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EVALUATION OF IMPROVING CYCLE-1 FOR S_1-LINES AND HALF-SIB FAMILIES OF YELLOW MAIZE UNDER DIFFERENT ENVIRONMENTS

Eraky[1], A.G; A.R. Al kaddoussi[1]; S.E, Sadek[2] and M.M., Osman[2]

1) Crop Science Department, Faculty of Agriculture, Zagazig Univ.

2) Maize Research program, Field Crop Research Institute, ARC, Giza, Egypt.

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ABSTRACT : The present research work was conducted during the period from 1996 to 1998 through summer season at Gemmeiza (Middle Delta Region) and Sids (Upper Egypt Region) Agricultural Research Stations, Agriculture Research Center (A.R.C.) using two recurrent selection methods, i.e., S1 (selfed for one generation) per se and half-sib recurrent selection (Design – I mating scheme) and the effect of two selection intensities (10 and 20%) for earliness characters, yield and yield components, as well as late wilt and smut diseases resistance using composite-21 yellow maize.

6 genotypes resulted from S_1-lines and Half-sib were evaluated under two selection intensities (10 and 20%) as well as selection intensity (100%) in two sowing dates (early and late) in two different locations Gemmeiza (Middle Delta) and Sids (Upper Egypt) during summer season 1998 in randomized complete block design with four replications. Three checks were used to be compared with these genotypes, i.e., original, T.W.C. 352 and Gemmeiza yellow population. These genotypes were compared for earliness characters i.e., days to 50% tasseling and silking, yield and yield components; ears no. / 100 plants, kernel no./row, row no./ear and 100-kernel/weight, grain yield / plant and plot . Pathological characters; late wilt disease as percentage of total plants and plants affected by smut disease (%).

The collected data were statistically analyzed . The obtained results could be summarized as follows :

1- Significant variations for S_1-lines and Half-sib were obtained among locations, sowing dates and combined data for the studied characters; earliness, yield and yield components as well as pathological characters.

2- Half-sib family selection method was effective in improving and developing earliness characters at 10% selection intensity.

3- S_1-lines at 10% selection intensity proved to be the best for improving kernel number/row, row no. / ear, number of ears/100 plants, 100-kernel weight and grain yield/plant and plot .

4- None of the check genotypes could surpass S_1-lines for yield and yield components and pathological characters in both sowing dates and locations.

5- Coefficient of variability was very low for earliness characters in both locations and sowing dates, moderate for yield components i.e., kernel no./row number of rows / ear , no. of ears/100 plants and 100-kernel weight. Meanwhile, high coefficient of variability was obtained for grain yield and pathological characters .

It could be concluded that S_1-lines selection method at 10% selection intensity is effective in improving grain yield and yield components as well as pathological characters in yellow maize. Meanwhile, (H. S.) family selection method is more effective in improving earliness characters. These information are of great attention for the corn breeder to improve these characters in maize population and to develop, improve and release early maturity, higher grain yield and resistance genotypes of maize for late wilt and smut diseases.

INTRODUCTION

Recurrent selection in a population can result in changes in traits other than those used directly as selection criteria . Such changes usually are not easily predicted or understood because they do not occur in indirectly manner.

Diab (1985) used two maize populations, Gemmeiza-2 and Gemmeiza-6 to evaluate the efficiency of three selection methods i.e., full sib, half sib and S_1-lines for earliness characters, late wilted plants (%), grain yield, number of rows per ear, number of kernels per row and 100-kenel weight. Gemmeiza-6 maize showed wider ranges than Gemmeiza-2 for yield and correlated attributes. Ranges for most characters using S_1 selection method in both population were wider than those for half-sib selection methods. Both actual and expected genetic gain from selection were much greater in S_1-line selection than in half-sib family selection methods. Gemmeiza-6 showed more progress in the first cycle from S_1-line per se (30%) and full-sib (28.5%) than Gemmeiza-2 using S_1-line (20.6%) and full-sib(13.2%) selection methods.

Leford and Russell (1985) studied date of anthesis, grain harvest moisture, grain breakage susceptibility, weight per 300 kernels and kernel density of 100 BS_{17}, S_1 and S_2 maize lines and were evaluated in 1979 and 1980 summer seasons, respectively. Selection of S_1-lines for breakage-resistant, grain weight would result in earlier-flowering S_2-lines with smaller kernels.

Coors (1988) indicated that effective recurrent selection for intrapopulation improvement maize [*Zea mays L.*] should be most effective when both inbred and noninbred progenies are evaluated. This study was conducted to examine the effectiveness of evaluating both half-sib [HS] and selfed [S_1] families during selection to improve population *per se* performance and inbred productivity . Four cycles for combined (HS) and [S_1] selection for increased grain yield were completed in a narrow-based maize population derived from inbred lines; A635, W182E, and W64A. For each cycle, both (HS) and (S_1) progenies were produced on prolific plants by selfing the bottom ear and exposing the upper ear to random pollen from the population. Increased in yield were not detected in test crosses with inbred lines A554 and W117. The yield of bulked composites from random, self pollinated plants increased by 20g/plant over cycles.

Helms *et al.,* (1989) indicated that the effects recurrent selection [RRS] and intrapopulation selection [including half-sib (H.S.) and S_2 (s) selection] in Iowa Stiff Stalk Synthetic (BSSSCo), on grain yield improvement of population on a per cycle basis were not significantly different. When advanced cycle were evaluated for grain yield in crosses with an unrelated inbred line (Mo17).

Shehata *et al.,* (1989) indicated that S_1 family selection was more effective than half-sib (H.S.) design for improving [Corn Belt, C_1] population. The actual gain from selection for grain yield was 39.5% based on the original [C.B.C_1] population in the S_1-line selection relative to 18.0% for half-sib selection method. Expected and actual gain yield using the S_1 family selection were greater than those obtained using half-sib selection method. Expected gain from selection for yield component characters showed that both number of kernels per row and number of rows *per se* were most effective traits for improving grain yield in S_1-line selection method. It could be concluded that S_1-line selection method is better than half-sib selection method for improving this population, where the cost, time and efforts will be taken into consideration for providing one cycle of improvement .

Holthaus and Lamkey (1995a) recurrent selection a cyclical breeding procedure that focuses on improving the mean performance of population by increasing the frequency of favourable alleles and maintaining adequate genetic variability for continued selection response. They added that selection pressure on the primary agronomic traits did not seem to affect the mean performance and genetic parameters of the other unselected agronomic traits.

Holthaus and Lamkey (1995b) pointed out the mean performance and genetic variance in BSSS after six cycles of half-sib (H.S.) progeny selection of S_2-progeny selection, and cycles of reciprocal recurrent selection [RRS] was estimated. Half-sib progeny and RRS methods produced the most effective mean performance response for grain yield in the populations *per se* , 0.076 and 0.104 t/ha per cycle, respectively. Mean performance and estimated genetic variability for other important agronomic trait [ear height] generally showed favourable response to selection.

Arias and Souza (1998) studied intra - and interpopulation in half-sib of 100-genotypes derived from maize populations BR-106 and BR-105 to estimate variance and covariance componets as well to compare the expected response to reciprocal [RRS], intrapopulational [HSS], and modified recurrent selection [MRS] in interpopulation hybrid, population *per se*, and to determine heterosis. Four sets of 100 progenies, both of two intra-and two interpopulations, were evaluated in partially balanced 10×10 lattices arranged in split-blocks with two replications in two years and two locations. The choice of a population tester for the MRS method based on population means *per se* may be incorrect. The additional use, when possible, of intra-and interpopulation is estimating additive genetic variance form each population which would be more appropriate .

Weyhrich *et al.,* (1998) compared the response to selection for seven different methods [six intra-and one inter-population] in the BS11 maize population. A minimum of four cycles of selection were conducted for each of the following methods : mass, modified ear-to-row, half-sib with inbred tester, full-sib, S_1-progeny, S_2-progeny, and reciprocal full-sib were based on an index composed of grain yield. Response to selection was measured for grain yield. All selection methods were successful in significantly improving the population *per se* performance for grain yield. S_2-progeny selection had the greatest response for grain yield of 4.5% per cycle. All selection programs in which selection index was practiced, except for modified ear-to-row, were successful significantly in improving the population per se for all four traits simultaneously .

El-Sheikh (1999) reported that the effect of recurrent selection on the improvement of grain yield in composite maize cultivar Alex.4 was studied at the Agricultural Experiment Station, Faculty of Agriculture, Alexandria University during summer season of 1995-1998. The average rate of increase in the first improvement cycle [C_1], through recurrent selection of GCA was 28% for grain yield relative to the original population (C_0). Recurrent selection based on progeny test was effective for improving yield and its component in the studied composite maize cultivar Alex.4.

Guzman and Lamkey (2000) showed that use of adequate effective population size in maize [*Zea mays L.*] of recurrent selection programs is important because of random genetic drift and inbreeding depression. This research work aimed to (1) evaluate the performance of the BS11 cycle o [C_0] and the BS11 cycle 5 [C_5] population from four S_1-progeny selection programs each with a different effective population size [5,10,20 or 30] but with a common selection intensity of 20%. Five cycles of selection were conducted by intermating 5, 10, 20, or 30 lines. The four selection programs resulted insignificant increase in grain yield . For yield, the 10-S_1 program showed the highest gain per cycle of 0.16Mg per ha followed by the 30-S1 program with 0.13 Mg per ha per cycle. The 5-S_1 program had a higher gain per cycle than the 20-S_1 program .

The main targets of The present work are to :

1) Evaluate 6 progenies resulted from two recurrent selection methods i.e., S_1-lines (2) and Half-sib (2) in additions to base populations i.e., S_1-lines and Half-sib families under three selection intensities [10,20 and 100%] and using three check genotypes i.e., Original, T. W. C. 352 and Gemmeiza yellow population under two sowing dates.

2) Detect variability in each sowing date and combined data for earliness characters, yield and yield components as well as pathological characters, employing composite-21 yellow maize as base population.

MATERIALS AND METHODS

Description of plant materials :

The present research work was conducted during the period from 1996 to 1998 through summer season at Gemmeiza (Delta Region) and Sids (Middle Egypt Region) Agricultural Research Stations, Agriculture Research Center (A. R. C.) using two recurrent selection methods, i.e., S1 (selfed for one generation), *per se.* and half-sib recurrent selection (Design-1 mating scheme) and effect of two selection intensities (10 and 20%) for earliness characters, yield and yield components as well as late wilt and smut resistance using composite-21 yellow maize .

Composite-21 yellow maize population was sown in summer season of 1996 at Gemmeiza Research Station. Biparental crosses were made as suggested by Comstock and Robinson (1948 and 1952). Within population, randomly selected plants (100 plants) based on mean performance were used as males and selfed at the same time. Each selfed male parent was crossed with 8 randomly plants used as females based on mean performance. After harvest. four ears that had sufficient seed for testing were selected from the 8 females.

One hundred male groups (half-sib families) or a total of 400 full-sib families, were developed from "composite-21 yellow" population. Each ear, from the female plants represented a full-sib family, while the ears having a common male parent represented a half-sib families.

At the same time, 200 S_1 lines were, also, randomly selected within "composite-21 yellow" population on basis of mean performance from about 400 randomly selfed plants.

Selfing generation (S_1) : generated from "composite-21 yellow" population was tested during the summer season of 1997 for earliness characters, yield and yield components as well as some pathological characters. Two field experiments, were carried out at two various locations i.e., Gemmeiza and Sids. S_1- lines were grouped into two sets i.e., 100 for each set. Sets were evaluated in simple lattices (10×10) with two replications in each lattice according to Cochran and Cox (1957).

Half-sib families: Progeny test trial for earliness characters, yield and yield components as well as pathological characters were employed. The half-sib family i.e., Design-1 matings or nestted design was conducted at the same locations and during summer season of 1997. This experiment included 100 males, grouped into 10 sets of 40 progenies. These sets were arranged in a randomized incomplete block design with two replications. Within each replication, each set of 10 males were assigned at random to the plots within each block.

Selection intensity :

Selection of families was based on average grain yield. Two selection intensities were used i.e., 10% and 20% for total families of the used sample size from both selection method.

Equal number of seeds from the selected families during summer season, 1997 were carefully bulked to form four new sub-populations i.e., two selection intensities × two breeding methods, These selected families were sown as ear to row technique, at Gemmeiza Agricultural Research Station in 15[th] May, summer season of 1997.

Bulk of seeds from each selection intensity (new sub-populations) were planted in hills, 25 cm apart in rows 80 cm apart and 5 meter in length. Each plot had 200 and 100 rows for both S_1 per se and half-sib families, respectively. Before silking all ears were covered by glysine bags to prevent cross pollination. Pollen grains were collected at 50-60% silking and bulked from almost of all the plants within a given sub-population. The bulk of pollen grains were used to pollinate the plants within the same plot. Pollinated ears from each selection intensity were harvested, dried, and shelled together. The seeds obtained from each sub-population represented cycle I (C_1) seed.

Evaluating the improved cycles:

During the summer of 1998 season two field experiments were carried out at Gemmeiza and Sids Agricultural Research Stations on 15[th] and 30[th] of May, respectively to evaluate the following 9 genotypes :

1- Composite-21 yellow (C_1S_1) 10% .

2- Composite-21 yellow (C_1S_1) 20% .

3- Composite-21 yellow (C_oS_o) 100% (all selfed families).

4- Composite-21 yellow (C_1H.S.) 10% .

5- Composite-21 yellow (C_1H.S.) 20% .

6- Composite-21 yellow (C_oH.S.) 100% (all Half-sib families).

Check genotypes :

7- Original composite-21 yellow (C_o).

8- Three way cross (T.W.C 352) and,

9- Gemmeiza-21 yellow population.

A randomized complete block design with 4 replications was used. Experimental plot was 4 rows, 6m length and 80 cm apart. Grains were sown in hills 25 cm.

apart. All normal agricultural practices for maize production were applied as recommended in both locations. Data were recorded from the inner two rows for the same traits of the progeny test trials of 9 genotypes.

Collected data :

A- Earliness characters :

1- Days to 50% tasseling.

2- Days to 50% silking.

B- Pathological characters :

1- late wilt disease.

2- Smut disease.

C- Yield and yield components :

At harvest, five random ears were taken to determine the following characters :

1- Number of ears per 100-plants .

2- Kernels number/row.

3- Row number per ear.

4- 100-kernel weight (gm).

5- Grain yield per plant (gm) : was determined as adjusted grain yield per plot (gm) divided on the number of plants per plot.

6- Grain yield per plot (kg) : was estimated by harvesting the whole plants per plot. After shelling grain yield was recorded and adjusted to 15.5 moisture percent .

Differences among the studied S_1-lines and Half-sib genotypes and 3 checks were tested using Duncan's Multiple range test (1955).

RESULTS AND DISCUSSION

1) Earliness characters :

Table (1) show mean performance of days to 50% tasseling and silking for maize genotypes selected using three selection intensities 10% , 20% and 100% [base population]. These genotypes obtained from S_1-lines and Half-sib recurrent selection methods as well as three checks of yellow maize i.e., Original composite-21 yellow maize, Gemmeiza yellow maize and three way cross 352 (T.W.C. 352) in two sowing dates during summer season of 1998.

Significant differences among the studied maize genotypes were detected for earliness character through the two sowing dates, locations and combined data.

The earliest genotype for days to 50% tasseling and silking was obtained from Half-sib at 10% selection intensity. This was true in

Table (1) : Mean performance of earliness characters in composite-21 yellow maize for two selection methods; S_1-lines and Half-Sib (H-S)-, under three selection intensities and two sowing dates under Gemmeiza, Sids and over locations during summer growing season, 1998.

Selection methods	Selection intensity %	Days to 50% tasseling						Days to 50% silking					
		First sowing date			Second sowing date			First sowing date			Second sowing date		
		Locations		Combined	Locations		Combined	Locations		Combined	Locations		Combined
		Gemmeiza	Sids		Gemmeiza	Sids		Gemmeiza	Sids		Gemmeiza	Sids	
S_1-lines	10	60.75^{a}	64.5^{a}	62.63^{ab}	59.25^{ab}	59.5^{a}	59.38^{a}	62.25^{a}	66.5^{a}	64.38^{a}	61.5^{ab}	61.5^{ab}	61.5^{a}
	20	61.5^{a}	65.25^{a}	63.38^{a}	60.5^{a}	60.25^{a}	60.38^{a}	63.5^{a}	68.25^{a}	65.88^{a}	62.75^{a}	62.25^{a}	62.5^{a}
	100	62.5^{a}	66.75^{a}	64.63^{a}	60.75^{a}	61.75^{a}	61.25^{a}	64.25^{a}	68.5^{a}	66.38^{a}	62.5^{a}	63.75^{a}	63.13^{a}
Half-sib H.S.	10	58.5^{b}	62.25^{b}	60.38^{bc}	56.5^{bc}	58.75^{b}	57.63^{b}	60.75^{b}	65.5^{a}	63.13^{b}	58.5^{c}	60.5^{b}	59.5^{b}
	20	59.25^{b}	63.5^{b}	61.38^{b}	57.75^{b}	59.5^{a}	58.63^{a}	61.5^{ab}	65.25^{b}	63.38^{b}	59.25^{bc}	61.75^{a}	60.5^{b}
	100	59.75^{a}	63.75^{ab}	61.75^{b}	57.25^{b}	60.75^{a}	59^{a}	62.75^{a}	65.5^{ab}	64.13^{a}	59.75^{b}	62.5^{a}	61.13^{ab}
Original		59.5^{ab}	63.5^{b}	61.5^{b}	57.5^{b}	59.5^{ab}	58.5^{ab}	61.75^{a}	65.75^{a}	63.75^{ab}	59.75^{b}	61.75^{a}	60.75^{b}
Check	T.W.C. 352	58.25^{b}	61.5^{b}	59.88^{c}	56.75^{b}	58.25^{bc}	57.5^{b}	60.5^{b}	64.5^{b}	62.5^{b}	58.5^{c}	60.5^{bc}	59.5^{b}
	Gemmeiza yellow population	57.75^{b}	61.25^{b}	59.5^{c}	55.75^{c}	56.75^{c}	56.25^{b}	60.5^{b}	63.75^{b}	62.13^{b}	57.5^{c}	58.25^{c}	57.88^{b}
($\bar{X}_G$) S_1-lines		61.58^{a}	65.5^{a}	63.54^{a}	60.16^{a}	60.5^{a}	60.33^{a}	63.33^{a}	67.75^{a}	65.54^{a}	62.25^{a}	62.5^{a}	62.37^{a}
($\bar{X}_G$) Half-Sib (H.S.)		59.16^{b}	63.16^{b}	61.17^{b}	57.16^{b}	59.66^{a}	58.41^{b}	61.66^{b}	65.41^{b}	63.54^{b}	59.16^{b}	61.58^{a}	60.37^{b}
C. V.%		3.19	3.01	3.10	3.13	3.09	3.11	3.17	2.91	3.04	3.09	2.89	2.99

both sowing dates and locations; Middle Delta and Upper Egypt. Genotypes in Combined data were earlier in 2nd sowing dates (57.63 and 59.50 days) than 1st sowing ones (60.38 and 63.63 days) for days to tasseling and silking, respectively. These results are in accordance with those obtained by Diab (1985) and Leford and Russell (1985).

It could be noted that genotypes from both of S_1-line and Half-sib in 2nd sowing date were earlier than 1st sowing date. This is may be due to the favorable environmental conditions that help maize genotypes to express themselves.

Concerning the comparison between genotypes of Half-sib at 100% selection intensity, the results showed that the differences were insignificant between Gemmeiza yellow population and the earliest check.

Coefficient of variability ranged from 3.01 to 3.19 (1st sowing date) and 3.09 to 3.13% (2nd sowing date) for days to 50% tasseling. For days to 50% silking, it ranged from 2.91 to 3.17 (1st sowing date) and 2.89-3.09 (2nd sowing date). Days to 50% silking had wider variability in both sowing dates as compared with days to 50% tasseling, indicating that there is a chance for the breeder for improving days to 50% silking.

2) Yield components :

Results of kernel number / row showed significant differences among S_1-lines, Half-sib and 3 checks of yellow maize genotypes in the two locations; Sids and Gemmeiza as well as combined data through 1st, and 2nd sowing dates [Table 2]. These results are similar to those of Diab (1985) and Shehata *et al.*, (1989).

The highest No. of kernels/row was obtained at 10% selection intensity for S_1-lines and valued (49.78) in 1st sowing date and 43.06 in 2nd sowing date for combined data. Also, this genotype was the highest in both locations; Sids and Gemmeiza. It could, also, noted that kernel/row was higher in 1st sowing date than 2nd one, indicating that the prevailed environmental conditions are favour for obtaining higher grain number / row and consequently higher grain yield.

Generally, no significant differences were observed between S_1-lines and Half-sib genotypes in yellow maize . These results are in contrary with Diab (1985) and Shehata *et al.*, (1989).

None of the check genotypes could surpass the highest S_1-line at 10% selection intensity, showing that S_1-lines could be included in breeding program to improve this character.

Coefficient of variation in 1st sowing date ranged from 4.99 (Sids) to 5.98 (Gemmeiza), in the second sowing date meanwhile it ranged from 4.17 (Sids) to 4.98 (Gemmeiza), showing that this character had wider variation in 1st sowing date than 2nd sowing one .

Data of row number/ear varied significantly from location to another and from sowing date to another. (Table, 2). These results showed that this character varied from genotype to another and offer the breeder a fair amount of genetic variability valid for improving this character and consequently grain yield. Row number in S_1-lines at 10% selection intensity was the highest in both sowing dates, locations; Sids and Gemmeiza as well as combined data. Row number for S_1-line at 10% selection intensity in 1st sowing dates valued 16.70% (Gemmeiza) 17.80 (Sids) and 17.25 (combined data). Meanwhile, row no./ear was 16.20 (Gemmeiza), 16.60 (Sids) and 16.40 (combined data). In the second sowing date These results indicated that row no./ear was higher in 1st sowing date than 2nd one. This may be due to the favourable prevailed conditions through 1st sowing date than 2nd one.

No check genotype exceeded S_1-line at 10% for no. row/ear, giving evidence that this genotype could be involved in yellow maize breeding program to improve this character.

The comparison between S_1-lines and Half-sib genotypes showed the superiority of S_1-lines either in location or sowing dates and combined data, revealing that S_1-lines that resulted from recurrent selection methods is the appropriate method for improving this character using population composite-21 yellow maize. The results of Diab (1985) and Shehata *et al.*, (1989) confirmed the obtained results.

Broader variability was observed for this character in early sowing date than late sowing one. Coefficient of variability (C.V.) ranged from 4.83 to 5.73 (1st sowing date) and from 4.04 to

Table (2) : Mean performance of kernel number / row and row number / ear in composite-21 yellow maize for two selection methods; S_1-lines and Half-Sib (H-S) under three selection intensities and two sowing dates under Gemmeiza, Sids and over locations during summer growing season, 1998.

Selection methods	Selection intensity %	Kernel number per row						Row number per ear					
		First sowing date			Second sowing date			First sowing date			Second sowing date		
		Locations		Combined	Locations		Combined	Locations		Combined	Locations		Combined
		Gemmeiza	Sids		Gemmeiza	Sids		Gemmeiza	Sids		Gemmeiza	Sids	
S_1-lines	10	47.95^{a}	51.60^{a}	49.78^{a}	43.75^{a}	42.37^{a}	43.06^{a}	16.70^{a}	17.80^{a}	17.25^{a}	16.20^{a}	16.60^{a}	16.40^{a}
	20	46.15^{a}	44.42^{bc}	45.29^{c}	41.15^{a}	41.52^{a}	41.34^{a}	15.80^{ab}	16.60^{ab}	16.20^{b}	15.50^{ab}	15.50^{b}	15.50^{b}
	100	45.95^{a}	42.42^{cd}	44.19^{c}	40.90^{a}	41.1^{a}	41.0^{a}	15.0^{b}	15.20^{bc}	15.10^{cd}	14.90^{bc}	15.10^{c}	15.0^{bc}
Half-sib H.S.	10	47.55^{a}	47.45^{a}	47.50^{b}	43.70^{a}	41.27^{a}	42.48^{a}	14.70^{bc}	14.90^{cd}	14.80^{d}	14.38^{cd}	14.70^{bc}	14.54^{c}
	20	45.95^{ab}	40.95^{d}	43.45^{cd}	40.80^{ab}	40.42^{ab}	40.61^{ab}	13.70^{c}	14.10^{d}	13.90^{e}	13.50^{d}	13.90^{c}	13.70^{d}
	100	45.50^{b}	40^{d}	42.75^{d}	39.60^{b}	39.02^{b}	39.3^{b}	13.75^{c}	13.90^{de}	13.83^{e}	13.60^{d}	13.80^{cd}	13.70^{d}
Original		43.55^{c}	38.65^{e}	41.10^{e}	40.02^{b}	36.77^{c}	38.40^{bc}	13.30^{d}	13.50^{e}	13.40^{f}	13.20^{e}	13.40^{d}	13.30^{de}
Check	T.W.C. 352	44.55^{b}	39.40^{de}	41.98^{de}	42.80^{a}	38.72^{bc}	40.76^{a}	13.50^{cd}	13.70^{e}	13.60^{ef}	13.40^{de}	13.60^{d}	13.50^{d}
	Gemmeiza yellow population	35.95^{d}	37.2^{e}	36.58^{f}	35.8^{c}	36.37^{c}	36.09^{c}	13.10^{d}	13.20^{e}	13.50^{f}	13.0^{e}	13.10^{d}	13.05^{e}
($\bar{X}_G$) S_1-lines		46.68^{a}	46.14^{a}	46.42^{a}	41.93^{a}	41.66^{a}	41.8^{a}	15.83^{a}	16.53^{a}	16.18^{a}	15.53^{a}	15.73^{a}	15.63^{a}
($\bar{X}_G$) Half-Sib(H.S.)		46.33^{a}	42.8^{b}	44.56^{b}	41.36^{a}	40.23^{a}	40.80^{a}	14.05^{b}	14.30^{b}	14.17^{b}	13.82^{b}	14.13^{b}	13.98^{b}
C. V.%		5.98	4.99	5.53	4.98	4.17	4.60	5.73	4.83	5.26	4.62	4.04	4.31

4.62. Lower C.V. was observed in Sids location than Gemmeiza one. This was true in both sowing date.

Mean performance of S_1-lines and Half-sib genotypes obtained from recurrent selection as well as three local checks of yellow maize for no. of ears 100-plants in two sowing dates and under two local locations in Egypt and combined data showed statistical differences among the studied yellow maize genotypes in both sowing date, locations and combined data (Table,3) .

The highest no. of ears/100 plants was recorded for S_1-lines at 10% selection intensity for both sowing dates and gave 118.50 (1st sowing date) and 114.0 (2nd sowing date). Also, no. of earsl100 plants were higher at 1st sowing date in both locations as compared to 2nd sowing date and valued 121.25 and 115.75 for Gemmeiza and Sids locations in 1st sowing date and 115.75 and 114.0 for Gemmeiza and Sids locations in 2nd sowing date, showed that 1st sowing date is suitable for improving this character and both higher no. of kernels/row and no. of rows/ear consequently higher grain yield .

When comparing S_1-lines and Half-sib genotypes with 3 checks, the results indicated that all the three checks were lower than S_1-line at 10% selection intensity. This was true in both locations and sowing dates, demonstrating that S_1-line at 10%, 1st sowing date could be involved in breeding program for improving this character and consequently grain yield.

Significant differences among S_1-line and Half-sib were observed in 2nd sowing date only. Also, S_1-lines was higher than Half-sib.

More variability was obtained for no. of ears/100 plant in 1st sowing date than 2nd one and ranged from 3.87 to 4.72 (1st sowing date) and from 2.70 to 2.79% (2nd sowing date). These results indicated that genotypes in 2nd sowing date were stable as compared to 1st one.

Table (3) show mean performance of 100-grain weight for S_1-lines and Half-sib genotypes at two selection intensities at 10% and 20% as compared with 3 checks of yellow maize in two sowing dates under two various locations; Gemmeiza (Middle

Table (3) : Mean performance of number of ears / 100 plants and 100-kernel weight (gm) in composite-21 yellow maize for two selection methods; S_1-lines and Half-Sib (H-S) under three selection intensities and two sowing dates under Gemmeiza, Sids and over locations during summer growing season, 1998.

Selection methods	Selection intensity %	Number of ears per 100 plants						100-kernel weight (gm)					
		First sowing date			Second sowing date			First sowing date			Second sowing date		
		Locations		Combined	Locations		Combined	Locations		Combined	Locations		Combined
		Gemmeiza	Sids		Gemmeiza	Sids		Gemmeiza	Sids		Gemmeiza	Sids	
S_1-lines	10	121.25^{a}	115.75^{a}	118.5^{a}	114^{a}	114^{a}	114.0^{a}	31.24^{a}	31.32^{a}	31.28^{a}	29.22^{a}	26.48^{a}	27.85^{a}
	20	111.25^{b}	109.75^{a}	110.5^{b}	115^{a}	110^{ab}	112.5^{ab}	29.62^{b}	28.42^{b}	29.02^{b}	28.1^{a}	25.14^{ab}	26.62^{b}
	100	112^{b}	111^{a}	11.5^{b}	112.5^{a}	107.5^{a}	110.0^{bc}	28.82^{ab}	29.19^{b}	29.01^{b}	28.04^{a}	24.18^{b}	26.11^{bc}
Half-sib H.S.	10	118.25^{a}	115.25^{a}	116.8^{ab}	112.5^{ab}	108^{a}	110.3^{b}	29.78^{a}	29.90^{ab}	29.84^{ab}	28.24^{a}	26.18^{a}	27.21^{ab}
	20	113.75^{ab}	111.75^{a}	112.8^{b}	110^{b}	107^{a}	108.5^{c}	28.54^{b}	28.74^{b}	28.64^{b}	28.06^{a}	25.16^{a}	26.61^{h}
	100	111.5^{b}	108.50^{b}	110^{bc}	108.25^{bc}	107.25^{a}	107.8^{c}	27.52^{c}	27.58^{c}	27.55^{c}	27.99^{ab}	22.2^{c}	25.10^{c}
Original		106.50^{b}	107.50^{b}	107^{c}	106.5^{c}	106.25^{a}	106.40^{cd}	28.3^{bc}	27.84^{bc}	28.07^{bc}	28.24^{a}	23.92^{b}	26.08^{c}
Check	T.W.C. 352	114.25^{a}	109.75^{ab}	112^{b}	112.75^{a}	107.50^{a}	110.1^{b}	29.3^{a}	29.64^{b}	29.47^{b}	28.38^{a}	24.20^{b}	26.29^{h}
	Gemmeiza yellow population	106.25^{b}	106.25^{b}	106.3^{c}	105.25^{c}	102^{c}	103.6^{d}	27.56^{c}	26.32^{c}	26.94^{c}	27.64^{b}	23.74^{bc}	25.69^{c}
$(\overline{X}_G)$ S_1-lines		114.80^{a}	112.16^{a}	113.5^{a}	113.83^{a}	110.50^{a}	112.16^{a}	29.89^{a}	29.64^{a}	29.77^{a}	28.45^{a}	25.26^{a}	26.86^{a}
$(\overline{X}_G)$ Half-Sib(H.S.)		114.50^{a}	111.83^{a}	113.2^{a}	110.25^{b}	107.41^{b}	108.86^{b}	28.61^{b}	28.74^{a}	28.67^{b}	28.09^{a}	24.51^{a}	26.30^{a}
C. V.%		4.72	3.87	4.33	2.79	2.70	2.75	4.72	4.96	4.83	3.16	4.95	4.02

Delta) and Sids (Upper Egypt) during summer season of 1998.

Significant variations among 100-grain weight was detected in both sowing date and locations as well as combined data for S_1-lines and Half-sib genotypes as well as 3 checks of yellow maize genotypes . The obtained data are in harmony with those of Diab (1985) and Leford and Russell (1985).

It could be noted that 100-grain weight was heavier in 1st sowing date for S_1-lines at 10% selection intensity. Also, 100-grain weight was heavier in both locations in 1st sowing date as compared to 2nd one . Hundred - grain weight was 31.28 gm for S_1-line (10%) and 27.85 gm for 1st and 2nd sowing dates, respectively.

It is worthy mentioning that S_1-lines (10%) at both sowing dates were heavier than the heaviest check Three way cross 352 yellow maize (T.W.C.352) which gave 29.47 gm (1st sowing date) and 26.29 gm for 2nd sowing date. The differences between (T. W. C. 352) and S_1-lines (10%) were significant in 1st and 2nd sowing dates and valued 1.81 gm (1st sowing dates) and 1.56 gm (2nd sowing date) . It could be said that, the earlier the sowing date, the greater the differences between S_1-line (10%) and T.W.C. 352 in 100-grain weight .

More variability was observed in 2nd sowing date than 1st sowing one, indicating the stability for 100-grain weight in 1st sowing date than 2nd one. Coefficient of variability ranged from 4.72 to 4.96 (1st sowing date) and from 3.16 to 4.95 (2nd sowing date). The results indicated that more variability is present in 2nd sowing date for this character and offer the breeder a fair amount of variability for this character and consequently higher grain yield .

Table (4) presented mean performance of grain yield/plant for S_1-lines and Half-sib genotypes at 10, 20 and 100% selection intensity as well as 3 checks of yellow maize during two sowing dates under two various locations i.e., Gemmeiza and Sids during summer season of 1998 .

Analysis of variance showed highly significant differences among the studied yellow maize genotypes in both sowing dates, locations and combined data for grain yield/plant. These results are in the line with Diab (1985) , Shehata *et*

Table (4) : Mean performance of grain yield per plant (gm) and per plot (kg) in composite-21 yellow maize for two selection methods; S_1-lines and Half-Sib (H.S.) under three selection intensities and two sowing dates under Gemmeiza, Sids and over locations during summer growing season, 1998.

Selection methods	Selection intensity %	Grain yield per plant (gm)						Grain yield / plot at 15.5% moisture (kg)					
		First sowing date			Second sowing date			First sowing date			Second sowing date		
		Locations		Combined	Locations		Combined	Locations		Combined	Locations		Combined
		Gemmeiza	Sids		Gemmeiza	Sids		Gemmeiza	Sids		Gemmeiza	Sids	
S_1-lines	10	188.00^{a}	201.30^{a}	194.65^{a}	176.55^{a}	187.30^{a}	181.92^{a}	8.062^{a}	7.610^{a}	7.836^{a}	5.727^{a}	6.222^{a}	5.975^{a}
	20	171.33^{b}	188.60^{b}	179.96^{b}	168.00^{b}	174.67^{b}	171.33^{b}	7.457^{b}	6.840^{b}	7.149^{c}	5.300^{b}	4.607^{d}	4.954^{c}
	100	163.50^{c}	176.50^{c}	170.00^{c}	156.70^{c}	168.00^{c}	162.35^{c}	7.280^{b}	6.795^{bc}	7.038^{cd}	5.057^{c}	3.740^{f}	4.399^{e}
Half-sib H.S.	10	158.66^{cd}	168.00^{d}	163.33^{d}	150.67^{d}	160.60^{d}	155.63^{d}	7.260^{bc}	7.450^{a}	7.355^{b}	4.172^{bc}	5.622^{b}	5.398^{b}
	20	152.70^{de}	154.67^{e}	153.68^{e}	144.50^{e}	150.00^{ef}	147.25^{e}	6.952^{c}	6.902^{b}	6.928^{d}	4.645^{d}	4.512^{d}	4.579^{d}
	100	146.67^{ef}	147.30^{f}	146.98^{fg}	140.00^{fg}	144.70^{fg}	142.35^{fg}	5.745^{d}	6.647^{c}	6.196^{e}	4.607^{d}	4.437^{de}	4.523^{de}
Original		137.30^{f}	140.00^{h}	138.65^{h}	134.00^{hl}	136.50^{h}	135.25^{h}	7.405^{b}	7.197^{ab}	7.301^{bc}	4.802^{cd}	4.702^{d}	4.753^{cd}
Check	T.W.C. 352	141.32^{f}	146.00^{g}	143.66^{g}	137.30^{gh}	142.00^{gh}	139.65^{g}	7.797^{ab}	7.502^{a}	7.650^{ab}	5.472^{bc}	5.207^{c}	5.340^{b}
	Gemmeiza yellow population	132.70^{f}	135.25^{h}	133.97^{l}	131.35^{l}	133.25^{l}	132.30^{h}	6.937^{c}	6.047^{d}	6.493^{e}	4.475^{d}	4.392^{e}	4.434^{e}
$(\bar{X}_G)$ S_1-lines		174.27^{a}	188.80^{a}	181.53^{a}	167.08^{a}	176.65^{a}	171.86^{a}	7.599^{a}	7.028^{a}	7.313^{a}	5.361^{a}	4.856^{a}	5.109^{a}
$(\bar{X}_G)$ Half-Sib(H.S.)		152.67^{h}	156.65^{b}	154.66^{b}	145.05^{b}	151.76^{b}	148.41^{b}	6.652^{b}	7.053^{a}	6.852^{b}	4.808^{h}	4.857^{a}	4.833^{b}
C. V.%		9.83	6.52	8.33	7.24	10.79	8.54	10.37	8.12	9.31	9.96	9.04	9.53

al., (1989), Holthaus and Lamkey (1995b), Weyhrich *et al.*, (1998), El-Sheikh (1999) and Guzman and Lamkey (2000).

The results showed that grain yield /plant was higher in 1st sowing date than 2nd one for S1-lines at 10% selection intensity and valued 188.0, 201.30 and 194.65 gm. For Gemmeiza location, Sids one and combined data for 1st sowing date on one hand and 176.55, 187.30 and 181.92 (gm) for Gemmeiza location, Sids location and combined data in 2nd sowing date on other hand .

When comparing S_1-line (10%) with the check genotype (T.W.C. 352), the results showed that there are significant differences between them in locations, combined data and sowing dates, explaining the superiority of S_1 over T.W.C. 352 check yellow maize genotype. The difference between S_1-line (10%) and T.W.C. 352 was highly significant and valued 50.99 (1st sowing date for combined data) and 42.27 (2nd sowing date). This result indicated that the earlier, the sowing date, the greater the difference among S_1-line and T.W.C. 352 (control). These results are similar to those obtained by Diab (1985), Coors (1988), Shehata *et al.*, (1989) Holthaus and Lamkey (1995a), Arias and Souza (1998), Weyhrich *et al.*, (1998) El-Sheikh (1999) and Guzman and Lamkey (2000).

Grain yield/plant was more variable in 2nd sowing date as compared with 1st sowing one. These results indicated that maize genotypes in 1st sowing date was stable than 2nd one .

These results indicated that S1-line (10%) could be involved in breeding program for improving grain yield / plant .

Statistical differences were observed among S_1-line, Half-sib genotypes and check genotypes for grain yield / plot (9.6m^2) in 1st, 2nd sowing dates in the two locations during 1998 summer growing season (Table,4) . These results are in accordance with those of Diab (1985), Coors (1998), Helms *et al.*, (1989), Shehata *et al.*, (1989), Arias and Souza (1998), Weyhrich *et al.*, (1998), El-Sheikh (1999) and Guzman and Lamkey (2000).

Grain yield / plot was higher in 1st sowing date in the two locations as compared with 2nd one. The highest grain yield/plot was recorded for S_1-line (10%) at combined data (7.836kg); 8.062 kg (Gemmeiza) and 7.610 (Sids).

These results indicated that S_1-line (10%) performed well in 1st sowing date and could be cultivated in 1st sowing date and give higher grain yield / plot.

These results indicated that differences between S_1-lines (10%) and T.W.C. 352 (check) was insignificant. These results were true in both locations and combined data for 1st sowing date. Meanwhile, significant variations were detected among S_1-line (10%) and T.W.C. 352 in both location and combined data. These results could be confirmed by values of C.V. which was low in 2nd sowing date as compared with 1st one. The coefficient of variability ranged from 9.04% to 9.96% (2nd sowing date) and from 8.12% to 10.37%.

These information are of great attention for plant breeder to develop and improve grain yield / plot through S_1-line method and earliness character genotypes through [H.S.] of recurrent selection.

Pathological characters :

Analysis of variance for late wilt disease as a percentage of total plants for S_1-lines and Half-sib genotypes and three checks of yellow maize indicated significant variations in both sowing dates, locations and combined data Table (5). The obtained data are in harmony with those of Diab (1985)

It is of great attention to note that S_1-line (10%) revealed the lowest percentage of infection for late wilt disease in both sowing dates, locations and combined data. The results of 1st sowing date gave the lowest percentage of infection as compared to 2nd sowing one. The percentage of infection ranged from 2.33% (Gemmeiza location) to 5.08% (Sids location) in 1st sowing date, Meanwhile, it ranged from 2.23% (Gemmeiza location) to 6.5% (Sids location) in 2nd sowing date. It could be noted that higher percent of infections were recorded in Sids location in both sowing dates, indicating that environmental conditions under this location are favorable for infection with late wilt disease. Percentage of late disease infection was lower in original population (check) as compared with S_1-line (10%) . This was true in 1st sowing date as well as locations and combined data. Meanwhile, the same check (original) was higher in 2nd sowing date in both locations and combined data, indicating that 2nd sowing date and Sids locations in

Table (5) : Mean performance of pathological characters in composite-21 yellow maize for two selection methods; S_1-lines and Half-Sib (H.S.) under three selection intensities and two sowing dates under Gemmeiza, Sids and over locations during summer growing season, 1998.

Selection methods		Selection intensity %	Late wilt disease as a percentage of total plants						Plants affected by smut disease (%)					
			First sowing date			Second sowing date			First sowing date			Second sowing date		
			Locations		Combined	Locations		Combined	Locations		Combined	Locations		Combined
			Gemmeiza	Sids		Gemmeiza	Sids		Gemmeiza	Sids		Gemmeiza	Sids	
S_1-lines		10	2.33^{b}	5.08^{c}	3.70^{d}	2.23^{d}	6.50^{d}	4.369	1.20^{d}	1.05^{d}	1.12^{h}	3.10^{c}	2.55^{d}	2.83^{d}
		20	2.32^{b}	8.18^{b}	5.25^{c}	3.57^{b}	9.20^{c}	6.38^{cd}	6.38^{d}	1.07^{h}	1.12^{h}	5.68^{b}	3.89^{c}	4.78^{bc}
		100	2.85^{b}	9.95^{b}	6.40^{c}	4.12^{b}	10^{b}	7.06^{cd}	2.0^{c}	2.56^{c}	2.28^{d}	5.24^{b}	5.16^{b}	5.20^{b}
Half-sib H.S.		10	2.16^{bc}	8.75^{b}	5.46^{c}	2.46^{cd}	10^{bc}	6.23^{ef}	1.17^{d}	1.09^{d}	1.139	4.91^{b}	2.38^{d}	3.64^{d}
		20	2.40^{b}	9.35^{b}	5.87^{c}	3.06^{c}	11.50^{b}	728^{c}	2.22^{b}	1.08^{d}	1.65^{ef}	7.16^{a}	3.89^{d}	5.53^{ab}
		100	6.63^{a}	15.37^{a}	11.0^{b}	3.28^{bc}	16.40^{a}	9.84^{a}	2.29^{ba}	2.94^{b}	2.61^{c}	7.36^{a}	4.25^{c}	5.80^{a}
Original			1.14^{d}	4.44^{c}	2.79^{d}	1.17^{e}	10^{c}	5.58^{f}	2.17^{b}	1.09^{d}	1.63^{f}	6.04^{a}	3.94^{c}	4.99^{b}
Check	T.W.C. 352		2.00^{c}	4.54^{c}	3.27^{d}	7.15^{a}	10.50^{b}	8.82^{b}	4.33^{a}	1.09^{d}	2.71^{b}	5.92^{ab}	2.5^{d}	4.21^{cd}
	Gemmeiza yellow population		7.05^{a}	17.49^{a}	12.27^{a}	3.01^{c}	11.30^{b}	7.15^{c}	2.22^{b}	4.05^{a}	3.13^{a}	5.93^{a}	6.79^{a}	6.36^{a}
$(\bar{X}_G)$ S_1-lines			2.50^{b}	7.73^{a}	5.11^{b}	3.30^{a}	8.560^{b}	5.93^{b}	1.45^{b}	1.56^{a}	1.51^{b}	4.67^{b}	3.86^{a}	4.27^{b}
$(\bar{X}_G)$ Half-Sib (H.S.)			3.73^{a}	7.44^{a}	7.44^{a}	2.93^{b}	12.63^{a}	7.78^{a}	1.89^{a}	1.70^{a}	1.80^{a}	6.47^{a}	3.50^{a}	4.99^{a}
C. V.%			14.94	15.97	17.61	16.39	9.57	10.45	4.76	8.70	5.18	16.64	18.17	17.35

both sowing dates offer conditions for spreading this disease in maize.

It is of great interest to note that S1-lines were more resistance against late wilt disease as compared to Half-sib genotypes. This may be due to genetical factors for resistance in S_1-lines.

More variability was observed in 2nd sowing date for late wilt disease, indicating that the studied genotypes should be further improved for late wilt disease in late sowing date. These results are supported by mean values of grain yield per plant which was lower at 2nd sowing date as compared to 1st one. Meanwhile, lower variability for this character was recorded for 1st sowing date, showing that yellow maize genotypes were more stable and gave higher grain yield / plant and plot .

Data of plants affected by smut disease % for S_1-lines and Half-sib genotypes of yellow maize as well as three checks of maize during two sowing dates in two locations and combined analysis are given in Table (5) .

Significant variations among the evaluated maize genotypes; S_1-lines, Half-sib genotypes and checks for resistance to smut disease were detected in both sowing date and locations (Table, 5) .

It is worthy mentioning that S_1-lines (%) in both sowing dates had the most resistant plants for smut disease . The S_1-line (10%) in 1st sowing date was the most resistant to smut disease in Gemmeiza and Sids locations as well as combined analysis. Also, in 2nd sowing date S_1-lines (10%) recorded the lowest smut disease infection of 3.10, 2.55 and 2.83 for Gemmeiza, Sids and combined data respectively. Hybrid corn T.W.C. 352 was higher than S_1-line, indicating that S_1-line (10%) is more resistant than the check genotype at both locations and combined analysis .

When comparing S_1-lines or Half-sib at 10 and 20% selection intensity, data showed that S_1-lines were more resistant than Half-sib for smut disease either in 1st or 2nd sowing dates and locations.

Coefficient of variability were higher in 2nd sowing date than 1st one. The values ranged from 16.64 to 18.17 for 2nd sowing date, meanwhile, it ranged from 4.76 to 8.70 . Although the values were high in 2nd sowing date, the span length was low and valued

1.53, meanwhile, it valued 3.94 in 1[st] sowing date, showing that these genotypes could be further improved for this character.

These results are of great attention to improve resistance to late wilt and smut disease in yellow maize genotypes through using S1-line (10%) resulted from recurrent selection for suitable generations.

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تقييم حلقة التحسين الأولى للسلالات الذاتية والنصف الأخوية من الذرة الصفراء تحت ظروف بيئية مختلفة

عبد الله غنيمي عراقي[1] ، الحسيني رضوان القدوسي[1] ، صادق الشحات صادق[2]

محيي الدين محمد أحمد عثمان[2]

١) قسم المحاصيل – كلية الزراعة – جامعة الزقازيق

٢) قسم بحوث الذرة الشامية ، معهد بحوث المحاصيل الحقلية ، مركز البحوث الزراعية – الجيزة – مصر ،

أجرى هذا البحث في الفترة من ١٩٩٦ إلى ١٩٩٨ في المواسم الصيفية في كلا من محطة بحوث الجميزة (وسط الدلتا) ومحطة بحوث سدس (مصر العليا) – مركز البحوث الزراعية مستخدماً طريقتين من طرق الانتخاب المتكرر هما طريقة انتخاب عائلات الجيل الذاتي الأول وطريقة انتخاب العائلات النصف أخوية وتأثير أثنين من الكثافات الانتخابية هما (١٠ ، ٢٠ %) على صفات التبكير والمحصول ومكوناته وكذلك التأثير على المقاومة لكلا من مرض الذبول المتأخر والتفحم على مجتمع – ٢١ من الذرة الصفراء . تم تقييم الستة تراكيب الوراثية الناتجة من كل من طريقتي انتخاب عائلات الجيل الذاتي الأول وانتخاب العائلات النصف أخوية تحت تأثير الكثافات الانتخابية (١٠ ، ٢٠ %) بالإضافة للكثافة الانتخابية ١٠٠% وذلك في ميعادين للزراعة (ميعاد مبكر وميعاد ومتأخر) في كلا من الجميزة (وسط الدلتا) وسدس (مصر العليا) أثناء الموسم الصيفي ١٩٩٨ في تصميم القطاعات الكاملة العشوائية في ٤ مكررات كانت التراكيب الوراثية المستخدمة للمقارنة هي أصل المجتمع – ٢١ الأصفر قبل التحسين وكذلك هجين ثلاثي ٣٥٢ ، مجتمع الجميزة الأصفر . هذه التراكيب الوراثية تم مقارنتها لصفات التبكير وهي عدد الأيام حتى ظهور ٥٠% من النوارت المذكرة وعدد الأيام حتى ظهور ٥٠% من الحريرة وكذلك المحصول ومكوناته وهي عدد الكيزان لكل ١٠٠ نبات ، عدد الحبوب / السطر ، عدد السطور / الكوز ، وزن الـ ١٠٠ حبة ومحصول الحبوب لكلا من النبات والقطعة بالإضافة للصفات المرضية وهي النسبة المئوية للنباتات المصابة بمرض الذبول المتأخر والنسبة المئوية للنباتات المصابة بالتفحم . ولقد تم تحليل النتائج المتحصل عليها إحصائياً . ويمكن تلخيص النتائج المتحصل عليها على النحو التالي :-

١- كانت هناك اختلافات معنوية لكلا من طريقتي انتخاب العائلات الذاتية وكذلك طريقة انتخاب العائلات النصف أخوية في كلا الموقعين وميعادي الزراعة وكذلك التحليل المتجمع وذلك للصفات المدروسة وهي صفات التبكير والمحصول ومكوناته بالإضافة للصفات المرضية .

٢- كانت طريقة انتخاب العائلات النصف أخوية فعاله في تحسين وتطوير صفات التبكير وذلك عند كثافة انتخابية ١٠% .

٣- أثبتت طريقة انتخاب عائلات الجيل الذاتي الأول عند كثافة انتخابية ١٠% أنهــا أفضــل بالنسبة لتحسين عدد الحبوب / السطر وعدد سطور الكوز وعدد الكيزان لكل ١٠٠ نبات ووزن الـــ١٠٠ حبة ومحصول الحبوب لكل من النبات وقطعة.

٤- لم تتفوق أي من التراكيب الوراثية المستخدمة للمقارنة على التراكيب الوراثية الناتجة من طريقة انتخاب عائلات الجيل الذاتي الأول في صفات المحصول ومكوناته وكذلك الصفات المرضية وذلك في ميعادي الزراعة في كلا الموقعين.

٥- كان معامل الاختلاف منخفض جداً بالنسبة لصفات التبكير في كلا المــوقعين فــي كــلا الميعادين ومتوسطاً بالنسبة لصفات مكونات المحصول التي تشــمل ، عــدد الحبــوب / السطر وعدد سطور الكوز وعدد الكيزان لكل ١٠٠ نبات ووزن الـــ ١٠٠ حبة بينما كان عالياً لمحصول الحبوب سواء للنبات أو القطعة والصفات المرضية .

يمكن الاستنتاج بأن طريقة انتخاب عائلات الجيل الذاتي الأول عند كثافة انتخابيــة ١٠% كانت فعاله للمحصول ومكوناته وكذلك للصفات المرضية في الذرة الصــفراء بينمــا طريقة انتخاب العائلات النصف أخوية كانت أكثر فعالية لتحسين صــفات التبكيــر . وهــذه المعلومات يمكن أن تفيد مربي الذرة الشامية في تحسين هذه الصفات في عشائر الذرة الشامية عن طريق التحسين والتطوير واستنباط تراكيب وراثية من الذرة الشامية مبكرة النضج وذات محصول حبوب عالي ومقاومة لأمراض الذبول المتأخر والتفحم .