Estimation of genetic and environment parameters for new white inbred lines of maize (Zea mays L.)

El-Shenawy, A.A
Maize Research Section, FCRI , Sakha ARS , ARC , Egypt

ABSTRACT

Evaluation of fifteen new white inbred lines of maize, used by line x tester analysis, for determining the genetic behaviour of these inbred lines for grain yield and its components. The fifteen inbred lines were crossed by two testers; namely, Sd-63 and Sk-9195 inbred lines at Sakha Agricultural Research Station in 2003 summer season. The thirty crosses produced were evaluated under two locations at Sakha and Sids Stations in 2004 summer season. Highly significant differencs were detected between the two locations for most studied traits. Mean squares due to lines, testers and lines x testers were highly significant for most traits. While, the interaction between lines, testers and locations were not significant for most traits. Six topcrosses; i.e., Sk 9195 x Sk-5048/26 (37.46 ard/fad), Sk 9195 x Sk-5069/27 (36.42 ard/fad), Sk 9195 x Sk 5046/24 (35.89 ard/fad), Sk 9195 x Sk 5040/19 (34.96 ard/fad), Sk 9195 x Sk 5044/21 (34.37 ard/fad) and Sd 63 x Sk5048/26 (34.16 ard/fad) were higher for grain yield than the commercial hybrids, S.C. 129 (33.51 ard/fad.) and S.C.122 (31.04 ard/fad).These results suggested the use of these crosses in maize breeding programs.

The additive genetic variance was more important component than the non-additive genetic variance in the inheritance of silking date, grain yield, ear length, ear diameter, number of rows per ear and weight of 100 kernels. While, the non-additive genetic variance played the major contribution in the inheritance of plant and ear height, and number of kernels per row. Significant and desirable GCA effects were exhibited in Sk-5046/24, Sk-5048/26 inbred lines and Sk-5069/27 inbred lines for grain yield. While, the Sk-9195 inbred line, as atester, was the best general combiner for all studied traits.

Ardab (ard)= (140 kg grain) Faddan (fad.)= $0.42h^2$

INTRODUCTION

The preliminary evaluation of the combining ability of new inbred lines can be achieved through topcross test. However, the effectiveness of this test depends mainly upon the type of tester to be used in the evaluation program. Rawlings and Thompson (1962), Ameha (1977), Ayad (1986), EL-Shenawy (2003) and Mosa *et al.* (2004) found that using narrow genetic base as atesters (inbred lines) was effective in the evaluation process. Sedhom (1992) found that the variance of general combining ability was predominant for ear diameter, number of rows/ear, whereas, variance of specific combining ability appeared to be more important in controlling number of kernels/row. EL-Kielany (1999) found that variance component estimates were larger for GCA than for SCA effects, revealing that the largest part of the total genetic variability was aresult of additive gene action for silking date, grain yield, ear length and 100 kernel weight. Mosa (2004) reported that the magnitude of non-additive genetic variance appeared to be more important than the magnitude of additive genetic variance for plant height. The objectives of the present study were:

1- To estimate combining ability of some new white inbred lines for several traits of maize.
2- To identify superior single crosses and to ascertain their superiority over the best commercial corn hybrids.

MATERIALS AND METHODS

New white fifteen inbred lines of maize, derived at Sakha Agricultural Research Station. These lines were screened for resistant to late wilt disease under artificial infection in the disease nursery. These 15 inbred lines were crossed handly with Sids 63 and Sakha 9195 inbred lines, during 2003 summer season. The thirty topcrosses and the two check hybrids, SC122 and SC 129, were evaluated at Sakha and Sids stations in 2004 summer season. The 30 testcrosses genotypes were arranged in a randomized complete block design (RCBD), with four replications at each. Each plot was one row,6m long,80cm apart with 25 single hill plants. Data were recorded on number of days till 50% silking, plant and ear heights, grain yield (ard/fad), adjusted on 15.5% grain moisture content, ear length and diameter (cm), number of rows per ear, number of kernels per row and weight of 100 kernels (g). Statistical analysis of the combined data the over two locations was performance as given by Steel and Torrie (1980). Assuming that location was random and hybrid was fixed.

RESULTS AND DISCUSION

The mean squares of combined analysis over two locations for nine traits are shown in Table (1). M.S of location was highly significant for silking date, plant height, ear height, grain yield,ear length, ear diameter and weight of 100 kernels. indicating that the difference between Sakha and Sids locations for these traits was segnificant. Also, this significant different for all is expected as the environmental conditions are guite different for growing maize as the temperature is higher at Sids and less humid than Sakha. These results are in agreement with those of EL-Zeir *et al.* (2000), Amer *et al.* (2001), Amer *et al.* (2003),EL-Shenawy *et al.*(2003) and Mosa (2004).

The mean performance of thirty topcrosses and the two check hybrids for the studied traits over the two locations are given in Table (2). The data showed that only the topcrosses, Sk 9195 x Sk 5048/26(37.46 ard/fad.), were significantly higher for grain yield than the commercial crosses, SC129 (33.51 ard/fad) and SC122 (31.04 ard/fad). Also, the five top crosses, Sk 9195 x Sk-5048/26 (37.46 ard/fad), Sk 9195 x Sk-5069/27 (36.42 ard/fad), Sk 9195 x Sk 5046/24 (35.89 ard/fad), Sk 9195 x Sk 5040/19 (34.96 ard/fad), Sk 9195 x Sk 5044/21 (34.37 ard/fad) and Sd 63 x Sk5048/26 (34.16 ard/fad), were significantly higher than the commercial cross, SC122 and insignificantly higher than SC129 cross. Moreover, the abovementioned topcrosses were not significantly different from the checks, SC129 and SC122, for most studied traits.These results indicated that these six top crosses could be used in maize hybrid breeding programs.

Table (3) shows the mean squares, due to lines (L), tester (T) and (L x T) interaction, were highly significant for all studied traits, except silking date, plant height, ear length, number of rows/ear and number of kernels per row for (T) and ear length, ear diameter, number.of rows/ear and weight of 100 kernels for (L x T). This indicates that the inbred lines significantly differed in their behaviour with respect to topcrosses. Also, the two testers were different from each other in topcrosses. The significance of lines x testers would suggest the mean of certain hybrid topcrosses production is a function of both the male and female parent. These results are in agreement with those of Mosa (2001), Amer *et al.* (2003), EL-Shenawy *et al.*(2003) and Mosa *et al.* (2004).The interactions between L x Loc, T x Loc and L x T x Loc were not significant for all traits, except for ear diameter for L x Loc, silking date, plant height, and number of rows/ear for T x Loc interaction and ear length and ear diameter for L x T x Loc interaction.

Estimates of variance for general (σ^2GCA) and specific (σ^2SCA) combining abilities and their interactions with locations are presented in Table (4). The results show that the σ^2GCA was higher than σ^2SCA for silking date, grain yield, ear length, ear diameter, number of rows per ear and weight of 100 kernels. This indicates that the additive variance played amore important role than the non-additive genetic variance in the inheritance of these traits. These results are in agreement with those by EL-Zeir *et al.* (1993), EL-Shenawy (1995), Mostafa *et al.* (1995) and Mosa (2001), but the non-additive genetic variance played amore important role than the additive one in the inheritance of plant and ear heights, and number of kernels per row. These results are in agreement with those of EL-Shenawy (2003) and Mosa (2004) for number of kernel per row respectively, while values of the interaction for σ^2GCA x Loc was higher than σ^2SCA x Loc for silking date, plant height and weight of 100 kernel. However, the values of σ^2SCA x Loc was higher than σ^2GCA x Loc for grain yield, ear height, ear length, ear diameter, number of rows/ear and number of kernels/row. This means that the SCA was more affected by locations than the GCA for most studied traits. These results agreed with these reported by Mosa (2001), EL-Shenawy *et al* (2003), Mosa (2004) and Mosa and Motawei (2005).

The general combining ability effects of inbred lines and testers for nine studied traits over two locations are presented in Table (5).Highly significant and desirable GCA effects were shown in the inbred lines, Sk-5046/24, Sk-5048/26 and Sk-5069/27 for grain yield, Sk-5040/17, Sk-5048/25, Sk-5048/26, Sk-5094/28 and Sk- 5094/29 for earliness, Sk-5040/17, Sk-5040/18, Sk-5094/28 and Sk-5103/31 for short ear height, Sk-5044/21, Sk-5044/22 Sk-5044/23 and Sk-5046/24 for ear length, Sk-5048/25, Sk-5069/27, Sk-5094/28 and Sk-5094/29 for ear diameter, Sk-5048/25, Sk-5048/26, Sk-5094/28 and Sk-5101/30 for number of rows per ear, Sk-5046/24 and Sk-5101/30 for number of kernels per row and Sk-5044/21, Sk-5044/22, Sk-5046/24, Sk-5048/25 and Sk-5069/27 for weight of 100 kernels. Generally, these inbred lines could be recommended for advanced stage of evaluation. On the other hand, the inbred line, Sk-9195, as a tester, was the best general combiner for all studied traits.

The estimates of SCA effects of thirty top crosses for the nine studied traits over two location are shown in Table (6). The results indicat that the significant desirable SCA effects were obtained from the hybrids Sd-63 x Sk-5044/21, for earliness, Sd-63 x Sk-5040/18, Sk 9195 x Sk-5048/25and Sk-9195 x Sk-5103/31 for short plant height, Sk-9195 x Sk-5101/30 and Sk-9195 x Sk-5103/31 for short ear height, Sk-9195 x Sk-5044/20 and Sd-63 x Sk-5094/29 for ear length and the topcross, Sd-63 x Sk-5044/22, for number of kernels per row. These topcrosses might be useful in the maize hybrid program.

Table (1): Analysis of variance for nine traits over the two locations (combind date).

S.O.V	d.f	Silking date (days)	Plant height (cm)	Ear height (cm)	Grain yield (Ard/fad)
Locations (Loc)	1	425.39**	69004.72**	34875.56**	1899.77**
Error	6	5.77	2126.18	1118.82	16.91
Genotypes (G)	31	41.25**	747.16**	451.99**	70.85**
G x Loc	31	1.70	102.32	108.44	13.68
Error	186	1.56	77.75	72.25	10.09
C.V%		1.8	3.3	5.3	10.11

*,**: Significant of 0.05 and 0.01 levels,respectively.

Count (1):

S.O.V	d.f	Ear length (cm)	Ear diameter (cm)	No.of rows/ear	No.of kernels/row	100-kernel weight (g)
Locations (Loc)	1	94.09**	18.54**	0.85	177.22	3741.38**
Error	6	1.91	0.11	2.54	103.92	35.65
Genotypes (G)	31	15.37**	0.16**	4.66**	26.24**	114.81**
G x Loc	31	1.89*	0.046	0.75	7.61	11.56
Error	186	1.12	0.046	0.51	6.31	9.42
C.V%		4.76	4.46	5.13	5.77	6.84

*,**: Significant of 0.05 and 0.01 levels,respectively.

Table (2): Mean performance of thirty top crosses and two check hybrids for nine traits over two locations.

Cross	Silking date (days)	Plant height (cm)	Ear height (cm)	Grain Yield ard/fad
Sd63 x S5040/17	70.2	259	158	27.94
Sd63 x Sk5040/18	71.7	252	155	26.52
Sd63 x Sk5040/19	71.7	278	170	28.18
Sd63 x Sk5044/20	70.5	273	163	28.81
Sd63 x Sk5044/21	71.3	277	160	29.93
Sd63 x Sk5044/22	73.2	277	167	30.57
Sd63 x Sk5044/23	73.2	268	160	26.68
Sd63 x Sk5046/24	71.1	278	170	31.50
Sd63 x Sk5048/25	70.1	278	164	31.98
Sd63 x Sk5048/26	70.3	286	175	34.16
Sd63 x Sk5069/27	71.6	275	168	33.45
Sd63 x Sk5094/28	70.7	265	160	23.77
Sd63 x Sk5094/29	69.6	269	163	31.36
Sd63 x Sk5101/30	71.3	275	167	29.50
Sd63 x Sk5103/31	71.5	270	163	32.10
Sk9195 x Sk5040/17	67.3	259	149	31.30
Sk9195 x Sk5040/18	69.3	269	160	33.14
Sk9195 x Sk5040/19	67.3	274	164	34.96
Sk9195 x Sk5044/20	67.5	269	155	32.96
Sk9195 x Sk5044/21	69.8	284	163	34.37
Sk9195 x Sk5044/22	71.6	282	166	30.36
Sk9195 x Sk5044/23	69.1	278	161	32.13
Sk9195 x Sk5046/24	68.2	288	174	35.89
Sk9195 x Sk5048/25	66.6	264	152	31.34
Sk9195 x Sk5048/26	65.7	290	171	37.46
Sk9195 x Sk5069/27	66.7	274	161	36.42
Sk9195 x Sk5094/28	66.6	264	154	28.93
Sk9195 x Sk5094/29	67.3	273	161	31.59
Sk9195 x Sk5101/30	68.5	263	145	31.47
Sk9195 x Sk5103/31	67.1	254	145	32.30
SC 122	65.8	257	153	31.04
SC 129	65.2	280	161	33.51
L.S.D 0.05	1.2	8.6	8.3	3.11
0.01	1.6	11.4	10.9	4.09

Count. (2):

Cross	Ear length (cm)	Ear diameter (cm)	No.ofr ows/e ar	No.of kernels/ row	100-kernel weight (g)
Sd63 x S5040/17	21.17	4.7	13.3	43.2	40.8
Sd63 x Sk5040/18	20.52	4.5	13.7	42.1	38.4
Sd63 x Sk5040/19	21.27	4.6	13.3	45.0	39.9
Sd63 x Sk5044/20	20.82	4.6	13.0	42.1	43.6
Sd63 x Sk5044/21	23.10	4.8	13.1	42.6	47.2
Sd63 x Sk5044/22	25.07	4.6	12.6	46.0	46.7
Sd63 x Sk5044/23	22.92	4.7	13.0	44.0	43.1
Sd63 x Sk5046/24	22.60	4.9	13.5	45.7	49.3
Sd63 x Sk5048/25	22.02	4.9	14.4	41.0	46.7
Sd63 x Sk5048/26	21.62	4.9	14.6	43.8	41.6
Sd63 x Sk5069/27	22.42	4.9	13.7	44.8	45.3
Sd63 x Sk5094/28	19.52	4.8	15.6	41.8	39.4
Sd63 x Sk5094/29	20.60	4.8	13.7	42.0	44.7
Sd63 x Sk5101/30	22.42	4.5	14.1	46.1	39.6
Sd63 x Sk5103/31	21.67	4.7	14.1	43.4	43.0
Sk9195 x Sk5040/17	22.32	4.7	13.4	39.6	45.5
Sk9195 x Sk5040/18	23.17	4.8	14.2	44.8	44.6
Sk9195 x Sk5040/19	23.57	4.7	13.7	42.8	46.4
Sk9195 x Sk5044/20	23.42	4.8	13.8	44.4	48.2
Sk9195 x Sk5044/21	23.25	4.8	13.4	43.1	50.5
Sk9195 x Sk5044/22	25.50	4.7	13.2	40.4	53.9
Sk9195 x Sk5044/23	24.07	4.7	13.6	44.4	48.5
Sk9195 x Sk5046/24	23.67	4.8	13.7	47.9	50.6
Sk9195 x Sk5048/25	22.22	5.0	14.5	41.4	49.2
Sk9195 x Sk5048/26	23.42	5.0	15.5	43.9	43.4
Sk9195 x Sk5069/27	22.10	5.0	14.1	44.4	48.9
Sk9195 x Sk5094/28	20.65	4.9	15.6	41.6	41.8
Sk9195 x Sk5094/29	19.87	5.0	14.8	41.8	44.9
Sk9195 x Sk5101/30	23.17	4.8	15.0	44.6	40.8
Sk9195 x Sk5103/31	22.90	4.9	14.2	43.4	44.7
SC 122	21.45	4.7	14.1	44.8	41.5
SC 129	21.95	4.8	14.4	44.3	42.4
L.S.D 0.05	1.0	0.19	0.69	2.46	3.0
0.01	1.4	0.25	0.92	3.24	3.95

Table (3): Mean squares of lines, testers, lines x testers and their interaction with locations for nine traits over two locations.

S.O.V	d.f	Silking date (days)	Plant height (cm)	Ear height (cm)	Grain yield (ard/fad)
Lines (L)	14	22.64**	1146.68**	590.17**	84.32**
Testers (T)	1	650.10	9.6	1820.5**	617.6**
(Lx T)	14	4.73**	342.16**	242.83**	23.83**
L x Loc	14	1.92	92.7	72.625	12.86
T x Loc	1	7.7**	828.8**	116.21	6.97
Lx T x Loc	14	0.98	72.82	122.72	14.55
Error	186	1.56	77.75	72.25	10.09

*,**: Significant at 0.05 and 0.01 levels,respectively

Count. (3):

S.O.V	d.f	Ear length (cm)	Ear diameter (cm)	No.of rows/ear	No.of kernels/ row	100- kernel weight (g)
Lines (L)	14	25.23**	0.35**	8.80**	35.91**	172.43**
Testers (T)	1	70.41	0.60**	9.60	7.35	724.53**
(Lx T)	14	3.82	0.10	0.77	19.12**	18.85
L x Loc	14	1.17	0.17**	0.69	9.68	15.27
T x Loc	1	3.75	0.001	2.0*	0.81	2.29
Lx T x Loc	14	2.71**	0.14**	0.62	7.66	8.75
Error	186	1.12	0.04	0.51	6.31	9.42

*,**: Significant at 0.05 and 0.01 levels,respectively

Table (4): Estimates of line, tester, line x tester constants and their interaction with environment.

Genetic	Silking date (days)	Plant height (cm)	Ear height (cm	Grain yield (ard/fad)
O^2GCA	4.82	-10.238	14.569	4.878
O^2SCA	0.468	33.66	15.01	1.16
O^2GCAxLoc	0.112	5.84	-0.785	-0.136
O^2SCAxLoc	-0.145	-1.232	12.617	1.115

Count. (4):

Genetic	Ear length (cm)	Ear diameter (cm)	No.of rows/ ear	No.of kernels/ row	100- kernel weight (g)
O^2GCA	0.650	0.007	0.113	0.072	6.320
O^2SCA	0.138	-0.005	0.018	1.432	1.251
O^2GCAxLoc	-0.007	-0.001	0.021	-0.071	0.0008
O^2SCAxLoc	0.397	0.025	0.027	0.337	-0.167

Table (5): Estimates of GCA effects for fifteen inbred lines and two testers for nine traits over two locations.

Line	Silking date (days)	Plant height (cm)	Ear height (cm)	Grain yield (ard/fad)
Sk5040/17	-0.78*	-13.42**	-7.99**	-1.75*
Sk5040/18	0.96**	-11.36**	-4.12	-1.62*
Sk5040/19	-0.03	3.57	5.19*	0.24
Sk5044/20	-0.59	-1.17	-2.05	-0.50
Sk5044/21	1.02**	8.13**	-0.24	0.74
Sk5044/22	2.84**	7.45**	4.94*	-1.06
Sk5044/23	1.59**	0.82	-0.99	-2.0*
Sk5046/24	0.09	11.01**	10.56**	2.37**
Sk5048/25	-1.22**	-1.23	-2.99	0.37
Sk5048/26	-1.53**	16.01**	11.56**	4.37**
Sk5069/27	-0.40	2.26	3.37	3.43**
Sk5094/28	-0.90**	-7.67**	-4.80*	-4.87**
Sk5094/29	-1.09**	-1.17	0.81	0.18
Sk5101/30	0.34	-3.05	-5.74**	-0.81
Sk5103/31	-0.28	-10.17**	-7.49**	0.93
L.S.D 0.05	0.61	4.32	4.16	1.55
0.01	0.80	5.68	5.48	2.04
Tester				
Sd-63	1.64**	-0.20	2.75**	-1.60**
Sk 9195	-1.64**	0.20	-2.75**	1.60**
L.S.D 0.05	0.22	-----	1.52	0.56
0.01	0.29	-----	2.00	0.74

*,**: Significant at 0.05 and 0.01 levels,respectively.

Count. (5):

Line	Ear length (cm)	Ear diameter (cm)	No.of rows/ear	No.of kernels/ row	100- kernel weight (g)
Sk5040/17	-0.67*	-0.05	-0.65**	-1.98**	-1.85*
Sk5040/18	-0.61*	-0.18**	0.09	0.01	-3.47**
Sk5040/19	0.008	-0.12*	-0.46**	0.32	-1.85*
Sk5044/20	-0.05	-0.12*	-0.59**	-0.17	0.77
Sk5044/21	0.63*	0.004	-0.52**	-0.55	3.83**
Sk5044/22	2.88**	-0.18**	-1.02**	-0.11	5.33**
Sk5044/23	1.19**	-0.05	-0.71**	0.82	0.70
Sk5046/24	0.69**	0.004	-0.40*	3.38**	4.89**
Sk5048/25	-0.17	0.19**	0.47**	-2.17**	2.89**
Sk5048/26	0.13	0.004	1.15**	0.45	-2.47**
Sk5069/27	0.008	0.19**	-0.09	1.13	2.08**
Sk5094/28	-2.36**	0.12*	1.59**	-1.67**	-4.41**
Sk5094/29	-2.17**	0.31**	0.28	-1.42*	-0.29
Sk5101/30	0.44	-0.12*	0.65**	1.95**	-4.85**
Sk5103/31	0.07	0.004	0.22	0.01	-1.29
L.S.D 0.05	0.51	0.10	0.34	1.23	1.50
0.01	0.68	0.13	0.46	1.62	1.97
Tester					
Sd-63	-0.54**	-0.05**	-0.20**	0.175	-1.73**
Sk 9195	0.54**	0.05**	0.20**	-0.175	1.73**
L.S.D 0.05	0.18	0.03	0.12	-----	0.54
0.01	0.24	0.05	0.16	-----	0.72

Table (6): Estimates of SCA effects of thirty topcrosses for nine traits over two locations.

Cross	Silking date (days)	Plant height (cm)	Ear height (cm)	Grain yield (ard/fad)
Sd63 x Sk5040/17	-0.20	0.20	1.99	-0.02
Sk9195 x Sk5040/17	0.20	-0.20	-1.99	0.02
Sd63 x Sk5040/18	-0.45	-8.23**	-5.0	-1.64
Sk9195 x Sk5040/18	0.45	8.23**	5.0	1.64
Sd63 x Sk5040/19	0.54	1.95	0.30	-1.77
Sk9195 x Sk5040/19	-0.54	-1.95	-0.30	1.77
Sd63 x Sk5044/20	-0.14	2.32	1.18	-0.52
Sk9195 x Sk5044/20	0.14	-2.32	-1.18	0.52
Sd63 x Sk5044/21	-0.89*	-3.61	-4.12	-0.64
Sk9195 x Sk5044/21	0.89*	3.61	4.12	0.64
Sd63 x Sk5044/22	-0.83	-2.17	-2.31	1.66
Sk9195 x Sk5044/22	0.83	2.17	2.31	-1.66
Sd63 x Sk5044/23	0.41	-4.92	-3.37	-1.14
Sk9195 x Sk5044/23	-0.41	4.92	3.37	1.14
Sd63 x Sk5046/24	-0.20	-4.98	-5.19	-0.64
Sk9195 x Sk5046/24	0.20	4.98	5.19	0.64
Sd63 x Sk5048/25	0.10	7.13*	3.24	1.97
Sk9195 x Sk5048/25	-0.10	-7.13*	-3.24	-1.97
Sd63 x Sk5048/26	0.66	-1.73	-0.56	-0.02
Sk9195 x Sk5048/26	-0.66	1.73	0.56	0.02
Sd63 x Sk5069/27	0.79	1.13	1.24	0.16
Sk9195 x Sk5069/27	-0.79	-1.13	-1.24	-0.16
Sd63 x Sk5094/28	0.41	0.82	0.18	-1.02
Sk9195 x Sk5094/28	-0.41	-0.82	-0.18	1.02
Sd63 x Sk5094/29	-0.52	-1.67	-1.94	1.41
Sk9195 x Sk5094/29	0.52	1.67	1.94	-1.41
Sd63 x Sk5101/30	-0.20	5.95	8.12**	0.66
Sk9195 x Sk5101/30	0.20	-5.95	-8.12**	-0.66
Sd63 x Sk5103/31	0.54	7.82*	6.24*	1.54
Sk9195 x Sk5103/31	-0.54	-7.82*	-6.24*	-1.54
L.S.D 0.05	0.86	6.11	5.89	2.20
0.01	1.13	8.04	7.75	2.89

Count. (6):

Cross	Ear length (cm)	Ear diameter (cm)	No.of rows/ear	No.of Kernels/row	100 kernel weight (g)
Sd63 x Sk5040/17	-0.14	0.05	0.13	1.51	-0.63
Sk9195 x Sk5040/17	0.14	-0.05	-0.13	-1.51	0.63
Sd63 x Sk5040/18	-0.70	0.05	0.01	-1.61	-1.26
Sk9195 x Sk5040/18	0.70	-0.05	-0.01	1.61	1.26
Sd63 x Sk5040/19	-0.70	0.11	0.07	0.82	-1.51
Sk9195 x Sk5040/19	0.70	-0.11	-0.07	-0.82	1.51
Sd63 x Sk5044/20	-0.77*	-0.01	-0.05	-1.42	-0.63
Sk9195 x Sk5044/20	0.77*	0.01	0.05	1.42	0.63
Sd63 x Sk5044/21	0.54	-0.01	0.13	-0.42	0.17
Sk9195 x Sk5044/21	-0.54	0.01	-0.13	0.42	-0.17
Sd63 x Sk5044/22	0.29	0.05	-0.11	2.63**	-1.95
Sk9195 x Sk5044/22	-0.29	-0.05	0.11	-2.63**	1.95
Sd63 x Sk5044/23	-0.02	0.05	-0.17	-0.42	-0.82
Sk9195 x Sk5044/23	0.02	-0.05	0.17	0.42	0.82
Sd63 x Sk5046/24	-0.02	0.11	0.13	-1.11	0.98
Sk9195 x Sk5046/24	0.02	-0.11	-0.13	1.11	-0.98
Sd63 x Sk5048/25	0.22	-0.07	0.26	-0.42	0.48
Sk9195 x Sk5048/25	-0.22	0.07	-0.26	0.42	-0.48
Sd63 x Sk5048/26	-0.33	-0.01	-0.30	-0.17	0.98
Sk9195 x Sk5048/26	0.33	0.01	0.30	0.17	-0.98
Sd63 x Sk5069/27	0.66	0.05	0.07	0.13	-0.07
Sk9195 x Sk5069/27	-0.66	-0.05	-0.07	-0.13	0.07
Sd63 x Sk5094/28	0.04	-0.01	0.26	-0.05	0.55
Sk9195 x Sk5094/28	-0.04	0.01	-0.26	0.05	-0.55
Sd63 x Sk5094/29	0.85*	-0.07	-0.42	0.07	1.55
Sk9195 x Sk5094/29	-0.85*	0.07	0.42	-0.07	-1.55
Sd63 x Sk5101/30	0.10	-0.13	-0.30	0.57	1.23
Sk9195 x Sk5101/30	-0.10	0.13	0.30	-0.57	-1.23
Sd63 x Sk5103/31	-0.02	-0.13	0.26	-0.11	0.92
Sk9195 x Sk5103/31	0.02	0.13	-0.26	0.11	-0.92
L.S.D 0.05	0.73	0.14	0.49	1.73	2.12
0.01	0.96	0.19	0.65	2.28	2.79

REFERENCES

Ameha,M. (1977). Comparison of S_2 progeny and inbred tester methods for improving maize. Ph.D. Thesis, Fac.Agric., Iowa State Univ., USA.

Amer E. A., A. A. El-Shenawy and H. E. Mosa (2001). Influences of planting dates and population densities under artificial and natural infections of common smut diseases on some maize varieties. Agric. Sci. 26 (8): 4673-4679 Mansoura Univ.

Amer, E.A.; A.A. El-Shenawy and A.A.Motawei Egypt.(2003). Combining ability of new maize inbred lines via line x tester analysis. Egypt.J.Plant Breed. 7 (1):229-239.

Ayad, B.N. (1986). The effect of the nature of tester on combining ability estimates in maize. Ph.D. Thesis, Fac. Agric., Minia Univ. Egypt.

El-Kielany, M.E.M. (1999). Evaluation of some new inbred lines of maize (*Zea mays* L.). Ph.D. Thesis, Fac. Agric., Zagazig Univ. Egypt.

El-Shenawy, A.A. (1995). Breeding for disease resistance in maize. Ph.D. These, Fac; Agric. Menofiya Univ.Egypt.

El-Shenawy, A.A. (2003). Combining ability and type of gene actions for grain yield and its components and resistance to downy mildew disease in maize. J. Agric. Sci. Mansoura 28 (10): 7095-7105.Univ.,

El-Shenawy, A.A.; E.A. Amer and H.E. Mosa Egypt. (2003). Estimation of combining ability of newly-developed inbred lines of maize by (line x tester) analysis.J.Agric.Res.Tanta. 29 (1):50-63.Univ., El-Zeir, F.A.; A.A. Abdel-Aziz and A.A.Galal. (1993). Estimation of heterosis and combining ability effects in some new top crosses in maize. Menofyia J.Agric. Res. 4 (1): 2179-2190.

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

Kempthorne, O. (1957). An Introduction to Genetial Statistics. John Wiley-Sons Inc., New York,USA.

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

Mosa, H.E. (2004). Comparison between two types of testers for evaluating new white inbred lines of maize.

Annals of Agric. 42(2): 475-487. Sci., Moshtohor,Egypt.

Mosa, H.E. and A.A. Motawei. (2005). Combining ability of resistance to late wilt disease and grain yield and their relationships under artificial and natural infections in maize.J.Agric.Sci. 30 (2): 731-742 Mansoura Univ.,Egypt.

Mosa, H.E.: A.A Motawei and Afaf A.I. Gabr. (2004). Evaluation of new inbred lines of yellow maize via linex tester analysis over three locations. J.Agric.Sci. 29 (3): 1023-1033 Mansoura Univ.,Egypt Mostafa, M.A., F.A. Salama and A.A.Abdel-Aziz. (1995). Combining ability of white maize populations with inbred testers. J.Agric. Sci. 20 (1): 143-149 Mansoura Univ.Egypt.

Rawlings, J.O. and D.L. Thompson. (1962). Performance level as criterion for the choice of maize testers. Crop Sci. 2: 217-220.

Sedhom, S.A. (1992). Development and evaluation of some new inbred lines of maize Proc. 5th Conf. Agron. Zagazig, 13-15. Sept. Vol. (1): 269-280.

Steel, R.G. and J.H. Torrie. (1980). Principlis and Procedures of Statistics. Mc. Grow Hill Book Inc., New York., USA.

الملخص العربى

تقدير الثوابت الوراثية والبيئية لسلالات جديدة بيضاء من الذرة الشامية (*Zea mays* L.)

عباس عبد الحى الشناوى

مركز البحوث الزراعية- معهد المحاصيل الحقلية – قسم بحوث الذرة الشامية

الملخص العربى

تم تقويم القدرة على الائتلاف لخمسة عشر سلالة نقية من الذرة الشامية البيضاء باستخدام تحليل (السلالة x الكشاف) وذلك لتقدير السلوك الوراثى لهذه المجموعة من السلالات لمحصول الحبوب ومكوناته. هجنت الخمسة عشر سلالة مع كشافين وهما: سلالة

سدس٦٣ وسلالة سخا-٩١٩٥ بمحطة البحوث الزراعية بسخا وذلك في موسم صيف ٢٠٠٣.

تم تقويم ثلاثين هجينا قميا الناتجة فى منطقتين وهما: محطة بحوث سخا ومحطة بحوث سدس في موسم صيف ٢٠٠٤. فقد أوضح تحليل التباين المشترك للسلالات والكشافات والكشافات × السلالات معنوية عالية لمعظم الصفات تحت الدراسة ،بينما كان تحليل التباين للتفاعل بين كل من السلالات والكشافات والسلالات x الكشافات مع المناطق غير معنوى لمعظم الصفات.

تبين وجود ستة هجن متفوقة معنويا فى محصول الحبوب عن الهجين التجارى " هف ١٢٢ (٣١,٠٤ أردب/فدان) "وكذلك عن الهجين التجارى الأخر "هف١٢٩ (٣٣,٥١ اردب/فدان). وهذه الهجن هى: سخا ٩١٩٥ × سخا ٢٦/٥٠٤٨ (٣٧,٤٦ أردب/فدان) وسخا ٩١٩٥ × سخا ٢٧/٥٠٦٩ (٣٦,٤٢ أردب/فدان) وسخا ٩١٩٥ × سخا ٢٤/٥٠٤٦ (٣٥,٨٩ أردب/فدان) وسخا ٩١٩٥ × سخا ١٩/٥٠٤٠ (٣٤,٩٦ أردب/فدان) وسخا ٩١٩٥ × سخا ٢١/٥٠٤٤ (٣٤,٣٧ أردب/فدان) وسدس ٦٣ × سخا ٢٦/٥٠٤٨ (٣٤,١٦ أردب/فدان) .

كان لتأثير الفعل الاضافى للجين الدور الأكبر عن الفعل غير الاضافى فى وراثة صفات التزهير ومحصول الحبوب وطول الكوز وقطر الكوز وعدد السطور بالكوز ووزن المائة حبة ، بينما لعب الفعل غير الاضافى للجين الدور الأكبر فى وراثة صفات ارتفاع النبات وارتفاع الكوز وعدد الحبوب بالسطر.

كان تأثير القدرة العامة على الائتلاف ذا قيمة عالية المعنوية فى السلالات "سخا ٢٤/٥٠٤٦ وسخا ٢٦/٥٠٤٨ وسخا ٢٧/٥٠٦٩ "لصفة محصول الحبوب واستخدام السلالة "سخا ٩١٩٥ " ككشاف مع هذه المجموعة من السلالات الجديدة كان الأفضل فى توضيح سلوكها بالنسبة لمحصول الحبوب والصفات الأخرى.