

INTRODUCTION

To development (*Zea mays everta*) in Iraqi agricultural sector, it must be entrance genetic materials from developed countries in production like Argentina, Brazil, USA, and others countries that adapted to the Iragi environment. The Previous studies had showed that there is well acclimatization some genotype, to Iraq environment despite the narrow genetic basis (12and 28). The results of recent studies, especially at the developed countries were clarified, the production of this crop, in some of countries like ; Argentina and Brazil, indicated that this crop has in developing in both productivity and expansion popping. For the purpose of advancement of the productivity in popcorn to the quality and quantity, must be depending on basis genetic marital which highest variation in different traits . First stage to obtaining superior genotyp is testing general combining ability after S3 generation and determination hybrid vigor for inbred after S7.In addition that its possibility exploitation efficiency of reciprocal recurrent selection to concentration favorable genes possible to increased the grain yield and popping in new progenies from

popcorn (18, 16,9, 6 and 5). The evolution of S3 families by selfing and crossing with a broad-based genetic tester revealed the highest combining ability genotyps . Several studies have confirmed the efficacy of this method in screening third-generation families (14, 15and 22). One of the main objective of in the reciprocal recurrent selection between two groups of pop corn ,which have high grain yield and expansion popping (3) . Both of traits have negative correlation. The breeders were suggested to produce the single cross and looking about their parents the produced of parents to give the highest potential for grain yield and expansion of popping in there companion(19, 20, 21, 22 and 23). Popping expansion is increased 50% percent to the single hybrids compared with open pollinated varieties (18). It was possible to improve the relationship between highest grain yield and popping expansion by single crosses hybrids that will compared with the synthetic varieties and open pollination varities (25 and 17). The objective of this study were evaluate top cross performance as a function of popping expansion and grain yield and

estimate best statistical criteria that more suitable for screening progenies .

MATERIAL AND METHODS

One hundred of S3 families developed from the Argentinean commercial genotype AGR-2 through three self-pollinated generation. The local synthetic popcorn variety Al-Suror was used as a tester to the whole of the progenies. Experiment studies were conducted in fall season in 18 / 7 / 2016 at Al-Latifyia. Resrarch Station. Agricultural Directorate/ Min.of Sci and Tech.Iraq, to estimate general combining ability between of the progenies and select progeny , which has high general combing abiliuty (GCA) of 100 top crosses by one cycle by reciprocal recurrent selection(RRS) .The experiment was conducted using (10 x10) partial balance lattice design with two replications. Each of the top cross was planted in tow rows. The row length was 5 m and the distance between rows0.70m and entries the rows 0.20m, The DAP fertilizers content(N: P (27:27) with 400 kg ha⁻¹were added to the soil during field preparation. the **urea** fertilizers(46%N) was added 2time. during elongation stag and other before anthesis.

Atrazine Herbicide at a rate 6 kg. ha⁻¹ was added before emergence, 6 kg.ha⁻¹of diazenon was applied to protect from attack of *Sesamia cretica*. The data were recorded on 10 plants randomly, 5 plants from each row. The data was collected days of 50% tasseling(DT) , days of 50% silking(DS) , plant hight cm(PH) , ear hight cm(EH), leaves number (LN), leaf area index(LAI) , number ear per plant⁻¹ (NEP) , number of row ear⁻¹ (N RE) , number of kernel ear⁻¹ (NRE) , number of kernel plant⁻¹ (NKP), grain Wight(GW) , grain yield(GY) and expansion popping (EP). **EP was measured by placing 50 g in microwave oven (modelVMO-G42LB DENKA) using special bag for popping , at 1000 w, for 2.50 min.The popping volume wase measure in a 1000 mL graduated cylinder. It was determined as the ratio between the volume of the popped kernel and the grain weghit was taken from the mid- basal part of the ear, at 14% moisture level (8,2 and 10).** three Statistical Criteria were used for screening third-generation families, Standard Error, Double the standard error value and standard division. The variance, standard deviation, standard error and coefficient of

variance were calculated according to the Singh and Chaudary (24) formula

$$S^2 = \frac{\sum X^2 - (\sum X)^2 / n}{n-1}$$

$$SD = \sqrt{\frac{\sum X^2 - (\sum X)^2 / n}{n-1}}$$

$$E = \frac{SD}{\bar{y}}$$

$$CV\% = \frac{SD}{\bar{y}} \times 100$$

Where. S^2 = variance, SD = standard deviation, SE

= standard error, CV = coefficient of variance, n = number

of top cross, \bar{y} = total mean

The values of the three criteria were subtracted from the total mean of both male and female parents, then the top cross was selected, which is less than the total mean. and this continuously for all traits under this study, the values of the three criteria were added to the total mean, top crosses were selected which exceeded the total mean according to each criterion. The screening process to the first criteria was contented two groups, first one consisted from 19 top crosses that which gave well performance in the grain yield and popping volume and some traits, another group consist 10 top cross that good performance in

popping expansion and some traits except grain yield. The second criteria was revealed two groups, first one include 10 top crosses that well performance in the grain yield, popping expansion and some other traits, another group include 8 top crosses were superior at the popping expansion only and some other traits. The third criterion had produced 14 top crosses superior in the popping volume as well as good performance for some other traits.

RESULTS AND DISCUSSION

Result revealed significant differences among S3 families. Progenies were divided into three groups. The number of superior progenies according to the first criteria shows in Table 1. The results shows that The progenies were scored superiority in percentage 48, 52, 51, 50, 50, 49, 43, 40, 49, 42, 43, 43 and 37% for all traits with overall mean respectively. While percentage of progenies decreased under the third criteria presented 14, 9, 14, 8, 15, 8, 21, 11, 14, 18, 20, 14, and 14% respectively (Table 1.).

First criteria

Results in Table 2 shows two groups of progenies, first one included 10 progenies, which is presented in Table 2. 4, 5, 6, 15, 56, 67, 91, 95, 96, 98, Superior in performance to the popping volume and some other traits except grain yield, the popping volume ranged from 1250 (progeny 4) to 800 (progeny 91 and 96) mL g⁻¹. The progeny 4 showed highest value of popping volume 1250 mLg⁻¹ As well as 6 traits tasseling and silking days, plant high leaves number, leaf area index, kernel row⁻¹ respectively. The progeny 5 was revealed well evaluated in field to the all traits except grain yield and grain weight. The results were exhibited that progeny 91 had best behavior to the some of traits, while progenies 4, 6, 15, 67 were superior in 7 traits. Progeny 56 was significant in 5 traits, while progenies 95, 96, and 98 significant in popping volume. All progenies were revealed significantly higher than their parents (Al-Suror and AGR-2) in popping volume(14).

Another group include 19 progenies significantly superior in grain yield and popping

volume and some other traits (table 3). The popping volume ranged from 1400 mL g⁻¹ (progeny 55) to 800 mL g⁻¹ (progeny 45) respectively, with total mean 767.77 mL g⁻¹ (11), while grain yield plant ranged from 227.26 g (progeny 100) to 139.00 g (progeny 74) respectively. The results was indicated that progeny 20 scored superiority in all traits except number of row ear, but the progeny 73 scored superiority in all traits except number of leaves, leaf area index and ear per plant. While the progenies 14, 64 and 66 were scored superiority in all the traits except number of kernel row and grain weight, number of leaves and number of row ear⁻¹, number of leaves and grain weight respectively. The progenies 13, 63 and 82 were scored in 9 traits. The progenies 24 and 62 have well performance in 8 traits, while traits 9, 27, 45 and 78 showed well evaluated, when compared with total mean for each trait, while progenies 28, 55, 74, 99 and 100 were scored superiority in 6 traits. In agreement with present results (1 and 9). All progenies were revealed higher significantly than their parents Al-Suror and AGR-2 population in EP and Gy.

Second criteria

Result in Table 4 reveal two groups according this scale, first one include 10 progenies that good performance in grain yield and popping volume. The popping volume is ranged from 1400 mL g⁻¹ (progeny 55) to 900 (progenies 14, 27 and 74) mL g⁻¹ respectively, compared with total mean 788.54 mL g⁻¹. this results were agreement with other studies (4, 7 and 10).

Grain yield plant⁻¹ ranged from 227.26 -74gm (progeny 100 and 74) respectively. The progeny 14 scored preponderance in all traits except number of kernel rows ear and grain yield, but the second progeny 66 that which is scored preponderance in 10 traits except number of laves LAI and grain weight. Progenies 62 and 87 were scored preponderance in 9 traits, while progeny 27 had well performance under field conditions in 7 traits, the progenies 55 and 74 were revealed a highest performance in 6 traits. while the progenies 28, 99 and 100 were scored high significant to the 5 traits. All progenies were revealed highest significantly than their parents Al- Suror and AGR-2 population in both EP and

Gy this study was corresponding with the previous study (24).

The second group is shows in Table 5, include 8 progenies which scored preponderance in popping volume and some traits except grain yield. Popping volume is ranged from 1250) to 950 mL g⁻¹ to the progeny 4 and 56 respectively. The progeny 69 was revealed good performance in all traits except number of laves, LAI, ear plant⁻¹ and number of kernel row⁻¹. The screening process were showed that 8 progenies 4, 5, 6, and 15 had well evaluated in the filed environmental conditions for 8 traits in each one, while progenies 65, 67 and 56 wer higher significant in 7, 6 and 5 traits, respectively. this results was corresponding with other studies (6 and 10). All progenies were revealed higher significantly compared with their parents Al- Suror and AGR-2 genotypes in EP.

Third criteria

The results were indicated that the number of progenies which is significant superior in the popping trait and another of traits approximately about 14 progenies Table 6. The popping volume ranged from 1400 (progeny 55) to

1000 (progeny 5, 6, 15 and 69) mL g⁻¹. with overall mean 950.76 mL g⁻¹. Grain yield ranged from 277.26 (progeny 100) to 64.35gm (progeny 69) with total mean 156.24gm, in this group , three of progenies were significant in grain yield that which are progeny 66, 99 and 100 scored 176.88, 177.84 and 227.26 gm respectively . The screening process were showed that the progeny 87 was observed a high significant differences in 9 traits, progenies 65, 69 and 100 were revealed significant differences of evaluated in 6 traits with total mean, while progenies 5, 15, 62, 66, 67 and 99 were significant in 5 tratis, the progenies 4, 6, and 55 were scored of superiority in 4 traits ,while progeny was significant in three only of traits . All progenies were revealed higher significantly higher than their parents Al- Suror and AGR-2 populations in EP . The number of superior characteristics were decreased so for highest standard deviation value(16).

The results were revealed efficiency of reciprocal recurrent selection program(RRSP) to concentration favorable alleles in their progenies. Results were indicated that the second screening criterion (table 4) was more suitable for this study,

it was collected progenies that which is more superiority in tow importance traits such as grain yield and expansion popping and corresponding with 10% selection intensity . The reciprocal recuerrent selection(RRS) is a cyclic of breeders to improve the population and produce the crosses between two genotypes by evaluation of general combing ability(GCA). In this procedure three population from the popcorn were evaluated under central Iraq environmental condition with their parents and the best genotype from each population were selected to gave recombination with the progenies , The screening process of the genotypes , which was selected progenies and improved tow importance traits grain yield and expansion popping.

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