+	0.00+	0.1	2.9	0.1*	6.4
	III	0.2	6.2	0.1	5.8	0.2	6.2

+ Negative estimates for genotypic variance component.
*,** Significant at 0.05 and 0.01 levels of probability, respectively.

REFERENCES

Abo-El-Zahab, A.A. and S.A. Abd-Alla (1972). Genetic variation and heritability of some agronomic characters in Egyptian cotton (*Gossypium barbadense* L.). J., Agric. Res., (20): 275-282.

Allard, R.W. (1960). Principles of Plant Breeding. John Wiley & Sons, Inc., New York.

Ghoneim, E.M. (1989). Studies on selection in Egyptian cotton. Ph. D. Thesis, Fac. of Agric., Al-Azhar Univ., Egypt.

Gomaa, M.A.M.; A.M.A. Shaheen and S.A.M. Khattab (1999). Gene action and selection indices in two cotton (*Gossypium barbadense* L.) crosses. Annals Agric., Sci., Ain-Shams Univ., Cairo, 44 (1): 293-308.

Gooda, B.M.R. (2001). Application of certain selection techniques in evaluating and maintaining Egyptian cotton varieties. M. Sc. Thesis, Fac. of Agric., Kafr El-Sheikh, Tanta Univ., Egypt.

Johnson, H.W.; H.F. Robinson and R.E. Comstock (1955). Genotypic and phenotypic correlations in soybeans and their implications in selection. Agronomy J. (47): 477 – 493.

Lasheen, A.F. (2003). Production of Giza 89 cotton variety breeder's seed under two different locations of its varietal zone. Minufiya J. Agric. Res., Vol. 28, No. (1): 23 – 30.

Lasheen, A.F.; G.H. Abdel-Zaher and M.A. Abbas (2003). Path coefficient analysis of some characters contributing to yield of Giza 89 cotton cultivar. J. Agric. Res., Tanta Univ., Vol. 29,No. (1): 85 – 94.

Mahdy, E.E.; E.A. Hassaballa; M.A. Khalifa and F.G. Younis (1987-a). Relative efficiency of three selection procedures in improving yield and its components in Egyptian cotton. Assiut J., Agric., Sci., 18(3): 159-175.

Mahdy, E.E.; E.A. Hassaballa; M.A. Khalifa and F.G. Younis (1987-b). Comparative studies on three selection procedures in an interspecific population of cotton. Assiut J., Agric., Sci., 18(3): 179-195.

Miller, P.A.; J.C. Williams, H.F. Robinson and R.E. Comstock (1958). Estimates of genotypic and environmental variances and covariance's in Upland cotton and their implications in selection. Agron. J., (50): 126-131.

Salamah, F.I.M. (1977). A comparative study of standard and modified pedigree methods of cotton breeding. Ph. D. Thesis, Fac. of Agric., Ain-Shams Univ., Egypt.

Shaheen, A.M.A.; M.A.M. Gomaa and R.M. Esmaeil (2000). Response to selection for yield, yield components and fiber properties in three Egyptian cotton crosses. Annals Agric., Sci., Ain-Shams Univ., Cairo, 45 (2): 491-506.

Shanti, Patil; T.S. Raveendran and S. Patil (1999). Genetic variability in F_2 populations in cotton (*Gossypium hirsutum* L.). PKV Res., J., 23(1): 9-13.

Steel, R.G.D. and J.H. Torrii (1980). Principles and Procedures of Statistics. A Biometrical Approach. 2nd Ed., McGraw Hill Book Company, Inc., New York, U.S.A., Pp 450-625.

Tian, Z.G.; X.Q. Hao and S.F. Zhang (1993). Inheritance analysis and selection strategies for earliness and yield components in short season cotton. Acta Agric., Boreali Sinica, 8 (1): 18-22.

Younis, F.G. (1986). Comparative studies on selection procedures in cotton. Ph.D. Thesis, Fac. of Agric., Assiut Univ., Egypt.

Yousef, S.M.M. (1979). Effect of some breeding methods on some quantitative characters in Egyptian cotton. Ph. D. Thesis, Fac. of Agric., Al-Azhar Univ., Egypt.

دراسات وراثية للكفاءة النسبية لبعض طرق الانتخاب في تحسين بعض الصفات الاقتصادية في القطن

ممدوح محمد عبد المقصود * ، زكريا محمد الديسطي*، زكريا عبد المنعم كسبة * ، عبد الفتاح عبد المنعم عكاشة **و محمد عبد المولى على محمد الأمير **

*** قسم الوراثة- كلية الزراعة- جامعة المنصورة- مصر.**

**** معهد بحوث القطن- مركز البحوث الزراعية- مصر.**

إن الغرض من هذه الدراسة هو دراسة الكفاءة النسبية لكل من طريقة انتخاب الجورة الواحدة، انتخاب النسب والانتخاب التجميعي في تحسين بعض الصفات الاقتصادية في القطن وحفظ وجود التباين الوراثي. اشتملت الدراسة الحالية على ٥ أصناف وهي: جيزة ٤٥، جيزة ٨٥، جيزة٨٨ ، TNB_1 والصنف كارشنسكي٢. وقد أجريت هذه الدراسة في مزرعة محطة سخا للبحوث الزراعية بمحافظة كفر الشيخ لمعهد بحوث القطن-مركز البحوث الزراعية عبر المواسم الزراعية ١٩٩٩ ،٢٠٠٠، ٢٠٠١، ٢٠٠٢، ٢٠٠٣ لمقارنة كفاءة طرق الانتخاب المختلفة لتحسين بعض الصفات الاقتصادية في ٣ هجن هي [جيزة ٨٨TNB_1X ، جيزة ٨٥ TNB_1X و جيزة ٤٥ $Kar._2X$].

ويمكن تلخيص النتائج المتحصل عليها في النقاط التالية:

اختبارات المعنوية لمتوسط المربعات أوضحت أن هناك اختلافات بين السلالات الناتجة بطريقة انتخاب النسب وكانت معنوية لكل الصفات المدروسة عدا صفة متانة التيلة للسلالات الناتجة من الهجين الثاني(جيزة ٨٥ TNB_1X). وبالرغم من أن متوسط المربعات للسلالات الناتجة من الهجين الأول(جيزة ٨٨TNB_1X) والهجين الثالث (جيزة ٤٥$Kar._2X$) بطريقة الانتخاب التجميعي كانت معنوية في كل الصفات المدروسة فقد كانت معنوية في حالات صفات معدل الحليج %، وزن اللوزة، معامل البذرة، معامل الشعر، طول التيلة بالبوصة عند ٢,٥%، نعومة التيلة و متانة التيلة للسلالات المنتخبة والناتجة من الهجين الثاني(جيزة ٨٥ TNB_1X). وكانت الاختلافات بين السلالات الناتجة بطريقة انتخاب الجورة الواحدة غير معنوية في معظم الصفات المدروسة في الثلاث هجن جميعا.

أشارت النتائج إلى أن طريقة انتخاب النسب برهنت على أنها الأفضل والأحسن من بين الثلاث طرق المستخدمة لمعظم الصفات المدروسة في هذه الدراسة. بينما طريقة انتخاب الجورة الواحدة أظهرت وبينت أداء عالي لمتوسط السلالات الناتجة منها وذلك لصفات التيلة عندما قورنت بطريقتي انتخاب النسب والانتخاب التجميعي. السلالات الناتجة بطريقة انتخاب النسب أظهرت مدى واسع من القيم لكل الصفات المدروسة مقارنة بالسلالات الناتجة بطريقتي الانتخاب التجميعي وانتخاب الجورة الواحدة ماعدا صفات عدد اللوز المتفتح/نبات و نسبة الانتظام والتي أظهرت مدى واسع للقيم في طريقة الانتخاب التجميعي.

أشارت النتائج أن أفضل نسبة تفوق للسلالات عن متوسط الأبوين لمعظم الصفات المدروسة كانت في طريقتي انتخاب النسب والانتخاب التجميعي. وفيما يتعلق بالهجين الثاني(جيزة ٨٥ TNB_1X) فقد كانت قيم انتخاب النسب تتراوح بين القيم المنخفضة أو المساوية للصفر في السلالات الناتجة من طريقتي انتخاب الجورة الواحدة و انتخاب النسب.وهذه النتيجة دلت على أن طريقة الانتخاب التجميعي أكثر فعالية وكفاءه في تحسين معظم الصفات المحصولية لهذا الهجين.

وقد أظهرت النتائج أن نسبة السلالات المتفوقة عن الصنف القياسي جيزة ٨٨ في الثلاث هجن كانت أعلى في طريقة انتخاب النسب مما يشير إلي أن هذه الطريقة هي الأكثر فاعلية وكفاءه في تحسين معظم الصفات المدروسة في الهجين الأول(جيزة ٨٨TNB_1X). وعلى الجانب الأخر فإن طريقة الانتخاب التجميعي أظهرت تفوقا على الطريقتين الأخرتين في تحسين صفتي محصول الشعر/ نبات ومحصول القطن الزهر/نبات.

إن قيم التباين الوراثي كانت عالية المعنوية في طريقة انتخاب النسب مقارنة بالقيم في طريقتي الانتخاب التجميعي وانتخاب الجورة الواحدة على التوالي لكل الصفات المدروسة في الثلاث هجن. وعموما فإن أفضل وأحسن السلالات جاءت بطريقتي انتخاب النسب والانتخاب التجميعي مقارنة بسلالات طريقة انتخاب الجورة الواحدة.

كل هذه النتائج اقترحت أن قيم التباين الوراثي سوف تعطي أفضل دليل علي كمية التباين الوراثي المتوقع والمكتسب من طرق الانتخاب. والقيم العالية للمكسب الانتخابي وّجدت أنها تكون مصاحبة للقيم العالية والمتوسطة من معامل التوريث في المدى الواسع لمعظم الصفات المدروسة دلالة على أن التعبير المظهري لهذه الصفات دليل على سلوكها الوراثي ، ولهذا فان الانتخاب لهذه الصفات يمكن أن يكون عالي الكفاءة.