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COMBINING ABILITY OF NEW MAIZE INBRED LINES BY LINE x TESTER ANALYSIS

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ABSTRACT

Fourteen inbred lines were top-crossed to three testers, i.e. SK-7001/8, SCSK-17 and Gz-2 at Sakha in 2002 season. The top-crosses were evaluated in 2003 at Sakha and Gemmeiza locations. Significant differences were detected between two locations for all the studied traits. Mean squares of crosses and their partitioning into lines and testers were significant for all studied traits except for ear diameter for lines and testers. Moreover, mean squares due to lines × testers interaction were highly significant for grain yield, plant height. While, it was significant for ear length, ear height and weight of 100-grains.

The best desirable GCA effects for grain and most yield components were obtained by inbred lines SK-63-32 and SK-58-30. Also, the inbred lines SK-62-11, SK-62-12 and Sk-62-13 showed the best GCA effects for silking date, plant and ear height towards earliness and short plants, respectively. The inbred tester SK-7001/8 showed the best desirable GCA effects for number of rows/ear.

Moreover, the tester SCSK-17 was the best combiner for grain yield and number of kernels/row. While, the tester Gz-2 was the best general combiner for earliness and short plants. Two top crosses SK-63-32 × SK-7001/8 and SK-63-32 × SCSK-17 did not differ significantly from the check variety SC10. Moreover, fourteen top crosses exhibited significant differences than check variety TWC310. Also, most of the remainder top crosses did not differ significantly from the last check (TWC 310). These crosses can be used in maize breeding program.

The additive genetic variance was more important for grain yield, weight of 100-grain, plant height and ear height. While, non-additive genetic variance was an important for number of kernels/row, ear diameter and silking date. Moreover, non-additive genetic variance was more affected interacted by locations than additive genetic variance for all studied traits except number of kernels/row and ear diameter.
Keywords: Maize, *Zea mays* L., line × tester, combining ability, top crosses.

INTRODUCTION

The purpose of line × tester testing is estimation combining ability for new inbred lines in maize breeding programs. Davis (1927) was the first to suggest the use of inbred lines × variety cross or top cross as a method for evaluating maize inbred lines. Kempthorne (1957) defined a method of statistical analysis of the line × tester for testing general and specific combining ability of inbred lines. Jenkins (1978) stated that the top crossing have been used fairly widely for the preliminary evaluation of combining ability of new inbred lines. Some investigators mentioned that the estimates of additive genetic variance were more important in the inheritance of grain yield comparing to non- additive genetic variance El-Zeir *et al.*, (1993), Mostafa *et al.*, (1995), El-Zeir (1999) and Amer *et al.*, (2002). While, Lonnquist and Gardner (1961), Nawar and El-Hosary (1984), El-Zeir *et al.*, (2000), Mosa{2001} and Ibrahim (2001) found the reverse. Moreover, El-Zeir *et al.*, (2000)found that the variance of lines, testers, line × testers and their interaction with location were highly significant except line × tester × loc for grain yield. The main objectives of this investigation were as follows:

1- To determine combining abilities and their interaction with locations.

2- To identify the best lines and top-crosses to use them in hybrid maize breeding programs.

MATERIALS AND METHODS

Fourteen inbred lines of maize derived at Sakha Agricultural Research Station shown in Table (3). These inbred lines were crossed with three testers i.e. the inbred line SK-7001/8, promising single cross SK- 17 and composite variety Giza-2 during 2002 season while, the 42 top- crosses were evaluated at Sakha and Gemmiza Research Station in 2003 growing season. A randomized Complete Block design with four replications was used in both locations. Plot size was one row, 6 m long, 80 cm apart and 25 cm between hills. All normal cultural practices were done. The reading were recorded on, days to 50% silking, plant height (cm), ear height (cm), ear length (cm), ear diameter (cm), number of rows/ear, number of kernels/row, weight of 100-grains and grain yield (ard/fed) adjusted based on 15.5% grain moisture content. The statistical analysis of the combined data over two locations was performed according to Steel and Torrie (1980). While, combining ability analysis was computed using the line × tester procedure suggested by kempthorne (1957). Combined analysis between the two locations was done based on the homogeneity test.

RESULTS AND DISCUSSION

Mean squares of combined analysis over two locations for grain yield (ard/fad), ear length, number of rows/ear, number of kernels/row, weight of 100-grains, number of days to 50% silking and ear height were highly significant affected by locations indicating that these traits differed from location to another while, plant height and ear diameter were not affected as shown in Table (1). These results are in agreement with reported by El-Zeir *et al.*, (2000). Mean squares due to crosses (Cr) and their two partitioning lines (L) and testers (T) were highly significant for all studied traits except ear diameter for lines and testers only. Mean squares due to line x testers were highly significant for grain yield and plant height but significant only for ear height, ear length and weight of 100-grains, while it was not significantly for the remaining traits as reported by Ibrahim (2001). On the other hand, the mean squares due to the interaction between Cr × loc and their partitioning (L × Loc, T × Loc and L × T × Loc)were not significant for all traits. While, the interactions among L × Loc and L ×T × Loc for grain yield, L × Loc for ear length , L × Loc and T × Loc for number of rows/ear and T × Loc for number of kernels/row exhibited significantly differences among them, indicating that the ranks of interaction of top cross differ from one location to another in most traits.

Table (1): Mean squares of the combined analysis for nine traits over two locations (SK and Gm).

S.O.V	Silking date (days)	Plant height (cm)	Ear height (cm)	Ear length (cm)	Ear diameter (cm)	No. of row/ear	No. of kernels /row	Weight of 100 grains (gm)	Grain yield (ard/fad)
Locations(Loc)	657.44**	777.15	12975.41**	202.74**	0.02	46.50**	1852.30**	582.20**	2744.76**
Reps/loc.	5.46	775.92	275.25	6.26	0.07	0.52	27.44	49.11	19.28
Crosse Cr	10.77**	2241.76**	1310.93**	5.12**	0.09*	2.14**	27.83**	66.33**	87.99**
Lines L	25.94**	4371.59**	3503.8**	10.22**	0.02	3.73**	39.83**	106.42**	196.26**
Testers T	28.32**	3680.41**	1731.65**	5.77**	0.03	10.66**	148.61**	176.31**	75.36**
L x T	1.83	1066.18**	182.14*	2.20*	0.02	1.01	12.25	37.11*	35.45**
Cr x Loc	1.16	876.84	102.95	1.88	0.02	1.03	17.12*	23.87	28.90**
L x Loc	1.04	890.19	65.35	2.46*	0.02	1.99**	4.94	28.18	49.63**
T x Loc	1.76	71.66	116.90	2.76	0.01	1.61**	105.08**	28.04	0.90
L x T x Loc	1.17	932.11	120.68	1.52	0.02	0.50	16.45	21.39	20.68*
Error	0.89	639.0	78.96	0.99	0.04	0.75	7.68	18.42	9.82
x	58.48	268.14	144.38	21.64	5	14.34	42.5	46.38	32.30
C.V%	1.62	9.43	6.15	4.59	4.02	6.03	6.52	9.25	9.70

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

Mean performance for the studied traits of 42 top crosses over two locations are shown in Table (2). The results showed that two top crosses SK-63-32 x SK-7001/8 (39.0 ard/fad) and SK-63-32 x SC SK-17 (39.0 ard/fad) did not differ significantly from the commercial variety single cross 10 (38.8 ard/fad) as check variety for grain yield and most yield components. In addition to 12 top crosses surpassed significantly to TWC 310 (30.24 ard/fad) as check variety, too. These results showed it is recommended to use fourteen top crosses in maize hybrids breeding programs. The inbred lines which had desirable GCA effects were; SK-63-32, SK-63-27 and SK-58-22 for grain yield, SK-63-26 for weight of 100-grain, SK-58-30 for number of kernels, SK-58-21 and SK-58-30 for number of rows/ear and SK-62-11, SK-62-12 and SK-62-13 for silking date (earliness), plant height and ear height (short plants). Therefore, these inbred lines can be used as desirable combiners in maize breeding program.

The estimates of GCA effects for the testers of the studied nine traits are shown in Table (4). Desirable significant GCA effects were obtained by tester SK-7001/8 (narrow genetic base) for plant and ear height and number of rows/ear. These results are in agreement with those of Russell *et al.*, (1973) and Soliman and Sadek (1999) where they found the superiority of inbred line as tester to evaluate and select the best lines with higher GCA effects. While, tester SC SK-17 had the higher and desirable significant GCA effects for ear/length, ear diameter and number of kernels/ear. Also, tester Gz-2 (broad genetic base) had desirable significant GCA effects for silking date (earliness), grain yield, number of kernels/row and weight of 100-grains.

Specific combining ability (SCA) effects for crosses for the studied traits are shown in Table (5). Two top crosses (SK-58-21 × SC SK-17) and (SK-63-26 × SK-7001/8) exhibited positive and significant SCA effects for grain yield. Also, some top crosses exhibited positive and significant SCA effects such as (SK-58-30 × SC SK-17) for weight of 100-grains and cross (SK-58-10 × Gz-2) for ear length. While, top crosses (SK-62-31 × Gz-2), (SK-62-21 × SC SK-17) and (SK-62-13 × SC SK-17) had negative and significant effects for silking date, plant and ear height towards, earliness and short plants, respectively.

Table (2): Means performance of maize genotypes for the combined data over two locations (SK+ Gm) for nine traits.

Genotypes	Silking data (days)	Plant height (cm)	Ear height (cm)	Ear length (cm)	Ear diameter (cm)	No. of rows/ear	No. of kernels/row	Weight of 100 grain	Grain yield Ard/Fed
SK-58/10 x SK-7001/8	58.4	260.9	138.1	21.9	4.7	14.6	41.9	43.6	28.6
SK-58/10 x SC SK-17	58.8	272.6	150.4	21.7	4.9	14.2	41.6	44.8	30.7
SK-58/10 x Gz-2	58.4	292.8	152.5	22.0	5.0	15.4	41.6	47.4	32.0
SK-62-11 x SK-7001/8	58.1	247.4	130.1	20.1	5.1	14.2	41.7	43.3	29.4
SK-62-11 x SC SK-17	57.1	247.4	131.0	21.0	4.9	14.1	39.2	48.1	32.0
SK-62-11 x Gz-2	56.6	246.9	132.6	20.3	5.1	14.9	40.4	46.6	32.6
SK-62-12 x SK-7001/8	57.9	280.6	121.0	20.7	5.1	14.9	43.0	43.2	29.9
SK-62-12 x SC SK-17	57.1	243.0	124.1	21.6	4.9	14.0	40.0	39.7	28.3
SK-62-12 x Gz-2	56.3	235.8	121.3	20.1	5.0	14.3	40.2	41.9	26.6
SK-62-13 x SK-7001/8	58.1	245.0	127.6	21.2	4.9	13.6	41.8	45.9	32.6
SK-62-13 x SC SK-17	57.1	247.3	124.6	21.7	4.9	13.8	41.7	46.5	32.0
SK-62-13 x Gz-2	57.6	264.6	140.1	22.0	5.1	14.5	41.9	50.5	31.3
SK-58-21x SK-7001/8	58.3	246.3	128.3	22.8	4.9	14.9	44.2	39.9	23.9
SK-58-21x SC SK-17	58.5	259.9	144.1	22.6	4.9	15.0	43.9	48.7	32.0
SK-58-21x Gz-2	58.3	259.9	137.8	21.6	4.9	15.1	40.8	44.6	28.6
SK-58-22x SK-7001/8	59.9	266.1	148.4	23.0	4.9	14.4	44.9	45.3	33.6
SK-58-22x SC SK-17	59.3	280.1	161.6	22.9	5.0	14.3	43.3	50.8	34.5
SK-58-22x Gz-2	58.6	272.8	153.3	20.9	5.0	14.7	40.7	48.7	33.6
SK-62-23x SK-7001/8	58.1	254.6	133.6	21.7	5.1	14.6	43.6	45.3	29.9
SK-62-23x SC SK-17	58.0	272.0	149.1	21.6	5.0	13.9	43.2	44.2	32.3
SK-62-23x Gz-2	57.0	269.6	146.8	20.8	5.2	15.4	40.5	46.6	32.0
SK-62-24x SK-7001/8	57.9	251.3	133.0	21.0	5.0	14.0	42.8	46.0	32.1
SK-62-24x SC SK-17	58.6	256.1	143.3	21.6	4.9	13.8	42.0	48.0	31.0
SK-62-24x Gz-2	57.8	264.5	140.5	20.4	5.1	14.3	40.0	48.1	26.4
SK-62-25x SK-7001/8	58.9	261.3	136.0	21.7	5.2	15.0	45.7	46.3	33.5
SK-62-25x SC SK-17	57.9	266.4	144.9	21.7	5.0	14.4	42.6	48.1	34.0
SK-62-25x Gz-2	57.6	268.6	147.6	20.8	5.1	14.3	40.4	45.8	32.6
SK-63-26x SK-7001/8	57.9	269.1	151.1	21.0	5.0	14.9	42.5	48.3	35.7
SK-63-26x SC SK-17	57.5	261.3	142.0	21.6	5.0	14.3	42.2	49.6	30.3
SK-63-26x Gz-2	57.5	310.3	140.5	21.6	5.0	14.7	40.0	49.2	27.9
SK-63-27x SK-7001/8	59.8	269.3	145.6	22.2	5.0	14.3	43.9	47.5	38.0
SK-63-27x SC SK-17	59.5	279.9	155.0	22.8	4.9	14.0	45.7	50.1	35.6
SK-63-27x Gz-2	58.9	287.3	156.4	22.0	5.0	14.3	42.1	47.9	33.7
SK-58-30x SK-7001/8	60.8	284.1	159.9	22.8	4.9	14.6	44.2	41.4	35.5
SK-58-30x SC SK-17	60.9	288.4	169.4	22.8	5.0	14.7	46.1	49.4	34.6
SK-58-30x Gz-2	60.0	302.1	173.0	23.1	5.1	15.6	44.8	41.1	35.4
SK-62-31x SK-7001/8	60.5	266.0	147.0	21.8	5.1	13.8	45.1	44.8	34.2
SK-62-31x SC SK-17	59.8	276.9	155.6	20.8	4.9	13.4	41.0	46.1	34.2
SK-62-31x Gz-2	57.6	272.5	150.6	21.9	5.0	14.2	41.8	49.5	30.1
SK-63-32x SK-7001/8	60.3	277.1	158.1	22.0	5.2	14.0	46.6	48.2	39.0
SK-63-32x SC SK-17	60.5	288.1	161.1	22.0	5.0	13.4	42.8	46.9	39.0
SK-63-32x Gz-2	58.9	291.1	157.0	22.3	5.1	14.3	43.3	50.4	37.1
Check									
SC 10	60.25	319.0	176.63	22.53	4.95	13.9	44.20	49.07	38.8
TWC 310	61.75	303.75	174.88	22.85	4.96	13.9	43.35	46.75	30.24
L.S.D 0.05	0.93	24.8	8.71	0.7	0.20	0.85	2.72	4.21	3.07
0.01	1.22	32.6	11.46	1.28	0.26	1.12	3.58	5.54	4.04

These results showed that inbred line SK-7001/8, SC SK-17 and Gz-2 are considered of the best testers for evaluating crosses as good testers having narrow and broad genetic bases were obtained by several researchers i.e. Main *et al.*, (1988) Sedhom (1992), Ibrahim (2001) and Amer *et al.*, (2003).

Values of GCA and SCA variance and their interaction with locations are given in Table (6). Grain yield, weight of 100-grains, plant and ear heights, the variance of GCA had the highest value in the inheritance of these traits as mentioned by Salama *et al.*, (1995) and El-Zeir *et al.*, (2000). While, the variance of SCA was important for number of kernels, ear diameter and silking date. These results are in agreement with Sprague and Tatum (1942), Nawar and El-Hosary (1984) and Ibrahim (2001) while, the interaction of $\hat{^2}$ SCA × location was greater than $\hat{^2}$ GCA for most studied traits, indicating that SCA was more affected by locations than GCA. This result is in agreement with those of Soliman and Sadek (1999) and El-Zeir *et al.*, (2000).

Table (3): Values of general combining ability effects for lines of the combined data over two locations for nine traits.

Lines	Silking data (days)	Plant height (cm)	Ear height (cm)	Ear length (cm)	Ear diameter (cm)	No. of rows/ear	No. of kernels/ row	Weight of 100 grain	Grain yield Ard/ Fed
SK-58.10	0.018	7.277	2.619	0.194	-0.042	0.324	-0.792	-1.167	-1.917**
SK-62-11	-1.191**	-20.932**	-13.131**	-1.140**	0.042	-0.051	-2.167**	-0.333	-0.958
SK-62-12	-1.399**	-15.015**	-22.256**	-0.848**	0.000	-0.051	-1.458*	-4.833**	-3.958**
SK-62-13	-0.857**	-15.848**	-13.589**	-0.015	0.00	-0.384*	-0.625	1.250	-0.333
SK-58-21	-0.149	-11.140**	-7.673**	0.569**	0.00	0.616**	0.417	-1.958*	-4.167**
SK-58-22	0.768**	4.860	10.036**	0.652**	0.000	0.033	0.500	1.792*	1.667**
SK-62-23	-0.774**	-2.723	-1.214	-0.307	0.000	0.199	-0.042	-1.042	-0.958
SK-62-14	-0.399*	-10.848*	-5.464**	-0.640**	-0.042**	-0.342	-0.917	1.000	-2.375**
SK-62.25	-0.357	-2.723	-1.548	-0.223	0.000	0.116	0.417	0.333	1.042
SK-63.26	-0.857	12.069*	0.161	-0.390	-0.042	0.324	-1.042	2.708**	-1.000
SK-63.27	0.935**	10.652	7.952**	0.694**	0.000	0.259	1.375*	2.083*	3.458**
SK-58-30	2.060**	23.402**	23.036**	1.152**	0.042	0.616**	2.500**	-2.375**	2.792**
SK-62.31	0.81**	3.652	6.702	-0.140	0.000	-0.634**	0.083	0.417	0.625
SK-63.32	1.393**	17.319**	14.369**	0.444**	0.042	-0.509**	1.75**	2.125*	6.083**
L.S.D 0.05	0.38	10.11	3.6	0.40	0.08	0.35	1.11	1.72	1.25
0.01	0.50	13.31	4.7	0.53	0.11	0.46	1.50	2.26	1.65

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

Table (4): Values of general combining ability for testers of the combined data over two locations.

Testers	Silking data (days)	Plant height (cm)	Ear height (cm)	Ear length (cm)	Ear diameter (cm)	No. of rows/ ear	No. of kernels/row	Weight of 100 grain	Grain yield Ard/Fed
SK-7001/8	0.429**	-5.354**	-4.533**	0.048	-0.018**	1.143**	-1.446	0.289	0.289
SC SK-17	0.125	-0.694	2.494**	0.199*	0.009**	0.018	0.795**	0.637	0.637*
Gz-2	-0.554**	6.048*	2.039*	-0.247	0.009**	-1.161	0.655**	0.926*	0.926**
L.S.D 0.05	0.17	4.70	1.65	0.18	0.0007	0.16	0.13	0.79	0.58
0.01	0.23	6.16	2.17	0.24	0.0009	0.21	0.18	1.05	0.76

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

Table (5): Values of specific combining ability for top-crosses of the combined data over two locations (SK and Gm) for nine traits.

Entries	Silking data (days)	Plant height (cm)	Ear height (cm)	Ear length (cm)	Ear diameter (cm)	No. of rows /ear	No. of kernels/ row	Weight of 100 grain	Grain yield Ard/Fed
SK-58/10 x SK-7001/8	-0.5536	-9.1880	-4.3423	-0.0060	-0.0655	-0.5268	-0.976	-0.1369	-2.1637
SK-58/10 x SC SK-17	0.1250	-2.0982	0.8810	-0.4077	0.0327	0.3542	-0.1012	-1.3780	-0.3869
SK-58/10 x Gz-2	0.4286	11.2857	3.4613	0.4137	0.0327	0.2560	1.0774	1.5149	2.5506
SK-62-11 x SK-7001/8	0.4048	5.5208	3.4077	-0.4226	-0.0238	-0.6101	0.2738	-1.2202	-2.1220
SK-62-11 x SC SK-17	-0.2917	0.8601	-2.7441	0.3006	-0.0506	-0.0625	-1.3511	1.4137	0.0298
SK-62-11 x Gz-2	-0.1131	-6.3810	-0.6637	0.1220	0.0744	0.2142	1.0774	-1.1935	2.923
SK-62-12 x SK-7001/8	0.3631	32.8542**	3.4077	-0.2142	0.0179	-0.1518	0.6905	3.1548	1.3780
SK-62-12 x SC SK-17	-0.0833	-9.4316	-0.4941	0.6339	-0.0089	-0.4375	-1.0595	3.1548	-0.5952
SK-62-12 x Gz-2	-0.2798	-23.4226	-2.9137	-0.4196	-0.0089	0.0893	0.3691	-2.7113	-0.7827
SK-62-13 x SK-7001/8	0.0714	-1.9375	1.3661	-0.4226	0.0179	0.3482	-1.2679	-0.4435	0.2530
SK-62-13 x SC SK-17	-0.6250	-4.3482	-8.6607	-0.1994	-0.0089	0.0625	-1.1429	-0.3036	-0.4702
SK-62-13 x Gz-2	0.5536	6.2857	7.2946	0.6220	-0.0089	-0.1607	1.4107	-1.9196	0.2173
SK-58-21x SK-7001/8	-0.5119	-5.3958	-3.9256	0.4941	0.0179	0.0982	-0.0595	2.2232	-4.5387**
SK-58-21x SC SK-17	0.0417	8.5685	4.9226	-0.0327	-0.0089	0.1875	0.9405	-2.9702	3.2381**
SK-58-21x Gz-2	0.47020	-3.1726	-0.9970	-0.4613	-0.0089	-0.2857	-0.8815	3.2887	1.3006
SK-58-22x SK-7001/8	0.4702	-1.5208	-1.5089	0.6607	0.0179	0.0982	0.8579	-0.3185	-0.6220
SK-58-22x SC SK-17	0.1964	7.8185	4.7143	0.5089	-0.0089	0.61	0.2321	-15952	-0.0952
SK-58-22x Gz-2	-0.1250	-6.2976	-3.2054	-1.1696**	-0.0089	0.79	-10893	1.7887	0.7173
SK-62-23x SK-7001/8	-0.0714	-5.4375	-5.0089	0.3691	0.0179	-0.3958	0.0238	-0.1935	-1.7470
SK-62-23x SC SK-17	-0.0119	7.2768	3.4643	-0.1577	-0.0089	-0.2441	0.6488	1.3631	0.4048
SK-62-23x Gz-2	0.1667	-1.8393	1.5446	-0.2113	-0.0089	0.6399	-0.6726	-2.0030	1.3423
SK-62-24x SK-7001/8	-0.1548	-0.6875	-1.3839	-0.0476	0.0595	-0.1458	0.0238	0.6339	1.9196
SK-62-24x SC SK-17	-0.6369	-0.4732	1.8393	0.4256	0.0327	0.0060	0.3988	0.0714	0.6964
SK-62-24x Gz-2	0.4167	1.1607	-0.4554	-0.3780	-0.0923	0.1399	-0.4226	-0.1696	-2.6161*
SK-62-25x SK-7001/8	0.2202	1.1875	-2.3006	0.1607	0.0179	0.4792	1.5655	0.0982	-0.1220
SK-62-25x SC SK-17	0.3214	1.6518	-0.4524	0.1339	-0.0089	-0.2441	-0.1845	0.8631	0.0298
SK-62-25x Gz-2	-0.3750	-2.8393	2.7530	-0.2946	-0.0089	-0.2351	-1.3810	0.4970	0.0923
SK-63-26x SK-7001/8	0.0536	-5.7292	11.1161**	-0.4226	-0.0655	-0.1875	-0.2262	0.7381	4.2946**
SK-63-26x SC SK-17	-0.2500	*-18.2649	-5.0357	0.0506	0.0327	-0.0357	0.7738	-0.2530	-1.8036
SK-63-26x Gz-2	0.4286	23.9941**	06 0804	0.3720	0.0327	0.2232	-0.5476	-0.4851	-2.4912*
SK-63-27x SK-7001/8	0.0298	-4.1875	-2.1756	-0.1310	0.0179	-0.1875	-1.1429	0.4881	1.9613
SK-63-27x SC SK-17	-0.0417	1.7768	0.1726	0.2173	-0.0089	0.4643	1.7321	0.7470	-0.7619
SK-63-27x Gz-2	0.0119	2.4107	2.0030	-0.0863	-0.0089	-0.2768	-0.5893	-1.2351	-1.1994
SK-58-30x SK-7001/8	-0.2202	-2.0625	-3.0089	-0.0893	-0.0238	0.0208	-2.1429	-1.1786	0.1280
SK-58-30x SC SK-17	0.2083	-2.4732	-0.5357	-0.3661	0.0744	0.0476	1.1071	4.5804**	-1.2202
SK-58-30x Gz-2	0.0119	4.5357	3.5446	0.4554	-0.0506	-0.0685	1.0357	-3.4018**	1.0923
SK-62-31x SK-7001/8	0.7798*	-0.4375	0.4494	0.2024	0.0179	-0.0208	1.2738	-0.4702	1.0446
SK-62-31x SC SK-17	0.3333	5.7768	2.0476	-0.8244	-0.0089	-0.3691	-1.6012	-1.4613	0.8214
SK-62-31x Gz-2	-1.1131**	-5.3393	-2.4970	0.6220*	-0.0089	0.3899	0.3274	1.9316*	-1.8661
SK-63-32x SK-7001/8	-0.0536	-2.9792	3.9077	-0.1310	-0.0238	0.0208	1.1071	1.1964	0.3363
SK-63-32x SC SK-17	0.5000	3.3601	0.1191	-0.2827	-0.0506	0.0476	-1.3929	-2.4196**	0.1131
SK-63-32x Gz-2	-0.444	-0.3810	-3.7887	0.4137	0.0747	-0.0685	0.2857	1.2232	-0.4494
L.S.D 0.05	0.65	17.52	6.16	0.69	0.14	0.3125	1.88	4.51	2.17
0.01	0.86	23.10	8.11	0.91	0.18	0.2143	2.48	5.91	2.86

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

Table (6):Values of genetic variance of general and specific combining ability for the combined of data over two locations.

Genetic components	Silking data (days)	Plant height (cm)	Ear height (cm)	Ear length (cm)	Ear diameter (cm)	No. of rows	No. of kernels	Weight of 100 grain	Grain yield Ard/Fed
^{2}GCA	0.367	50.157	36.252	0.0002	0.071	0.638	1.707	1.409	0.069
^{2}SCA	0.098	21.924	14.598	0.0001	1.084	0.913	1.116	-1.773	-0.0325
^{2}GCA/ ^{2}SCA	3.744	2.287	2.483	2.0	0.065	0.698	1.528	1.409	0.069
^{2}GCA x L	0.006	-13.261	-0.869	-0.0002	0.038	1.134	-0.002	0.134	0.0321
^{2}SCA x L	0.07	73.278	10.430	-0.005	-0.063	2.192	0.742	2.716	0.131
^{2} GCA x L/ ^{2}SCA x L	0.085	73.278	10.430	0.04	0.038	0.517	0.742	0.049	0.243

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تقييم القدرة على الائتلاف فى سلالات جديدة من الذرة الشامية باستخدام تحليل السلالة x الكشاف

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مركز البحوث الزراعية – قطاع ابحاث الذرة

تم تهجين أربعة عشر سلالة جديدة من الذرة الشامية مع ثلاث كشافات (سلالة سخا ٨/١٠٠٧-هجين فردى سخا-١٧ والصنف التركيبي جيزة ٢) وذلك بمحطة البحوث الزراعية بسخا موسم ٢٠٠٢ ثم قيمت الهجن القمية الناتجة وعددها ٤٢ هجين قمى في محطتى البحوث الزراعية بسخا والجميزة موسم ٢٠٠٣ وذلك في تصميم القطاعات الكاملة العشوائية وتم التحليل الوراثى باستخدام تصميم (سلالةxالكشاف) طبقا لطريقة Kempthrone 1957 بهدف تقدير القدرة الائتلافية لهذه السلالات لصفة المحصول وبعض الصفات المحصولية الأخرى وكانت النتائج كما يلي:-

- أظهرت الدراسة اختلافات معنوية بين الموقعين لكل الصفات المدروسة ووجدت اختلافات معنوية أيضا بين الهجن القمية ومجزئاتها (السلالات والكشافات) لكل الصفات المدروسة ماعدا صفة قطر الكوز بالنسبة للسلالات وكذلك كان التفاعل بين السلالات والكشافات معنويا لمعظم الصفات المدروسة.
- كان تباين الفعل الوراثى المضيف أكثر أهمية بالنسبة لصفة محصول الحبوب) ووزن ١٠٠ حبة وارتفاع النبات والكوز وكان تباين الفعل الوراثى الغير مضيف أكثر أهمية لصفات ٥٠% ظهور حريرة ، عدد الحبوب للسطر وقطر الكوز. بينما كان الفعل الوراثى الغير مضيف أكثر تأثيرا وتفاعلا مع المواقع لكل الصفات ماعدا صفة عدد الحبوب للسطر وقطر الكوز.
- كانت أفضل السلالات للقدرة العامة على الائتلاف لصفة محصول الحبوب ومعظم صفات مكونات المحصول هي سخا-٥٨-٣٠ و سخا-٦٣-٣٢ بينما أظهرت السلالات سخا-٦٢-١٢ و سخا-٦٢-١١ تأثيرات جيدة للقدرة العامة على الائتلاف لصفات التبكير وقطر النبات.
- كانت السلالة سخا-٨/١٠٠٧أفضل كشاف لتأثيرات القدرة العامة على الائتلاف لصفة عدد السطور/كوز والكشاف هـ.ف سخا-١٧ اظهر أحسن قدرة عامة على الائتلاف لصفة محصول الحبوب وعدد الحبوب للسطر بينما الكشاف جيزة-٢ اظهر قدرة ائتلاف عالية لصفة ٥٠% ظهور حريرة (صفة التبكير) وارتفاع النبات والكوز.
- لم يختلف الهجينن القمين سخا-٦٣-٣٢ هـ.ف سخا-١٧ و سخا-٦٣-٣٢ × سخا-٨/١٠٠٧معنويا عن الهجين الفردي ١٠ كصنف مقارنة وتفوق ١٢ هجين قمى أيضا عن الهجين الثلاث٣١٠ معنويا وبناء عليه يمكن الاستفادة من هذه الهجن مستقبلا في برنامج التربية للذرة الشامية.