Egypt. J. Plant Breed. 14 (3): 131 – 141 (2010)

IMPROVEMENT OF GRAIN YIELD IN TWO POPULATIONS OF MAIZE FOLLOWING TWO CYCLES OF S_1 PROGENY SELECTION

H. E. Mosa, A. A. Motawei and A. A. El-Shenawy

Maize Research Section, Sakha ARS, FCRI, ARC, Egypt

ABSTRACT

Two newly developed open-pollinated maize populations, Sakha-7 and Sakha-8, were subjected to two cycles of S_1 progeny selection to improve their grain yield. A total of 196 S_1 progenies from each original population (C 0) were evaluated at Sakha and Sids Research Stations during 2003 season. The 10% highest yielding S_1 families were recombined during 2004 season to give rise to selection cycle one (C1) for both populations. Same procedure was repeated during 2005, 2006 and 2007 seasons on both C1 populations to obtain selection cycle two (C2) of both Sk-7 and Sk-8. Each of C0, along with its derivatives (C1 and C2) and a check variety were compared in two separate yield trails (one for populations Sk-7 and the other for populations Sk-8) conducted at four locations during 2008 season. Genetic variances (σ^2G) among S_1 progenies of both populations (Sakha 7 and Sakha 8) for both cycles of selection (C1 and C2) were significant for all studied traits. The genotype x location interaction variances (σ^2GL) for S_1 progenies of both populations for both cycles of selection were significant for most studied traits. Broad sense heritability (H_b%) for S_1 progenies of both populations for both cycles of selection exhibited medium to high values for the studied traits. Expected gain from selection for grain yield was higher than that for other studied traits. Percentages of expected genetic gain from selection for grain yield were 20.68 % and 13.01 % for C1 and C2 , respectively of Sk-7 and 15.8% and 21.3% for C1 and C2 ,respectively of Sk-8 . Actual grain yield of population Sk-7 C2 (32.34 ard/fed) was significantly higher than that of Sk-7 C0 (22.01 ard/fed),and Sk-7 C1 (27.76 ard/fed), as well as the check variety Giza-2 (25.47 ard/fed). Also, Sk-7 C1 was significantly higher yielding than Sk-7 C0. Similarly, actual grain yield of population Sk-8 C2 (27.20 ard/fed) was significantly higher than that of Sk-8 C0 (21.22 ard/fed), and Sk-8 C1 (24.18 ard/fed). Also, Sk-8 C1 was significantly higher yielding than Sk-8 C0. These results indicated that actual grain yield of both original populations Sk-7 and Sk-8 was significantly improved after two cycles of S_1 progeny selection.

Key words: ***Maize, Recurrent selection, Heritability, Expected selection gain***

INTRODUCTION

Recurrent selection methods have been widely used by maize breeders for population improvement and for genetic experiments to compare empirical results with those of quantitative genetic theory. Maize breeders using recurrent selection methods have two goals in mind, (i) improvement of population mean performance and (ii) maintenance of genetic variation for continued selection. Recurrent selection is a cyclical breeding system involving three steps (development of progenies, evaluation and selection of progenies and recombination of selected progenies), each of which is vitally important and can dramatically influence progress toward goals of the recurrent selection program. Duclos and Crane (1968) suggested that more improvement should be obtained by selection based on S_1 progeny tests. Jinahyon and Moore (1973) observed an increase in yield of 8.30% per cycle after two cycles of S_1 family selection in Thai composite, meanwhile stalk lodging decreased from 53% to 17% in the second cycle. They also observed slight decrease in plant and ear height and no changes in the number of days to silk. Genter and Eberhart (1974) found that the improvement after 4 cycles of S_1 progeny selection was about 21.5% over the original parent. They reported that the selection was effective in increasing gene frequencies with considerable dominance. Goulas and Lonnquist (1977) concluded that selection based on S_1 evaluation utilized largely additive genetic effects. While selection based on half-sib performance would reflect additive together with non-additive effects. Choo and Kannenberg (1979) conducted a simulation study comparing, mass, ear-to-row and S_1-progeny selection and they concluded that S_1-progeny selection would give superior improvement with both additive and complete dominance model. El-Rouby *et al* (1979) concluded that the use of S_1 line selection was recommended to select among base populations to start improvement in most promising ones. West *et al* (1980) completed two cycles of S_1 *per se* selection in the three corn populations; NBS, NSS and NKS. They found that grain yield of the three populations was increased by 20% after the second cycle of selection. Moll and Smith (1981) reported that the S_1 progeny recurrent selection is regarded as the fastest method of intra population improvement. Amer (1995) found that S_1 line *per se* selection for grain yield showed high estimate of heritability (93.13%) and the expected gain from selection was approximately 52.6%. Garay *et al* (1996) found that S_1 recurrent selection was effective in improving the two maize synthetics EZS_1 and EZS_2 after two cycles of selection. Amer *et al* (2003) reported that the expected gain from selection showed that S_1 family selection would be effective for improving grain yield. They recorded an expected increase of 28.1% in yield from one cycle of selection in the synthetic variety Sakha-6. Al-Naggar *et al* (2008) found that the actual gain in grain yield after practicing one cycle of S_1 recurrent selection in the newly –improved populations (Giza 2-low nitrogen and Giza 2- high nitrogen) using both low and high –nitrogen as selection environments was considerable high (21.88 % and 23.22 %, respectively) when evaluated under low-nitrogen. The objective of current research was to improve yielding potentiality of Sakha-7 and Sakha-8 maize populations by using S_1 recurrent selection method.

MATERIALS AND METHODS

Two newly developed maize open-pollinated populations, Sakha-7 and Sakha-8 were used for the purpose of this study. Sakha-7 was developed by crossing among 9 white exotic populations characterized by resistance to downy mildew disease and three white local populations. While Sakha-8 was formed by crossing among 15 yellow exotic populations characterized by resistance to downy mildew disease and two yellow local populations. Both populations had undergone random mating for three generations. In 2002 season, the two populations were grown at Sakha Research Station, and 300 plants from each population of desirable performance were self pollinated to develop S_1 lines. After harvest, only 196 S_1 ears of sufficient seed from each population were chosen to form two sets of S'_1s. Kernels of each ear were divided into 5 envelopes, where 4 of them were used for preparing progeny testing trials and the last one was kept (remnant seeds) in the cold storage room. In 2003 season, the 196 S_1 progenies, from each population were evaluated in two experiments at Sakha and Sids Research Stations. The two sets of S'_1s were planted at the same planting date at both locations. Based on the combined analysis of the data, the 20 highest yielding S_1 progenies in each set were selected. In 2004 season, equal numbers of remnant seeds of each selected S_1 progeny for each set, were bulked and planted in an isolated plot under random mating to obtain seeds representing 1st cycle of selection (C-1) population which was again used to generate S_1 lines for the next cycle of selection. In 2005, 2006 and 2007 seasons same procedure was repeated to obtain seeds representing 2nd cycle of selection (C-2) for each population. A (14x14) simple lattice design with two replications was used for all four experiments (2 each cycle). Plot size was one row, 4m long and 80 cm between rows. The distance between hills was 25 cm apart. In 2008 season, the original cycle (C-0) of the white population Sk-7 and its developed cycles of selection C-1 and C-2 along with the check variety Giza-2, were evaluated at Sakha, Gemmeiza, Sids and Mallawy locations. While C-0, C-1, and C-2 for the yellow population Sk-8 along with the check composite-21, were evaluated at Sakha, Gemmeiza, Sids and Nubaria locations. A randomized complete block design with four replications was used for conducting the above population evaluation experiments. The experimental plot was 4 rows, each 4 m long with 80 cm between rows and 25 cm between hills. Data were recorded for number of days to 50% silking , plant height (cm), ear height (cm) and grain yield in ardabs per fadden (ard/fed) (one ardab= 140 kg and one fadden = 4200 m^2), adjusted to 15.5% grain moisture content in all experiments of 2003, 2006 and 2008 seasons. The analysis of variance for each experiment, as well as their combined analysis based on the homogeneity of error mean squares were carried out as suggested by Snedecor and Cochran (1967). Estimates of phenotypic and genotypic variances, heritability in the broad sense and excepted gain from selection based on 10% selection intensity were calculated according to Falconer (1960).

RESULTS AND DISCUSSION

Mean, environmental error ($\sigma^2 e$) and coefficient of variability (CV%) for S_1 progenies of cycle-1 and cycle-2 of Sakha-7 and Sakha-8 populations for all studied traits are given in Tables (1 and 2). It is observed that mean values of S_1 progenies for cycle-1 and cycle-2 of the white population Sakha-7 were higher than those of the yellow population Sakha-8 for all studied traits except for days to 50% silking, indicating that S_1 progenies of Sk-7 were of more vigorous plants and higher productivity than those of Sk-8. However, current experiments do not provide for accuse to comparisons between the two populations, since progenies were evaluated separately. Also, these results indicated that S_1 progenies of C2 were higher yielding and of earlier maturity than S_1 progenies of C1 for both populations. Estimates of coefficient of variability for both cycles of Sk-8 were higher than those of Sk-7 for all studied traits. Also, estimated coefficients of variability for cycle-1 and cycle-2 for both populations were highest for grain yield compared to other traits.

Table 1. Mean ($\overline{X}$), environmental error ($\sigma^2 e$) and coefficient of variability (CV%) for S_1 progenies of cycle-1 for Sakha-7 and Sakha-8 populations for all studied traits (combined analysis 2003).

Trait	$\overline{X}$		$\sigma^2 e$		CV%	
	Sk-7	Sk-8	Sk-7	Sk-8	Sk-7	Sk-8
50% Silking (days)	68.23	71.22	2.55	5.71	2.34	3.36
Plant height (cm)	213.96	188.90	200.16	266.06	6.61	8.64
Ear height (cm)	115.42	104.93	115.83	158.21	9.32	11.99
Grain yield (ard/fed)	12.57	7.28	2.85	1.59	13.68	17.36

Table 2. Mean ($\overline{x}$), environmental error ($\sigma^2 e$) and coefficient of variability (CV%) for S_1 progenies of cycle-2 for Sakha-7 and Sakha-8 populations for all studied traits (combined analysis 2006).

Trait	$\overline{X}$		$\sigma^2 e$		CV%	
	Sk-7	Sk-8	Sk-7	Sk-8	Sk-7	Sk-8
50% Silking (days)	67.37	68.6	2.76	3.77	2.47	2.83
Plant height (cm)	226.34	180.86	311.87	376.96	7.80	10.73
Ear height (cm)	129.09	100.84	137.79	166.04	9.09	12.78
Grain yield (ard/fed)	18.23	11.92	6.34	3.43	13.81	15.56

Estimates of phenotypic (σ^2_{Ph}), genotypic (σ^2_G), and genotypic x location (σ^2_{GL}) variances, as well as estimates of heritability in the broad sense (H_b%) and expected gain from selection (Δg%) for S_1 progenies of both populations (Sakha-7 and Sakha-8) are presented in Tables (3 and 4) for C1 and C2, respectively. All estimates of genetic variance (σ^2_G) among S_1 progenies of both populations for both cycles of selection (C1 and C2) were significant for all studied traits. However, for C1 of selection, the genetic variances of Sk-7 were larger than those of Sk-8 for ear height and grain yield, while the reverse was true for number of days to 50% silking and plant height. Same trend was observed for C2 of selection, except for number of days to 50% silking, where σ^2 G of Sk-7 appeared greater than that of Sk-8. A greater genetic variance indicates greater genetic variability, consequently greater response to selection.

All estimates of genotype x location (σ^2 GL) interaction variances for all studied traits of both populations were significant for C1 of selection (Table 3) while for C2 of selection (Table 4), they were significant for number of days to 50% silking and grain yield in both Sk-7 and Sk-8, and for ear height in Sk-7only.

Heritability estimates in the broad sense, (Tables 3 and 4), for both cycles of selection and both populations, ranged from medium to high values for the studied traits, indicating that those traits of lower estimates are most influenced by the environment. El-Rouby *et al* (1979), evaluating S_1 progenies, obtained heritability estimates of 51, 5 and 3% for grain yield, days to 50% silking and plant height, respectively.

Estimates of expected genetic gain (Δg%) from S_1 progeny selection for both cycles and both populations (Tables 3 and 4) were higher for grain yield than those for other traits. The expected increases in grain yield of Sk-7 and Sk-8 were 20.68% and 15.80%, respectively, for cycle-1 and were 13.01% and 21.3%, respectively, for cycle-2, indicating that grain yield in both populations was governed mostly by additive genes and that selection for improving productivity would be rewarding. Sprague and Eberhart (1977) reported an average gain per cycle for grain yield of 2.0, 3.1, 3.4, 3.8 and 4.6% for S_2-progeny, full sib, mass, ear-to-row and S_1-progeny selection, respectively. Nawar (1985) obtained an expected average gain of 5.2% per cycle of S_1 selection. El-Zeir *et al* (1993) found that the expected gain per cycle of selection using S_1 families was 8.89% for grain yield. Hallauer and Miranda (1988) reported a gain of 6.4% per cycle of S_1 selection for grain yield. Amer *et al* (2003) found that the expected gain per cycle of selection using S_1 progenies was 28.1% for grain yield.

Table 3. Estimates of phenotypic (σ^2_{Ph}), genotypic (σ^2_G), genotypic x location (σ^2_{GL}), heritability (H_b%) and expected gain from selection (Δg%) for S_1 progenies of cycle-1 for Sakha-7 and Sakha-8 populations .

Trait	σ^2 Ph		σ^2 G		σ^2 GL		H_b%		Δg%	
	Sk-7	Sk-8	Sk-7	Sk-8	Sk-7	Sk-8	Sk-7	Sk-8	Sk-7	Sk-8
50% Silking	5.85	9.26	3.54*	5.18*	3.34*	5.31*	60.51	55.9	3.76	4.20
Plant height	243.77	271.32	158.32*	174.8*	70.81*	60.02*	64.94	64.42	8.33	9.37
Ear height	136.12	108.13	91.49*	56.18*	31.34*	24.79*	67.21	51.95	11.95	9.06
Grain yield	9.13	4.52	4.48*	1.39*	7.87*	5.46*	49.06	30.75	20.68	15.80

* significant based on the respective standard error (± S.E.)

Table 4. Estimates of phenotypic (σ^2_{Ph}), genotypic (σ^2_G), genotypic x location (σ^2_{GL}), heritability (H_b%) and expected gain from selection (Δg%) for S_1 progenies of cycle-2 for Sakha-7 and Sakha-8 populations .

Trait	σ^2 Ph		σ^2 G		σ^2 GL		H_b%		Δg%	
	Sk-7	Sk-8	Sk-7	Sk-8	Sk-7	Sk-8	Sk-7	Sk-8	Sk-7	Sk-8
50% Silking	4.32	3.80	3.14*	2.37*	0.98*	0.98*	72.68	62.36	3.94	3.11
Plant height	284.09	365.31	189.66*	280.83*	32.92	-19.53	66.76	76.87	8.74	14.29
Ear height	156.07	150.45	110.86*	109.74*	21.52*	-1.59	71.03	72.94	12.09	15.61
Grain yield	11.54	7.27	4.58*	3.89*	10.75*	5.04*	39.68	53.50	13.01	21.30

* significant based on the respective standard error (± S.E.)

Combined analysis of variance across locations for performance of the four populations, i.e. C0, C1,and C2 of white population Sakha-7 and the check variety Giza-2 for four traits is presented in Table (5). Highly significant differences existed among locations (L) for all traits, and among populations (P) for only ear height and grain yield. Variance due to P x L interaction was significant for only grain yield.

Table 5. Combined analysis of variance for four populations (C0, C1, C2 of white population Sakha-7 and check variety Giza-2) for four traits.

SOV	Df	Mean squares			
		50% Silking	Plant height	Ear height	Grain yield
Locations (L)	3	98.41**	9409.26**	3699.22**	1710.14**
Rep/L	12	2.79	375.47	190.39	12.99
Populations (P)	3	11.0	816.55	1040.43*	300.26**
P x L	9	3.16	287.33	260.6	22.47**
Error	36	1.88	179.18	164.95	3.38

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

Mean performance across locations of the four tested populations; i.e. C0, C1, C2 of white population Sk-7 and the check variety Giza-2; for the four studied traits are presented in Table (6). No significant differences were obtained between the original population Sk-7 C0 and either of its derivatives, C1 and C2 for number of days to 50% silking, indicating that earliness, as assessed by number of days to 50% silking, was not affected by S_1 progeny selection. Similarly, no significant changes occurred in ear height of population Sk-7 C0 due to selection. For plant height, only plants of Sk-7 C2 that were affected and became significantly taller than those of Sk-7 C0. Grain yield showed significant response to selection (selection was done for yield improvement). Compared to productivity of original population Sk-7 C0 (22.01 ard/fed.); Sk-7 C1 and Sk-7 C2 yielded 27.76 and 32.34 ard/fed, respectively, with relative increases of 26.12% and 46.93%, respectively. Compared to the check variety Giza-2, the original population Sk-7 C0 and its derivatives were of later silking. Although no significant differences accrued between Giza-2 and the original population Sk-7 C0, both selected populations, C1 and C2 showed significant increases for plant and ear height than Giza-2. Considering grain yield, the original population Sk-7 C0 was significantly the lowest yielding. However, C1 exhibited a similar productivity performance to that of Giza-2, since there was no significant difference, while C2 significantly outyielded Giza-2.These results indicated that S_1 recurent selection was effective in improving grain yield of the white population Sk-7. However, other traits did not show improvement, since desired improvement of maturity and plant and ear height traits would be for earliness, shorter plants and lower ear placement, characters that were not considered when selecting for high grain yield.

Table 6. Means of studied traits for four populations (C0, C1, C2 of white population Sakha-7 and check variety Giza-2) across four locations.

Population	50% Silking (days)	Plant height (cm)	Ear height (cm)	Grain yield (ard/fed)
Sk-7 C0	60.93	268.18	158.75	22.01
Sk-7 C1	60.56	279.68	166.81	27.76
Sk-7 C2	60.55	280.37	166.87	32.34
Giza-2 (check)	59.06	267.18	149.93	25.47
LSD $_{0.05}$	1.3	12.1	11.5	3.4

Combined analysis of variance across locations for the comparative performance of four populations; i.e. the original yellow population Sk-8 C0 and its derivatives C1 and C2, as well as the check composite-21; for four traits is given in Table (7). Mean squares due to locations and populations were either significant or highly significant for all traits except for populations for number of days to 50% silking. Mean squares due to P × L interaction was highly significant for only grain yield.

Table 7. Combined analysis of variance for four populations (C0, C1, C2 for Sakha-8 and check variety composite-21) for four traits.

S O V	df	Mean squares			
		50% Silking	Plant height	Ear height	Grain yield
Locations (L)	3	64.55**	9626.30**	5594.39**	1210.98**
Rep/L	12	1.95	215.96	171.80	11.65
Populations(P)	3	2.76	631.89*	286.80**	102.9**
P x L	9	0.96	124.76	33.58	9.0**
Error	36	1.50	141.51	81.48	2.62

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

Mean performance across locations of the four populations, C0, C1 and C2 of Sakha-8 and the check composite-21 for four traits are presented in Table (8). The results showed no differences between the original population Sk-8 C0 and either of its derivatives, C1 and C2, in earliness, as indicated by number of days from planting to 50% silking. For plant and ear height traits, plants of both C1 and C2 were significantly taller and of higher ear placement than those of the original population Sk-8 C0. Population Sk-8 C0 (21.22 ard/fed) responded positively to selection for grain yield improvement. Sk-8 C1 and C2 yielded 24.18 and 27.20 ard/fed, respectively, with a relative increase of 13.9% and 28.1% compared to Sk-8 C0. Because selection was absolutely for grain yield improvement, other traits such as plant and ear height, known to be positively correlated with yield were increased, (Table 8). Compared to the check comp.21, the original population Sk-8 C0 was of later silking, shorter plants, lower ear placement and less productivity. Whereas its selected derivatives, C1 and C2, exhibited a similar performance to that of the check, since there was no significant differences, regarding all four traits, except for ear height of Sk-8 C2 which was higher. In general, the previous results indicated that S_1 progeny selection was effective in improving grain yield of the two populations Sk-7 and Sk-8. Burton *et al* (1971) obtained an average increase of 16.3% by four cycles of S_1 progeny selection for yield of BSK. Genter (1973) found that selection based on S_1 performance was effective in improving VCBS population (14.3% over two cycles). West *et al* (1980) found that grain yield of three populations was increased by 20% after the second cycle of S_1 progenies selection. Shehata *et al* (1987) reported that the S_1 family selection method demonstrated good efficiency in realizing progress. They reported that actual gains in grain yield under 20% selection intensity were 32.0% for Gemmeiza-6 and 20.1% for Gemmeiza-2 in the first cycle of selection. Livini *et al* (1993) obtained 6.6% per cycle increase in grain yield after three cycles of S_1 selection in an opaque-2 synthetic. Galal *et al* (1996) found that the actual gain in grain yield after one cycle from S_1 recurrent selection was 20.66%.

Table 8. Means of studied traits for four populations (C0, C1, C2 of white population Sakha-8 and composite-21) over four locations.

Population	50% Silking (days)	Plant height (cm)	Ear height (cm)	Grain yield (ard/fed)
Sk-8 C0	62.3	249.81	147.37	21.22
Sk-8 C1	61.9	261.12	155.68	24.18
Sk-8 C2	61.7	264.31	156.62	27.20
Comp-21 (check)	61.3	260.18	151.62	25.55
LSD 0.05	0.7	7.9	4.1	2.2

REFERENCES

Al-Naggar, A.M.M., R. Shabana, A.A. Mahmoud and S.A.M. Shaboon (2008). Genetic improvement of maize for low –soil nitrogen tolerance via S_1 recurrent selection. Egypt. J. Plant Breed. 12: 255-277.

Amer, E.A. (1995). Evaluation of some selection breeding methods and their efficiency in yield improvement of maize. Ph.D. Thesis, AL-Azhar University, Egypt.

Amer, E.A., H.E. Mosa and A.A. Motawei (2003). Forming a new maize synthetic variety and improvement by using S_1 line *per se* selection. J. Agric. Sci. Mansoura Univ. 28:791- 798.

Burton, J.W., L.H. Penny, A.R. Hallauer and S.A. Eberhart (1971). Evaluation of synthetic populations developed from a maize variety (BSK) by two methods of recurrent selection. Crop Sci. 11: 361-365.

Choo, T.M. and L.W. Kannenberg (1979). Relative efficiencies of population improvement methods in corn: A simulation study. Crop Sci. 19:179-185.

Duclos, L.A. and P.L. Crane (1968). Comparative performance of top crosses and S_1 progeny for improving populations of corn (*Zea mays* L.). Crop Sci. 8:191-194.

EL-Rouby, M.M., A.M. Gad and R.M. Abdullah (1979). Comparative studies on estimation of genetic variances in maize (*Zea mays* L.) from S_1 lines and design-1.Egypt. J. Genet. Cytol. 8: 95-106.

El-Zeir, F.A., M.A. Younis, F.M. Omar and A.A. Galal (1993). Estimation of genetic variability in a composite variety of maize using Design-1 and S_1 families. J. Agric. Res. Tanta Univ. 19: 114-122.

Falconer, D.S. (1960). Introduction to Quantitive Genetics. The Ronald Press Co., N.Y. USA.

Galal, A.A., E.A. Amer, A.A. EL-Shenawy, F.A. EL-Zeir and M.A. Younis (1996). Three cycles of modified ear to row versus one cycle of recurrent selection based on half-sibs (Design-1) and S_1 line *per se* for improving composite Giza-2 variety. Al-Azhar.J.Agric.Res. 23: 1-13.

Garay, G, E. Igartua and A. Alvarez (1996). Responses to S_1 selection in flint and dent synthetic maize populations. Crop Sci. 36: 1129-1134.

Genter, C.F. (1973). Comparison of S_1 and testcross evaluation after two cycles of recurrent selection in maize. Crop Sci. 13: 524-527.

Genter, C.F. and S.A. Eberhart (1974). Performance of original and advanced maize populations and their diallel crosses. Crop Sci. 14: 881-885.

Goulas, C.K. and J.H. Lonnquist (1977). Comparison of combined half sib and S_1 family selection with half sib, S_1 and selection index procedures in maize. Crop Sci. 17: 754-757.

Hallauer, A.R. and J.B. Miranda (1988). Quantitative Genetics in Maize Breeding. 2nd ed. Iowa State Univ. Press., Ames, USA.

Jinahyon, S. and C.L. Moore (1973). Recurrent selection techniques for maize improvement in thailand. Agron. Abstr. P. 7.

Livini, C., L. Pirovano, A. Brandolim and M. Motto (1993). Evaluations of three cycles of selection for grain yield in an opaque-2 variety of maize (*Zea mays* L.). Maydica 37: 89-93.

Moll, R.H. and O.S. Smith (1981). Genetic variances and selection responses in an advanced generation of a hybrid of widely divergent populations of maize. Crop Sci. 21: 387-391.

Nawar, A.A. (1985). Genetic variance components and their implications in yield improvement in maize. Minufiya J. Agric. Res. 12: 83-93.

Shehata, A.H., F.T. Oraby; S.E. Sadek, H.A. EL-Itriby and M.T. Diab (1987). Improvement of grain yield and its components in two maize populations. 1. S_1 progeny selection method.Egypt. J. Gent. Cytol. 16: 171-180.

Snedecor, G.W and W.G Cochran (1967). Statistical Methods 6th ed. Iowa State Univ. Press Ames, Iowa, USA.

Sprague, G.F. and S.A. Eberhart (1977). Corn breeding (P. 305-362) in G.F. Sprague and J.W. Dudley (ed.) Corn and corn improvement. Agron. Monogr. 18. ASA, CSSA and SSSA, Madison, WI.,USA.

West, D.R., W.R. Conton and M.A. Thomas (1980). A comparison of replication S_1 *per se* vs reciprocal full-sib index selection in corn. I.Indirect response to population densities. Crop Sci. 20: 35.41.

تحسين محصول الحبوب في عشيرتين من الذرة الشامية باستخدام الانتخاب الدورى لأنسال الجيل الذاتي الأول

حاتم الحمادى موسى، عاصم عبده مطاوع وعباس عبد الحى الشناوى

مركز البحوث الزراعية – معهد المحاصيل الحقلية – محطة بحوث سخا – قسم بحوث الذرة الشامية

أجرى هذا البحث بغرض تحسين القدرة المحصولية لعشيرتين جديدتين من الذرة الشامية هما عشيرة سخا-٧ بيضاء الحبوب وسخا-٨ صفراء الحبوب وذلك من خلال تنفيذ دورتين انتخابيتين لأنسال الجيل الذاتي الأول لكل عشيرة. وشملت كل دورة تقييم عدد ١٩٦ عائلة جيل ذاتي أول وكان التقييم خلال موسم ٢٠٠٣ للدورة الأولى وموسم ٢٠٠٦ للدورة الثانية وذلك بمحطتي البحوث الزراعية بسخا وسدس حيث تم انتخاب أفضل ١٠%

من الأنسال المقيمة بكل دورة لتكوين عشيرة الدورة الأولى في موسم ٢٠٠٤ و عشيرة الدورة الثانية في موسم٢٠٠٧.تم تقييم كل من عشيرة الأساس وعشيرتي الدورة الأولى والدورة الثانية وصنف مقارنة في تجربتين منفصلتين (واحدة لعشائر سخا ٧ وواحدة لعشائر سخا ٨) وذلك في أربع مناطق مختلف في موسم ٢٠٠٨.

وقد أظهرت النتائج أن التباين الوراثي بين أنسال الجيل الذاتي الأول للدورة الأولى والثانية لكل من العشيرة البيضاء سخا-٧ والعشيرة الصفراء سخا-٨ كان معنويا لكل الصفات تحت الدراسة. ، وكان التفاعل بين التباين الوراثي الكلى والمواقع لانسال الجيل الذاتي الأول لكلا الدورتين فى كلا العشيرتين معنويا في معظم الصفات. وقد تراوحت قيم درجة التوريث بالمعنى الواسع من متوسطة إلى عالية وذلك لانسال الجيل الذاتي الأول للدورة الأولى والثانية في كلا العشيرتين للصفات تحت الدراسة، وكان التحسين الوراثي المتوقع لصفة المحصول أعلى منه لكل الصفات الأخرى وذلك لكلا الدورتين فى كلا العشيرتين حيث بلغت نسبة التقدم الوراثي المتوقع لصفة المحصول ٢٠.٦٨% لعشيرة سخا-٧ و ١٥.٨% لعشيرة سخا-٨ للدورة الأولى و ١٣.٠١% لسخا-٧ و ٢١.٣% لسخا-٨ للدورة الثانية.

كما أوضحت النتائج أن المحصول الفعلي لعشيرة الدورة الثانية من سخا-٧ (٣٢.٣٤ اردب/فدان) كان أعلى معنوياً من عشيرتي الأساس (٢٢.٠١ اردب/فدان) والدورة الأولى (٢٧.٧٦ اردب/فدان) وكذلك صنف المقارنة جيزة- ٢ (٢٥.٤٧ اردب/فدان). كذلك تفوقت عشيرة الدورة الأولى من سخا-٧ معنوياً في المحصول عن عشيرة الأساس.أيضا تفوق المحصول الفعلي لعشيرة الدورة الثانية من سخا-٨ (٢٧.٢ اردب/فدان) معنوياً على محصول كل من عشيرتي الأساس (٢١.٢٢ اردب/فدان) والدورة الأولى (٢٤.١٨ اردب/فدان). وكذلك تفوقت عشيرة الدورة الأولى من سخا- ٨ معنوياً في المحصول على عشيرة الأساس. وقد خلصت النتائج إلى أن محصول الحبوب لكلا العشيرتين سخا-٧ وسخا-٨ قد تحسن بصورة مؤكدة بعد دورتين من الانتخاب لانسال الجيل الذاتي الأول.