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COMBINING ABILITY OF NEW WHITE INBRED LINES OF MAIZE WITH THREE TESTERS TESTED OVER TWO LOCATIONS.

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ABSTRACT

Eighteen new white inbred lines of maize were top crossed to three testers, i.e. line SK 7001/8, S.C SK 17 and Giza 2 at Sakha in 2002 season. The 54 top crosses and two cheeks were evaluated at Sakha and Gemmeiza Agricultures Research Stations in 2003 season. Significant differences were detected between the two locations for all the studied traits except number of kernels/row. Mean squares due to lines, testers and line x tester interaction were significant for all traits except ear diameter for lines, resistance to late wilt disease for testers and ear length, no.of rows/ear, no.of kernels/row and 100- kernel weight for lines x testers interaction. The additive type of gene action was more important than non-additive type of gene action in inheritance of all studied traits except ear position and ear diameter. The inbred lines SK 7/2, SK 7/15 and SK 7/28 exhibited positively and significant GCA effects for grain yield and resistance of late wilt disease. Also, inbred lines SK 34/7, SK 34/17, SK 34/19 and SK 34/20 had negatively and significant, GCA effects for silking date and plant height towards, earliness and short plants. Whereas, the tester inbred line SK 7001/8 had desirable significant GCA effects for short plant and ear position. While, the tester SC SK 17 had desirable significant GCA effects for earliness, short plant, grain yield, ear length and ear diameter. Giza 2 as a tester had downer favorable genes for no.of rows/ear and 100- kernel weight (g). Two single crosses i.e. SK 7/15 x SK 7001/8 (37.62 Ard/Fed) and SK 7/28 x SK 7001/8 (36.22 Ard/Fed) were significantly superior than the commercial SC 10 (33.40 Ard/Fed) for grain yield and most agronomic traits. Also, three TWC i.e. SC SK 17x SK 7/2 x (37.41 Ard/Fed), SC SK 17x SK7/15 (37.07 Ard/Fed) and SC SK 17x SK 7/28 (35.26 Ard/Fed) were significantly superior than the commercial TWC 310 (32.30 Ard/Fed) for grain yield and most agronomic traits. These crosses would be prospective and more efficiency to be used in maize breeding programs

INTRODUCTION

Egyptian national maize research program has an optimistic to increase the national production of maize through the development of new high yielding hybrids with resistant to late wilt disease. Allison and Curnow (1966) defined the best tester as one that capable of giving higher maximum grain yield of its top cross. Production a high yielding maize hybrid is based mainly on development of better inbred lines Jenkins (1978). El-Hosary (1985) concluded that testers of broad genetic base are more efficient than those of narrow genetic base for the evaluation of GCA of maize. Liakat and Tepore (1986) used four types of tester which were open- pollinated variety, three way cross hybrid, single cross hybrid and an inbred line for evaluating the combining ability of 19 inbred lines, they concluded that the inbred tester which had the narrowest genetic and lowest yield potentiality although it gave maximum genetic variation in the top crosses progenies for must traits. This results indicated that inbred lines considered as effective tester for evaluating inbred lines. Moreover numerous investigators suggested that the estimates of additive genetic variance played an important role than non-additive genetic variance in the inheritance of grain yield, ear position, no.of rows/ear, no.of kernels/row and resistance to late wilt disease. Mahmoud (1996), Soliman and Sadek (1999), El-Shenawy *et al.*, (2003) and Mosa *et al.*, (2004). While Lonnquiest and Gardener (1961), Shehata and Dhawan (1975), and Mosa (2001) found that the non- additive genetic variance was more important than additive genetic variance in the inheritance of grain yield. Matzinger *et al.*, (1959), Mostafa *et al.*, (1995), Mahmoud (1996) and El-Zeir *et al.*, (2000) found that GCA x environment interaction was significantly larger than SCA x environment.

The main objectives of this investigation were as follows.

1- To estimate combining ability for 18 new inbred lines of maize in top crosses with three testers under two locations.
2- To determine the important types of gene action.
3- To identify the superior top crosses to improve the yielding ability in maize breeding programs.

MATARIALS AND METHODES

The material used in this study were 18 new white maize inbred lines of diverse genetic origin i.e. SK7/1, SK 7/2, SK 7/3, SK 7/4, SK 7/5, SK 7/6, SK 34/7, SK 34/8, SK 34/9, SK 7/14, SK 7/15, SK 34/16, SK 34/17, SK 34/18, SK 34/19, SK 34/20, SK 7/28 and SK 34/29. These inbred lines were developed at Sakha Agriculture Research Station. Inbred line SK 7001/8, promising single cross SK 17 and variety Giza 2 were used as testers. In 2002 growing season a top crossed-mating system was carried out among 18 inbred lines and three testers according to Kempthorne procedure, (1957).

In 2003 growing season the resulting 54 top crosses and the two checks i.e. SC 10 and TWC 310 were evaluated in the two locations, at Sakah and Gemmiza Agricultural Research Stations. A Randomized Complete Block Design (RCBD) was used with four replications in each location. The plot size consisted of one row 6 m long and 80 cm apart with 25 cm between hills. All agronomic field operations were practiced as usual with ordinary field maize cultivation. During the growing season and at harvest, in both experiments locations data on the following traits were measured: silking date (days from planting to 50% emeragence silking), plant height (cm), ear position (cm), resistance of late wilt disease, grain yield (Ard/Fed) adjusted to 15.5% grain moisture content, ear length (cm), ear diameter (cm), number of rows/ear, number of kernels/row and 100- kernel weight (g).

The analysis of variance for each location and over the two locations was performed according to Steel and Torrie (1980). Combining ability analysis was computed using the line x tester procedure suggested by Kempthorne (1957). Combined analysis among the two locations was done based on the homogeneity test.

RESULTS AND DISCUSSION

Mean squares of the combined data over two locations for the ten studied traits are shown in Table (1). Mean squares of locations (Loc.) were significant for all the studied traits except no.of kernels/row. Mean squares due to lines (L) and testers (T) were highly significant for all traits except testers mean square for resistance to late wilt disease and lines mean square for ear diameter such results indicated a wide range of variability among both parental lines and testers. It is clear that the mean squares due to testers were much higher than those of inbred lines for most traits. Mean squares due to line x testers (L x T) interaction were highly significant for silking date, plant height, ear position, resistance of late wilt disease, grain yield and ear diameter, indicating that the parental lines performed differently according to the type of tester to used.. Many investigators reported significant mean square i.e.lines,testers and lines x testers interaction in growth, yield and yield components traits;(Ashish and Singh (2002), Duarte *et al.*, (2003) and Mosa *et al.*, (2004)). Mean squares for (L x Loc) interaction were significant for all traits except, ear diameter and 100 kernel weight, while mean squares for (T x Loc) and (L x T x Loc) interactions were not significant for all traits except of (T x Loc) for plant height, grain yield and no.of kernels/row and (L x T x Loc) for plant height, ear position and grain yield.

Mean performance for the studied traits of 54 top crosses over two locations are given in Table (2). The results showed that the two single crosses SK 7/15 x SK 7001/8 (37.62 Ard/Fed) and SK7/28 x SK 7001/8 (36.22 Ard/Fed) were significantly superior than the commercial SC 10 (33.40 Ard/Fed) for grain yield and most agronomic traits. Moreover eight single crosses did not differ significantly from the check variety SC 10.Also three TWC i.e. SC SK 17x SK 7/2 (37.41 Ard/Fed), SC SK17 x SK 7/15 (37.07 Ard/Fed) and SC SK 17 x SK 7/28 (35.26 Ard/Fed) were significantly superior than the commercial TWC 310 (32.30 Ard/Fed) for grain yield and most agronomic traits. These desirable and promising genetic materials could be used in maize breeding programs for improving yielding ability and other agronomic traits.

Estimates of variance for general and specific combining ability (k^2GCA, k^2SCA) and their interactions with locations are shown in Table (3). The results exhibited that k^2GCA was higher than k^2SCA for all studied traits except ear position and ear diameter. This results indicated that the additive type of gene action was more important than non-additive type of gene action in inheritance of all studies traits except ear position and ear diameter. This results are in agreement with that obtained by Matzinger *et al.*, (1959), Mostafa *et al.*, (1995), Mahmoud (1996) Soliman and Sadek (1999) and Amer *et al.*, (2002). On the other hand, the magnitude of the interaction for k^2SCA x location was markedly higher than those of k^2GCA x location for plant height, ear position, resistance of late wilt and grain yield. While reverse results were obtained for other studied traits, these results indicated that the non- additive gene action was more sensitive to environmental differences than additive gene action for those traits. Similar results were obtained by Nawar and El-Hosary (1984), Mahmoud (1996), Mosa (2001) and Amer *et al.*, (2002)for grain yield.

General combining ability effects for the 18 inbred lines and three testers over two locations are given in Table (4). Significant and disarable GCA effects for grain yield, were detected of inbred lines SK 7/2, SK 7/4, SK 7/6, SK 7/15, SK 7/28 and SK 34/29. These lines could be used directly in hybrid breeding programs after many yield trial test. Inbred lines SK 34/7, SK 34/19 and SK 34/20 had the highest negative (favorable) and significant GCA effects for silking date and plant height towards, earliness and short plants. Also, the best inbred lines for GCA effects was detected for inbred line SK 34/8 for resistance of late wilt, SK 34/16 for ear length, SK 7/5 for ear diameter, SK 7/1 for no.of rows/ear, SK 7/28 for no.of kernels/row and SK 7/15 for 100 kernel weight. On the other hand, desirable GCA effects of the testers were obtained from, the inbred line SK 7001/8 of short plant and ear position, the SC SK 17 for earliness, short plant,grain yield, ear length and ear diameter and Giza 2 for no.of rows/ear and 100 kernel weight. The superiority of inbred lines as good testers was noticed by several investigators of them Ameha (1977), Liakat and Tepora (1986), Mahmoud (1996) and Al-Naggar *et al.*, (1997) and Amer *et al.*, (2002). While, the superiority of crosses or varieties as good testers was noticed by Grogan and Zuber (1957), Sokolov and Kostyuchenco (1978) and Mosa *et al.*, (2004).

Specific combining ability SCA effects of the 54 top crosses the two the locations are presented in Table (5). The results showed that the best SCA effects were observed in the top crosses SC SK 17 x SK 7/2, SK 7008/8 x SK 7/3, G 2 x SK 7/4, G 2 x SK 7/6, SK 7001/8 x SK 34/8, SC SK 17 x SK 34/17, G 2 x SK 34/17 and SK 7001/8x SK 7/28 for grain yield. Also, the top crosses G 2 x SK 7/3, SC SK 17 x SK 7/5, SK 7001/8 x SK 34/17, exhibited desirable SCA effects for earliness. The top crosses G 2 x SK 7/3, SC SK 17 x SK 7/5, G 2 x SK 7/5, SK 7001/8 x SK 7/6, SC SK 17 x SK 34/9, G 2 x SK 34/18 and SK 7001/8 x SK 34/29 exhibited desirable SCA effects for short plant, top crosses G-2 x SK7/4 and SK 7001/8 x SK 34/17 for resistance of late wilt disease. Top crosses G 2 x SK 7/1 for no.of rows/ear, top cross SC SK 17 x SK 34/16 for no.of kernels/row and top cross SK 7001/8 x SK 34/8 for 100 kernel weight.

Table (1): Mean squares of the combined analysis for the ten studied traits over the two locations.

S.O.V	d.f	Silking date (days)	Plant height (cm)	Ear position %	Resistance of late wilt	Grain yield Ard/Fed	Ear length (cm)	Ear diameter (cm)	No.of rows/ear	No.of kernels/row	100-kernel weight (g)
Locations Loc	1	690.08^{**}	825.208^{**}	407.39^{*}	1303.47^{**}	116.25^{**}	92.22^{**}	0.95^{*}	119.70^{**}	275.84	793.27^{*}
Rep\ Loc	6	12.87	324.85	49.97	9.33	13.65	8.75	0.22	3.09	90.91	160.90
Lines L	17	27.61^{**}	3711.34^{**}	31.51^{**}	101.58^{**}	195.58^{**}	6.79^{**}	0.04	2.69^{**}	37.83^{**}	230.59^{**}
Testers T	2	8.95^{**}	9581.42^{**}	67.188	0.002	65.29^{**}	19.88^{**}	0.14^{*}	12.13^{**}	37.78^{*}	241.13^{**}
L x T	34	2.27^{**}	348.69^{**}	16.35^{**}	25.99^{**}	43.58^{**}	1.82	0.3^{**}	0.94	11.34	29.63
L x Loc.	17	2.47^{*}	184.42^{**}	10.97^{**}	83.11^{**}	42.22^{**}	2.26^{*}	0.04	1.67^{**}	21.56^{**}	27.14
T x Loc	2	0.777	567.59^{**}	11.87	1.26	48.27^{**}	3.83	0.016	0.146	118.56^{**}	36.5
Lx Tx oc	34	1.067	200.41^{**}	8.53^{*}	19.94	16.18^{**}	1.03	0.033	0.526	10.9	14.38
Error	318	1.26	84.42	5.277	14.40	7.98	1.45	0.049	0.66	9.50	21.79
C.V%		1.85	3.46	4.42	3.88	9.26	5.57	4.22	5.84	7.23	10.45

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

Table 2: Mean performance of 54 top crosses for the ten traits of maize over the two locations.

Top cross	Silking date (days)	Plant height (cm)	Ear position %	Resistance of late wilt	Grain yield Ard/Fed	Ear length (cm)	Ear diameter (cm)	No.of rows/ ear	No.of kernels/ row	100-kernel weight
SK7001/8 x SK 7/1	62.0	278.12	51.65	98.5	32.90	21.82	5.17	14.4	43.17	39.81
SC SK17x SK 7/1	61.62	266.5	50.14	98.3	30.01	22.47	4.48	14.15	44.72	39.42
G-2 x SK 7/1	63.37	298.37	56.62	100	31.2	21.97	5.23	16.15	45.15	41.05
SK7001/8 x SK 7/2	61.37	278.62	53.61	100	33.08	21.15	4.81	16.75	43.62	41.55
SC SK17x SK 7/2	61.0	281.5	51.60	99.5	37.41	21.82	4.7	13.75	40.87	42.67
G-2 x SK 7/2	61.37	296.12	52.75	100	29.67	21.97	4.96	14.35	43.65	41.08
SK7001/8 x SK 7/3	61.5	292.37	52.46	99.43	31.74	21.5	4.98	14.15	44.75	43.96
SC SK17x SK 7/3	60.87	279.12	53.67	100	32.24	21.8	4.9	14.6	43.87	45.55
G-2 x SK 7/3	59.62	273.37	52.30	79.72	22.68	21.0	5.11	14.5	44.47	50.21
SK7001/8 x SK7/4	60.12	253.75	48.80	87.86	31.9	20.82	4.95	13.9	42.82	44.88
SC SK17x SK7/4	59.37	261.75	52.81	95.16	32.89	21.45	4.92	13.7	41.57	47.8
G-2 x SK7/4	59.5	276.37	52.38	96.41	35.2	22.22	5.0	14.15	42.60	49.9
SK7001/8 x SK7/5	61.5	273.5	54.08	100	30.06	20.67	4.87	13.95	43.35	37.02
SC SK17x SK7/5	59.0	255.12	54.02	96.75	31.23	21.27	4.72	13.55	45.02	37.03
G-2 x SK7/5	59.5	267.37	53.63	98.02	29.1	20.80	4.75	14.25	41.72	38.76
SK7001/8 x SK7/6	60.62	254.5	48.48	100	31.01	20.51	4.93	14.05	44.07	43.9
SC SK17x SK7/6	59.87	269.25	49.32	97.95	32.19	20.95	4.88	14.0	41.97	47.02
G-2 x SK7/6	60.12	277.25	49.98	97.43	34.85	20.65	4.98	13.85	41.02	42.88
SK7001/8 x SK34/7	60.12	249.87	50.30	100	31.21	21.30	4.97	14.55	42.35	46.33
SC SK17x SK34/7	60.37	254.62	53.57	97.93	28.78	22.77	4.83	13.7	44.15	48.35
G-2 x SK34/7	60.12	267.62	50.14	100	28.08	22.4	5.17	14.95	42.45	47.55
SK7001/8 x SK34/8	60.62	253.75	50.23	100	30.69	22.12	4.97	14.5	42.37	47.13
SC SK17x SK34/8	60.87	249.0	54.17	100	24.81	21.75	4.82	14.4	41.11	41.95
SK7001/8 x SK 34/9	61.12	256.12	51.1	97	28.11	21.85	4.88	14.25	42.52	39.92
SC SK17x SK 34/9	61.0	254.25	53.23	100	29.49	23.02	4.71	13.65	41.97	43.78
G-2 x SK 34/9	61.37	283.5	52.98	96.45	29.24	21.72	4.83	15.05	42.25	47.9
SK7001/8 x SK7/14	60.62	239.87	49.71	90.69	28.15	20.87	4.85	13.8	41.62	37.13

Table (2): Count.

Top cross	Silking date (days)	Plant height (cm)	Ear position %	Resistance of late wilt	Grain yield Ard/Fed	Ear length (cm)	Ear diameter (cm)	No.of rows/ ear	No.of kernels/ row	100-kernel weight
SC SK17x SK7/14	59.25	247.0	53.34	95.41	31.7	21.92	4.88	14.1	43.37	43.3
G-2 x SK7/14	59.75	248.87	50.23	95.78	28.21	20.92	5.0	14.6	41.37	45.76
SK7001/8 x SK7/15	61.37	265.37	50.96	100	37.62	21.77	5.16	13.25	44.57	50.83
SC SK17x SK7/15	60.37	262.25	50.32	99.5	37.07	21.05	4.88	13.55	41.46	49.36
G-2 x SK7/15	61.0	283.87	48.49	100	36.09	21.97	5.07	14.15	43.02	51.75
SK7001/8xSK34/16	60.62	261.37	51.16	99.40	32.22	21.95	5.13	14.35	44.25	45.4
SC SK17x SK34/16	61.0	260.12	52.82	97.72	28.99	23.4	5.03	14.9	46.87	38.3
G-2 x SK34/16	60.62	266.0	52.71	99.43	31.12	22.17	5.1	14.57	42.02	47.1
SK7001/8x SK34/17	59.62	247.87	52.59	98.22	21.61	20.82	4.97	13.95	41.7	43.77
SC SK17x SK34/17	60.62	257.87	52.28	94.02	27.87	22.18	5.0	13.75	41.22	49.02
G-2 x SK34/17	60.12	269.87	50.77	93.58	25.56	21.37	4.91	14.15	42.2	45.41
SK7001/8x SK34/18	61.37	253.87	51.72	96.28	25.88	20.0	4.91	13.95	41.27	42.23
SC SK17x SK34/17	61.37	251.25	52.86	97.91	30.17	21.6	4.92	14.45	39.4	46.42
G-2 x SK34/17	60.87	257.12	52.38	97.82	29.49	21.37	5.1	15.0	41.07	47.85
SK7001/8x SK34/19	61.0	248.37	51.90	100	28.74	20.5	4.86	13.85	42.6	41.7
SC SK17x SK34/19	60.12	264.37	53.03	98	29.51	21.72	4.78	13.65	43.12	41.61
G-2 x SK34/19	60.0	268.5	52.96	98.36	29.38	21.9	4.87	14.05	41.45	44.7
SK7001/8x SK34/20	60.62	243.12	48.59	100	27.93	21.75	4.91	14.07	41.62	41.0
SC SK17x SK34/20	59.75	244.12	51.97	96.89	28.29	21.72	4.82	13.85	39.45	44.0
G-2 x SK34/20	60.12	256.62	51.74	97.43	28.4	20.95	4.83	14.15	38.87	44.3
SK7001/8x SK7/28	63.5	236.37	52.33	99.4	36.22	22.02	5.02	13.82	45.9	47.16
SCSK17x SK7/28	62.87	285.62	52.18	100	35.26	22.95	4.97	13.35	44.1	46.5
G-2 x SK7/28	62.62	302.25	53.34	100	31.25	22.12	5.02	14.1	44.3	47.06
SK7001/8x SK34/29	63.75	261.75	52.35	95.65	30.31	21.42	5.06	14.25	43.42	45.3
SC SK17x SK34/29	63.62	276.75	52.92	97.11	32.54	23.02	5.02	14.65	44.57	46.53
G-2 x SK34/29	63.25	291.87	53.45	93.8	23.62	22.07	5.18	15.1	42.22	46.61
S C 10	**63.75**	**313.12**	**57.25**	**100**	**33.40**	**24.5**	**5.05**	**13.6**	**45.07**	**49.91**
TWC 310	63.5	284.12	54.68	99.45	32.30	22.75	4.97	14.05	45.2	46.98
L.S.D 0.05	1.1	9.00	2.25	3.71	2.76	1.18	0.19	0.79	3.0	4.57
0.01	1.44	11.85	2.96	4.89	3.64	1.55	0.25	1.04	3.97	6.02

Table (3): Estimates of effects of general and specific combining ability (k^2 GCA and k^2 SCA) and their interaction with locations.

Estimate	Silking date (days)	Plant height (cm)	Ear position %	Resistance of late wilt	Grain yield Ard/Fed	Ear length (cm)	Ear diameter (cm)	No.of rows/ear	No.of kernels/row	100-kernel weight(g)
K^2 GCA	0.183	72.88	0.358	0.030	0.687	0.113	-0.0022	0.072	0.055	2.245
K^2 SCA	-0.15	18.53	0.672	-7.14	0.17	0.098	0.032	-0.091	-1.277	0.311
K^2 GCA/ σ^2 SCA	1.21	3.93	0.532	0.030	4.041	1.34	0.032	0.072	0.055	7.212
K^2 GCA x Loc	0.013	4.18	0.068	0.529	0.692	0.047	0.057	0.009	1.408	0.415
K^2 SCA x Loc	-0.048	28.99	0.813	1.385	2.05	-0.105	-0.004	-0.033	0.35	-1.852
k^2 GCA x Loc / k^2 SCA x Loc	0.013	0.14	0.083	0.763	0.337	0.047	0.057	0.009	4.022	0.415

Table (4): Estimates of general combining ability effects for ten traits of maize over the two locations.

Line	Silking date (days)	Plant height (cm)	Ear position %	Resistance of late wilt	Grain yield Ard/Fed	Ear length (cm)	Ear diameter (cm)	No.of rows/ear	No.of kernels/row	100-kernel weight(g)
SK7/1	1.421**	15.555**	0.937*	1.002	0.944	0.465	0.089	0.784**	1.692**	-4.590**
SK 7/2	0.338	19.972**	0.770	1.919*	2.861**	0.006	-0.034	-0.256	0.108	-2.84**
SK 7/3	-0.245	6.180**	0.812	1.127	-1.763**	-0.243	-0.034	0.284	0.775	1.868*
SK 7/4	-1.245**	-1.486	-0.604	-4.706**	2.861**	-0.076	0.006	-0.256	-0.266	2.909**
SK 7/5	-0.219	-0.111	1.979**	0.335	-0.305	-0.701**	-0.118*	-0.256	0.650	-7.048**
SK 7/6	-0.703**	1.555	-2.604**	0.585	2.111**	-0.993**	0.006	-0.131	-0.266	-0.173
SK 34/7	-0.703**	-8.069**	-0.604	1.419	-1.097	0.506*	0.006	0.118	0.358	2.826**
SK 34/8	0.046	-11.236**	-0.437	2.085**	-3.513**	0.256	0.006	0.243	-1.182	0.159
SK 34/9	0.254	-0.819	0.520	-0.081	-1.555**	0.548*	-0.034	0.118	-0.432	-0.798
SK 7/14	-1.037**	-20.194	-0.812	-3.956**	-1.138	-0.409	0.048	-0.006	-0.432	-2.673**
SK 7/15	0.004	5.055**	-1.979**	1.919*	6.402**	-0.076	0.006	-0.506**	0.4	6.034**
SK 34/16	-0.162	-2.944	0.354	0.877	0.319	0.840**	0.048	0.076	1.858**	2.201*
SK 34/17	-0.787**	-6.902**	0.020	-2.581**	-5.472**	-0.243	-0.034	-0.215	-0.932	1.368
SK 34/18	0.296	-11.361**	0.395	-0.539	-1.972**	-0.701**	0.006	0.326*	-2.099**	0.743
SK 34/19	-0.537*	-5.027**	0.645	0.877	-1.305*	-0.284	0.006	-0.340*	-0.266	-1.965*
SK 34/20	-0.745**	-17.486**	-1.187*	0.210	-2.222**	-0.201	0.006	-0.131	-2.682**	-1.590
SK 7/28	2.088**	25.972**	0.854	1.877*	3.652**	0.756**	0.006	-0.340*	2.067**	2.159*
SK 34/29	2.629**	11.347**	0.937*	-2.372**	1.194*	0.584*	0.006	0.493**	0.650	1.409
Tester										
7001/8	0.282**	-6.076**	-0.729**	0.002	0.076	-0.375**	0.006	-0.097	0.499	-1.395**
SC SK17	-0.189*	-3.194**	0.625**	-0.004	0.631**	0.368**	-0.034*	-0.229**	0.108	0.236
G-2	-0.092	9.270**	0.104	0.002	-0.708**	0.006	0.027	0.326**	-0.557*	1.159**
L.S.D g_i L 0.05	0.44	3.67	0.91	1.51	1.13	0.48	0.09	0.32	1.23	1.86
L.S.D g_i L 0.01	0.59	4.83	1.24	1.99	1.48	0.63	0.119	0..42	1.62	2.45
L.S.D g_i t 0.05	0.18	1.5	0.37	0.61	0.46	0.19	0.03	0.13	0.50	0.76
L..S.D g_i t 0.01	0.24	1.97	0.49	0.81	0.60	0.25	0.04	0.17	0.66	1.00

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

Table (5): Estimates of specific combining ability effects of top crosses for ten traits over the two locations.

Top cross	Silking date (days)	Plant height (cm)	Ear position %	Resistance of late wilt	Grain yield Ard/Fed	Ear length (cm)	Ear diameter (cm)	No.of rows/ear	No.of kernels/row	100-kernel weight(g)
SK7001/8 x SK 7/1	-0.615	3.201	-0.395	-0.418	1.465	0.125	0.034	-0.569	-1.574	1.104
SC SK17x SK 7/1	-0.518	-11.305	-3.250	-0.662	-1.840	0.006	-0.048	-0.312	0.266	-0.777
G-2 x SK 7/1	1.134	8.104	3.645	1.081	0.375	-0.131	0.013	0.881	1.037	-0.326
SK7001/8 x SK 7/2	-0.157	-0.715	1.770	0.164	-0.326	-0.041	0.034	-0.027	0.509	1.104
SC SK17x SK 7/2	-0.060	-0.722	-1.708	-0.328	3.368	-0.284	-0.048	-0.020	-1.900	0.597
G-2 x SK 7/2	0.217	1.437	-0.062	0.164	-3.041	0.326	0.013	0.048	1.391	-1.701
SK7001/8 x SK 7/3	0.550	-3.173	0.354	0.331	2.798	0.458	-0.090	-0.069	0.717	-1.229
SC SK17x SK 7/3	0.398	10.694	0.125	0.962	2.743	-0.034	0.076	0.437	0.432	-1.236
G-2 x SK 7/3	-0.949	-7.520	-0.479	-1.293	-5.541	-0.423	0.013	-0.368	-1.150	2.465
SK7001/8 x SK7/4	0.175	-4.131	-1.854	-5.21	-1.576	-0.208	0.118	0.097	-0.115	-1.145
SC SK17x SK7/4	-0.101	0.986	0.916	2.046	-1.006	-0.451	-0.090	-0.02	-0.775	-0.027
G-2 x SK7/4	-0.074	3.145	0.937	3.164	2.583	0.659	-0.027	-0.076	0.891	1.173
SK7001/8 x SK7/5	1.217	14.243	0.937	1.747	-0.159	0.166	0.118	0.097	-0.532	0.812
SC SK17x SK7/5	-0.810	-7.013	-0.541	-1.495	0.534	-0.076	-0.090	-0.145	1.682	-0.819
G-2 x SK7/5	-0.407	-7.229	-0.395	-0.252	-0.375	-0.09	-0.027	0.048	-1.150	0.006
SK7001/8 x SK7/6	0.134	-6.423	-0.104	1.497	-1.576	0.208	-0.006	0.097	1.259	0.687
SC SK17x SK7/6	-0.143	5.444	-0.458	-0.495	-1.256	-0.034	0.034	0.354	-0.525	2.180
G-2 x SK7/6	0.009	0.979	0.562	-1.002	2.833	-0.173	-0.027	-0.451	-0.733	-2.868
SK7001/8 x SK34/7	-0.365	-1.423	-0.354	0.664	1.881	-0.416	-0.006	0.347	-1.115	0.312
SC SK17x SK34/7	0.356	0.444	1.791	-1.328	-1.173	0.215	0.034	-0.395	0.974	0.680
G-2 x SK34/7	0.009	0.979	-1.437	0.664	-0.708	0.201	-0.027	0.048	0.141	-0.993
SK7001/8 x SK34/8	-0.615	0.618	-0.520	-0.002	3.923	0.458	-0.006	0.347	0.300	3.927
SC SK17x SK34/8	0.106	-2.013	2.00	0.004	-3.006	-0.659	0.034	0.229	-0.358	-3.152
G-2 x SK34/8	0.509	-3.604	-1.479	-0.002	-0.916	0.201	-0.027	-0.576	0.058	-0.576
SK7001/8 x SK 34/9	-0.324	-2.423	-0.729	-0.835	-0.784	-0.083	0.034	-0.027	-0.199	-2.562
SC SK17x SK 34/9	0.023	-7.180	0.271	2.171	-0.090	0.548	-0.048	-0.520	-0.358	-0.319
G-2 x SK 34/9	0.300	9.604	0.437	-1.335	0.875	-0.465	0.013	0.548	0.557	2.881
SK7001/8 x SK7/14	0.467	0.701	-0.645	-3.210	-1.326	-0.125	-0.048	-0.277	-0.824	-3.312

Table (5): Count.

Top cross	Silking date (days)	Plant height (cm)	Ear position %	Resistance of late wilt	Grain yield Ard/Fed	Ear length (cm)	Ear diameter (cm)	No.of rows/ear	No.of kernels/row	100-kernel weight(g)
SC SK17x SK7/14	-0.435	4.944	1.750	1.421	1.743	0.381	-0.006	0.229	1.141	0.805
G-2 x SK7/14	-0.032	-5.645	-1.104	1.789	-0.416	-0.256	0.055	0.048	-0.317	2.506
SK7001/8 x SK7/15	0.175	0.951	1.895*	0.164	0.631	0.541	-0.006	-0.277	0.967	1.604
SC SK17x SK7/15	-0.351	-5.055	-0.333	-0.328	-0.423	-0.951*	0.034	0.104	-1.567	-1.402
G-2 x SK7/15	0.175	4.104	-1.562	0.164	-0.208	0.409	-0.027	0.173	0.599	-0.201
SK7001/8xSK34/16	-0.407	4.951	-0.437	0.581	1.465	-0.250	-0.048	0.138	-0.49	-0.062
SC SK17x SK34/16	0.439	8.814	-0.041	-1.162	-2.465*	0.506	-0.006	-0.104	2.471*	1.180
G-2 x SK34/16	-0.032	-5.770	0.479	0.581	1.00	-0.256	0.055	-0.034	-1.983	-1.118
SK7001/8x SK34/17	-0.782*	-4.590	1.395	2.914*	-3.368**	-0.166	-0.090	0.180	-0.324	-1.104
SC SK17x SK34/17	0.689	2.527	-0.208	-1.203	2.076*	0.215	0.076	-0.062	-0.608	2.888
G-2 x SK34/17	0.092	2.062	-1.187	-1.71	1.291*	-0.048	0.013	-0.118	0.932	-1.784
SK7001/8x SK34/18	-0.115	5.868	0.145	-1.127	-2.493*	-0.583	-0.006	-0.361	0.92	-1.854
SC SK17x SK34/17	0.356	0.361	0.166	0.629	0.826	0.173	0.034	0.145	-1.067	0.638
G-2 x SK34/17	-0.240	-6.30*	-0.312	0.497	1.666	0.409	-0.027	0.215	0.974	1.215
SK7001/8x SK34/19	0.342	-5.965	-0.104	1.206	-0.534	-0.500	-0.006	0.055	-0.240	0.354
SC SK17x SK34/19	-0.060	7.162*	-0.208	-0.787	-0.340	-0.243	0.034	0.062	0.599	-1.277
G-2 x SK34/19	-0.282	-1.187	-0.312	-0.418	0.875	0.743	-0.027	-0.118	-0.358	0.923
SK7001/8x SK34/20	0.175	1.243	-1.520	1.872	-0.368	0.666	-0.006	0.222	1.05	-0.770
SC SK17x SK34/20	-0.226	-0.638	0.750	-1.245	-0.423	-0.076	-0.034	-0.020	-0.608	0.597
G-2 x SK34/20	0.050	-0.604	0.770	-0.627	0.791	-0.590	-0.027	-0.201	-0.442	0.173
SK7001/8x SK7/28	0.217	1.034	0.062	-0.418	2.006*	0.083	-0.006	0.180	0.800	1.729
SCSK17x SK7/28	0.064	-2.597	-0.541	0.212	0.326	0.215	-0.034	-0.062	-0.858	-0.652
G-2 x SK7/28	-0.282	1.562	0.479	0.206	-2.333*	-0.298	-0.027	-0.118	0.057	-1.076
SK7001/8x SK34/29	-0.074	-8.965**	0.104	0.081	-1.659	-0.333	-0.006	-0.152	-0.282	0.604
SC SK17x SK34/29	0.273	3.152	-0.500	1.587	0.409	0.548	-0.090	0.104	1.057	0.097
G-2 x SK34/29	-0.199	5.812	0.395	-1.668	1.25	-0.215	0.097	0.048	-0.775	-0.701
L.S.D s_{ij} 0.05	0.77	6.36	1.59	2.62	1.95	0.83	0.15	0.56	2.13	3.23
L.S.D s_{ij} 0.01	1.02	8.38	2.09	3.46	2.57	1.09	0.201	0.74	2.81	4.25

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

REFERENCES

Allison, J.C.S. and.Curnow, R.N (1966): On the choice of tester parent for the breeding of synthetic varieties of maize (*Zea mays* L.) .Crop .Sci., 6 : 541-544 .

Al-Naggar, A.M.; El-Sherbieny, H.Y. and Mahmoud, A.A. (1997): Effectiveness of inbred, single crosses and population as testers for combining ability in maize. Egypt. J. plant breed., 1:35-46.

Ameha, M. (1977): Comparison of S2 progeny and inbred tester methods for improving maize. Ph.D.Thesis, Fac. Agric., Iowa State Univ., Ames USA.

Amer, E.A; El-Shenawy, A.A and Mosa, H.E. (2002): A comparison of four testers for the evaluation of maize yellow inbreds. Egypt.J.Appl. Sci., 17 (10): 597-610.

Ashish, S. and Singh, I.S. (2002): Evaluation and classification of exotic inbreds over locations based on line x teaster analysis in maize (*Zea mays* L.). Crop Improvement.,29 (2) : 184-189.

Duarte, I.A; Ferreira, J.M. and Nuss, C.N. (2003): Screening potential of three maize top cross testers. Pesquisa Agropecuaria Brasileria., 38 (3): 365-372.

El-Hosary, A.A. (1985): Study of combining ability in some top crosses in maize. Egypt. J. Agron., 10(1-2):39-47.

EL-Shenawy, A.A.; Amer, E.A. and Mosa, H.E. (2003): Estimation of combining ability of newly developed inbred lines of maize by (Line x Tester) analysis.J. Agric.Res.Tanta Univ.,29 (1) 50:63.

EL-Zeir, F.A.; Amer; E.A.; Abdel-Aziz, A.A. and Mahmoud, A.A. (2000): Combining ability of new maize inbred lines and type of gene action using top-crosses of maize. Egypt. J.Apple.Sci.,15 (2): 116-128.

Grogan, C.O. and Zuber, M.S. (1957): A comparative study of top cross tester parent of maize. J.Amer.Soc. Agron.,49:68-72.

Jenkins, M.T. (1978): Maize breeding during the development and early years of hybrid maize. In Walden, D.B. (ed) Maize breeding and genetic. New York, Wiley- Interscience Pupl.

Kempthorne, O. (1957): An introduction to Genetic Statistics. John wiley-son Inc., New York.

Liakat, M.A. and Teparo, N.M. (1986):Comparative performance of four types of testers for evaluating corn inbred lines from two populations . Philippine J .Crop Sci., 4 (5) :175-179 .

Lonnquiest, J.H. and Gardener, C.O. (1961): Heterosis in intervarietal crosses in maize and its implication in breeding procedures. Crop Sci., 1:179-183.

Mahmoud, A.A. (1996): Evaluation of combining ability of newly developed inbred lines of maize.Ph.D. Thesis, Fac. Agric., Cairo, Univ.,Egypt.

Matzinger, F.T.; Spreague, G.F. and Clar Cookerhom, C. (1959): Diallel crosses of maize in experiments reported over location and year. Agron. J. 51: 346-349.

Mosa, H.E. (2001): A comparative study of the efficiency of some maize testers for evaluation of white maize inbred lines and their combining ability under different enviroumental conditions. Ph.D. Thesis, Fac.Agric., Kafr El-sheikh, Tanta Univ., Egypt.

Mosa, H.E.; Motawei, A.A. and Afaf A.I.Gabr (2004): Evaluation of new inbred lines of yellow maize via line x tester analysis over three locations. J. agric. Sci., Mansoura Univ., 29(3): 1023-1033.
Mostafa, M.A.; Salama, F.A. and Abdel-Aziz, A.A. (1995): Combining ability of white maize populations with inbred testers. J. Agric. Sci., Mansoura Univ. 20 (1): 143-149.
Nawar, A.A. and El-Hosary, A.A. (1984): Evaluation of eleven testers of different genetic sources of corn. Egypt. J. Genet. Cytol., 13:227-237.
Shehata, A.H and Dhawan, N.L. (1975): Genetic analysis of grain yield and their crosses. Egypt. J. Genetic Cytol., (4): 96-116.
Sokolov, B.P. and Kostyuchenko, V.I. (1978): Choice of testers for the evaluation of combining ability in maize lines in top crosses Sel. Skokhazyaistvennaya Biolog., 13(1):44-48.
Soliman, F.H.S.; El-Shenawy, A.A.; El-Zeir, F.A. and Amer, E.A. (1995): Estimates of combining ability and type of gene action in top crosses of yellow maize. Egypt. J. Appl. Sci., 10(8):212-229.
Soliman, F.H.S.and Sadek, S.E. (1999): Combining ability of new maize inbred lines and its utilization in the Egyptian hybrid program. Bull. Fac. Agric., Cairo Univ. 50: 1-20.
Steel, R.G. and Torrie, J.H. (1980): Principal and procedures of Statisrics. Mc. Grow Hill Book Inc., New Yourk, USA.

القدرة للائتلاف لسلالات جديدة بيضاء من الذرة الشامية مع ثلاث كشافات اختبرت فى موقعين زراعيين

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هجنت ١٨ سلاله من الذرة الشامية مع ثلاث كشافات وهى سلالة سخا ٨/٧٠٠١ وهجين فردى سخا ١٧ وصنف جيزة ٢ وذلك بمحطة البحوث الزراعية بسخا فى موسم ٢٠٠٢. تم تقييم ٥٤ هجين قمى مع اثنين من هجن المقارنة (هـ.ف ١٠ وهـ.ث ٣١٠) فى محطتى سخا والجميزة للبحوث الزراعية فى موسم ٢٠٠٣. واستخدمت طريقة تحليل السلالة x الكشاف عن Kempthorne (1957) لصفات تزهير ٥٠% حريرة، ارتفاع النبات، موقع الكوز، والمقاومة لمرض الذبول المتأخر، محصول الحبوب، طول الكوز،قطر الكوز،عددالصفوف بالكوز عدد الحبوب بالصف ووزن ١٠٠ حبه. ويمكن تلخيص اهم النتائج فى الاتى:-

- توجد اختلافات معنوية بين المواقع لكل الصفات المدروسة فيما عدا صفة عدد الحبوب بالصف.
- اظهر تباين السلالات والكشافات والتفاعل بينهما معنوية لكل الصفات فيما عدا قطر الكوز للسلالات، المقاومة لمرض الذبول المتأخر للكشافات، طول الكوز،، عدد الصفوف بالكوز، عدد الحبوب بالصف ووزن ١٠٠ حبه لتفاعل السلالات فى الكشافات.

- كان فعل الجين المضيف أكثر أهمية من فعل الجين غير المضيف فى توريث كل الصفات المدروسة فيما عدا صفة موقع وقطر الكوز بينما كان فعل الجين الغير مضيف اكثر تاثيرا بالبيئة من الفعل الجينى المضيف لصفة ارتفاع النبات وموقع الكوز ومحصول الحبوب والمقاومة لمرض الذبول المتأخر.
- أظهرت السلالات سخا ٢/٧، سخا ١٥/٧، سخا ٢٨/٧ أفضل قيم مرغوبة لتأثيرات القدرة العامة على الائتلاف لصفات محصول الحبوب والمقاومة لمرض الذبول المتأخر. بينما أظهرت السلالة سخا ٧/٣٤، سخا ١٧/٣٤ والسلالة سخا ١٩/٣٤ والسلالة سخا ٢٠/٣٤ أفضل قيم مرغوبة لتأثير القدرة العامة على الائتلاف للتبكير وقصر ارتفاع النبات.
- اظهر الكشاف سلالة سخا ٨/٧٠٠١ قدرة عامة مرغوبة فى اتجاه قصر ارتفاع النبات وموقع الكوز بينما الكشاف هجين فردى سخا- ١٧ يمتلك قدرة عامة على الائتلاف مرغوبة فى التبكير وقصر ارتفاع النبات ومحصول الحبوب، طول الكوز وقطر الكوز بينما الكشاف جيزة ٢ لصفة عدد السطور بالكوز ووزن ١٠٠ حبه.
- تفوق معنويا اثنان من الهجن الفردية وهما سلالة سخا ١٥/٧ x سلالة سخا ٧٠٠١ /٨ (٣٧,٦٢ اردب/فدان) وسلالة سخا ٢٨/٧ x سلالة سخا ٨/٧٠٠١ (٣٦,٢٢ اردب/فدان) عن هجن المقارنة هجن فردى١٠ (٣٣,٤ اردب/فدان) لصفة محصول الحبوب وكذلك معظم الصفات الأخرى وأيضا تفوقت ثلاث هجن ثلاثية معنويا وهى:

هجين فردى سخا ١٧ x سلالة سخا ٢/٧ (٣٧,٤١ اردب/فدان)، هجين فردى سخا ١٧ x سلالة سخا ١٥/٧ (٣٧,٠٧ اردب فدان)، هجين فردى سخا ١٧ x سلالة سخا ٢٨/٧ (٣٥,٢٦ اردب/فدان) عن هجين المقارنة هـ.ث ٣١٠ (٣٢,٣٠ اردب/فدان) لصفة المحصول الحبوب ومعظم الصفات الاخرى لذلك يمكن الاستفادة من هذه الهجن كهجن جديدة متفوقة عالية المحصول ومقاومة لمرض الذبول المتأخر فى برنامج التربية للذرة الشامية.