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

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ABSTRACT

Twenty yellow maize inbred lines in the (S_6^{15}) generation were developed at Gemmeiza Agricultural Research Station and topcrossed with each of three yellow commercial inbred line testers i.e. Gm.1002 , Gm.1004 and Gm. 1021 during 2007 growing season. Sixty-two entries (60 top crosses and two check commercial yellow single crosses Gz 155 and Gz 162) were evaluated at Gemmeiza and Sids Agricultural Research Stations in 2008 summer season . Data were recorded for number of days to 50% silking , plant and ear heights , ear position, resistance to late wilt (%) , number of ears per plant and grain yield. The obtained results indicated that highly significant differences were detected between locations for all studied traits. Mean squares due to crosses and their partitions into lines (L), testers (T) and L x T interaction as well as crosses, lines, testers and L x T interactions with locations were highly significant for all studied characters except resistance to late wilt. Non-additive gene actions are more effective in studied traits inheritance and were more interacted with locations than additive gene actions. The inbred line tester Gm. 1021 showed the highest positive and significant GCA effects among the three inbred line testers. Ten top crosses i.e. entries number 2, 3, 6, 9, 24, 39, 41, 42, 45, and 51 were better than the check single crosses 155 and162 for grain yield. However the tested inbred lines i.e. 1, 2, 13, 14 and 15 were the highest good combiners tested lines with the tester inbred line Gm.1021 for grain yield with 33.3, 33.0 , 32.9, 33.2 , and 34.1 ard/fed ,respectively. These five top crosses or new yellow single crosses were significantly yielded better than the check single cross Gz.162 and considered promising new hybrid and can be advanced for next evaluation step in maize breeding programs.

Key words : ***Combining ability, Line x Tester, Top crosses , Maize.***

INTRODUCTION

Developing a high yielding hybrid is based mainly on the development of inbred lines of high combining ability as reported by Allison and Curnow (1966), Jenkins (1978) stated that the top crossing have been used fairly widely for the preliminary evaluation of combining ability of new inbred lines. Aly and Tepora (1986) and Al-Naggar *et al* (1997) found that inbred lines with narrowest genetic base and lowest yield potential exhibited the highest genetic variation in the test crosses progenies for most of the studied traits and could be considered as tester of choice for distinguishing the new inbred lines for their combining abilities.

Numerous investigators suggested that the estimates of additive played important role in the inheritance of grain yield than non-additive

genetic variance i.e. (El-Zeir *et al* 1993 and Amer 2004). While, Lonnquiest and Gardner (1961), Ibrahim 2001 , Mosa 2001 and Ibrahim *et al* 2007 found that the opposite trend was true for the same trait. On the other hand, Ibrahim and Osman (2005) found that the mean squares due to general (GCA) and specific (SCA) combining ability were highly significant for most of yield and yield components under different drought stress and non-stress conditions in two seasons. In this respect, Barakat and Osman (2008) mentioned that both inbred lines and testers exhibited high and significant GCA effects for the studied traits and that variance magnitude due to GCA was higher than that due to SCA for all studied traits, indicating that the additive genetic variance was the major source of variation responsible for the inheritance of these traits.

The main objectives of this investigation were :-

1. Evaluation of the combining ability effects for some new yellow maize inbred lines.
2. Determination of the most important of gene action for yield and its components.
3. Identification of the best inbred lines and promising single crosses (top crosses) to be recommended for future use.

MATERIALS AND METHODS

New twenty yellow $\underline{S_6}$ inbred lines of maize derived from Gemmeiza Yellow Population at Gemmeiza Agricultural Research Station of the ARC were presented in (Table 4). These inbred lines were crossed with three testers i.e. the inbred lines Gm. 1002, Gm. 1004 and Gm. 1021 during 2007 season. In 2008 season, the 60 top crosses plus the two check cultivars (S.C. 155 and S.C. 162) were evaluated at Gemmeiza and Sids Agricultural Research Stations. The tested crosses were arranged in randomized complete blocks design (RCBD) with four replications. Plot size was one row of 6m long, 80 cm apart and 25 cm between hills. All recommended cultural practices were done. Data were recorded on 50% silking (days to mid silk), plant height (cm) , ear height (cm) ,while, ear position , resistance to late wilt disease % , number of ears per plant and grain yield (ard /fed).

Statistical analysis of the combined data across 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 in the two locations was done after carrying out the homogeneity test.

RESULTS AND DISCUSSION

Combined analysis of variance over the two locations for all of the studied traits is presented in Table (1). Mean squares due to locations were

highly significant indicating that the conditions differed from one location to another. This result agreed with that reported by El-Zeir (1999), Ibrahim *et al* (2007) and Abdel-Moneam *et al* (2009).

Mean squares due to crosses (C) and their partitions, lines (L) and testers (T) and lines x testers (L x T) were highly significant for all traits except resistance to late wilt, indicating that the top crosses exhibited the stability of these new crosses for resistance to late wilt under two locations. On the other hand, mean squares duo to the interaction between crosses and locations (C x Loc.) and their partitioning into L x Loc, T x Loc. and L x T x Loc. were highly significant for all studied traits except resistance to late wilt. These results showed that the genotypes varied significantly among each other and ranked differently from one location to another.

Table 1. Mean square for the seven studied traits of 60 top crosses in two locations (Gemmeiza and Sids).

S. O. V.	d.f.	Mean squares						
		50 % Silking	Plant height	Ear height	Ear position	Resistance to late wilt	Number of ears/ plant	Grain yield
Locations(Loc.)	1	109.50**	37678.10**	4122.80**	225.3**	466.9**	24991.40**	150.20**
Rep/Loc.	6	160	119.10	124.50	21.15	7.10	150.10	9.70
Crosses	(59)	60.70**	11468.30**	3504.60**	56.2**	13.5	662.20**	73.60**
Lines (L)	19	53.10**	19344.80**	5586.60**	72.6**	16.1	1048.79**	107.60**
Tasters (T)	2	19.80**	1651.52**	662.80**	53.03**	9.5	255.30**	29.40**
L x T	38	66.60**	8046.67**	2613.10**	48.21**	12.5	490.32**	58.93**
Crosses x Loc.	(59)	27.450**	2491.20**	10.28.60**	32.81**	13.6	255.80**	9.92**
Lines x Loc.	19	28.01**	2239.80**	998.8**	54.4**	16.69	283.00**	12.8**
Testers x Loc.	2	5.36*	554.90**	1419.50**	47.4**	12.9	209.90**	9.40**
L x T x Loc.	38	28.33**	2718.80**	1023.00**	21.3*	11.9	244.62*	8.51**
Error	354	1.44	41.96	57.60	10.62	9.3	119.00	2.98

*,** indicate significance at 0.05 and 0.01 levels of probability, respectively.

Mean performance of the 60 top crosses for the seven studied traits combined across two locations are presented in Table (2). Mean grain yield ranged from 23.4 ard/fed. for the cross (L-20 x Gm. 1002) to 34.1 ard/fed for the cross (L-17 x 1021). Eleven top crosses i.e. L-17 x 1021 (34.1 ard/fed), L-1 x 1021 (33.3 ard/fed), L-1 x 1021 (33.2 ard/fed), L-15 x 1021 (33.2 ard/fed), L-10 x 1021 (33.0 ard/fed), L- 13 x 1021 (32.9 ard/fed), L-14 x 1021 (32.8 ard/fed), L-14 x 1004 (32.7 ard/fed), L-3 x 1021 (32.7 ard/fed), L-8 x 1021 (32.6 ard/fed) and L-17 x 1021 (32.5 ard/fed). surpassed significantly for grain yield comparing to the two check hybrids S.C. 155 (31.9 ard./fed) and S.C. 162 (30.6 ard./fed). These crosses could be selected and used in breeding program for improving grain yield trait.

Table 2. Mean performance of maize top crosses for combined data in two locations (Gemmeiza and Sids).

Top crosses	50% Silking (day)	Plant Height (cm)	Ear height (cm)	Ear Position (%)	Resistance to late wilt (%)	Number of ears/ plant	Grain yield (ard/fed)
1- L - 1 x 1002	58.10	284.3	128.1	55.1	96.3	103.7	29.4
2- " " x 1004	64.1	267.8	149.3	53.5	100.0	110.5	33.2
3- " " x 1021	63.3	273.4	143.8	52.4	100.0	110.1	33.3
4- L - 2 x 1002	57.1	219.0	113.8	52.1	98.1	99.3	24.9
5- " " x 1004	60.1	262.0	140.3	52.5	98.8	101.0	26.7
6- " " x 1021	63.3	206.5	103.4	52.4	96.9	100.0	33.0
7- L - 3 x 1002	56.4	197..5	106.4	53.9	98.1	96.4	24.5
8- " " x 1004	57.5	285.9	115.1	54.0	100.0	109.6	25.3
9- " " x 1021	67.0	191.0	99.8	52.3	98.1	90.9	32.7
10- L- 4 x 1002	53.6	211.4	112.4	52.1	98.1	107.5	23.9
11- " " x 1004	58.3	189.9	119.8	63.7	100.0	95.5	25.2
12- " " x 1021	59.9	157.0	86.9	56.7	95.1	91.2	25.2
13- L- 5 x 1002	58.6	158.4	81.3	52.2	97.5	108.8	24.6
14- " " x 1004	58.6	217.8	113.9	52.8	100.0	101.9	26.2
15- " " x 1021	61.6	209.1	113.5	54.4	100.0	99.9	27.5
16- L- 6 x 1002	58.0	194.0	87.1	47.8	98.0	92.6	26.7
17- " " x 1004	59.4	192.9	96.0	49.9	100.0	100.3	26.7
18- " " x 1021	59.3	194.9	99.3	51.0	97.1	98.4	27.2
19- L- 7 x 1002	57.9	193.5	102.0	53.4	96.1	101.3	26.6
20- " " x 1004	57.5	206.1	102.4	50.7	98.8	107.6	26.9
21- " " x 1021	57.8	195.8	110.6	57.0	100.0	91.1	28.9
22- L- 8 x 1002	56.8	286.5	175.4	58.0	97.5	108.8	26.8
23- " " x 1004	60.9	202.0	113.0	55.8	100.0	104.7	30.9
24- " " x 1021	63.0	286.3	132.9	56.5	100.0	103.8	32.6
25- L- 9 x 1002	57.9	284.5	146.4	58.3	96.3	99.9	25.6
26- " " x 1004	59.3	203.5	107.1	52.6	98.8	94.6	27.7
27- " " x 1021	64.0	203.8	106.5	53.0	98.1	97.9	30.7
28- L- 10 x 1002	58.5	229.0	90.3	52.2	100.0	96.3	27.8
29- " " x 1004	59.6	204.5	101.3	53.5	98.8	79.4	29.3
30- " " x 1021	62.4	213.3	113.8	53.5	98.5	106.2	30.3
31- L- 11 x 1002	58.0	244.4	137.3	54.7	98.8	106.9	24.8
32- " " x 1004	61.1	201.3	109.4	55.4	97.6	104.3	27.8
32- " " x 1021	63.4	186.1	98.9	54.3	100.0	102.2	31.8
34- L- 12 x 1002	57.1	194.1	102.0	51.9	98.1	103.2	24.5
35- " " x 1004	60.3	194.1	109.8	56.6	96.1	88.2	26.3
36- " " x 1021	62.9	200.6	102.6	52.3	98.1	106.2	26.4

Table 2. Cont.

Top crosses		50% Silking (day)	Plant Height (cm.)	Ear height (cm.)	Ear position	Resistance to late wilt (%)	Number of ears/ plant	Grain yield (ard./fed.)
37-L-13 x 1002		59.6	251.6	135.9	54.6	100.0	105.7	30.4
35-" " x 1004		58.3	273.0	133.9	52.9	97.3	108.3	31.4
36-" " x 1021		61.3	273.5	132.6	51.9	100.0	101.2	32.9
40-L-14 x 1002		60.3	296.0	183.3	50.9	100.0	113.0	24.2
41-" " x 1004		65.8	297.0	155.4	59.8	98.0	116.9	32.7
42-" " x 1021		67.3	205.6	105.8	51.4	100.0	104.2	32.8
43-L-15 x 1002		57.4	188.3	99.3	50.3	100.0	100.4	27.4
44-" " x 1004		57.1	221.0	117.3	52.8	100.0	100.4	27.8
45-" " x 1021		67.6	288.4	1 60.5	53.5	100.0	107.5	33.2
46-L-16 x 1002		56.0	209.6	112.6	54.5	100.0	109.7	24.o
47-" " x 1004		60.0	211.6	113.8	54.3	100.0	118.0	28.4
48-" " x 1021		61.1	273.8	152.9	55.8	100.0	106.6	31.9
49- L-17 x 1002		58.5	305.5	144.8	53.8	100.0	108.8	29.9
50-" " x 1004		61.3	252.9	122.4	53.8	100.0	112.2	32.5
51-" " x 1021		62.5	273.4	143.8	56.2	100.0	116.3	34.1
52- L-18 x 1002		57.9	218.3	115.6	54.3	100.0	95.5	25.5
53-" " x 1004		57.5	266.9	117.3	53.0	99.5	114.9	26.3
54-" " x 1021		58.1	205.3	98.6	48.7	100.0	108.2	26.5
55 L-19 x 1002		56.1	216.9	113.1	52.7	100.0	107.1	25.7
56-" " x 1004		59.1	192.4	102.5	53.2	98.1	108.3	26.0
57-" " x 1021		59.8	218.3	115.3	52.8	100.0	101.3	27.4
58-L-20 x 1002		56.6	218.5	103.0	47.8	100.0	104.9	23.4
59-" " x 1004		58.0	245.5	115.4	53.5	100.0	126.2	27.6
60-" " x 1021		61.8	217.5	114.5	52.7	100.0	110.1	31.1
Checks	61.9	61.9	244.9	124.6	45.2	99.5	110.2	31.9
	63.8	62.8	249.4	131.9	51.7	100.0	107.2	30.6
L.S.D.	1.19	1.19	6.44	7.55	3.24	3.03	10.85	1.72
	1.55	1.56	8.36	9.79	4.20	3.93	14.07	2.23

Estimates of variance for general (δ^2 GCA) and specific (δ^2 SCA) combining ability and their interactions with locations are presented in Table (3). The results showed that

δ^2 SCA was higher than δ^2 GCA for all studied traits, indicating that the non-additive genetic variance played more important role than the additive genetic variance in the inheritance of studied traits and crosses could be made between these inbred lines. This conclusion is in agreement with Mahmoud (1996), Soliman and Sadek (1999), Amer (2004) and Ibrahim and Osman (2005), while Nawar and El- Hosary (1984), El- Hosary (1985) and Ibrahim (2004) found that the reverse was true. On the other hand, the magnitude of the δ^2 SCA x Loc. interaction was higher than δ^2

GCA x Loc. for all studied traits. This result showed that the non-additive was more influenced by locations than the additive genetic variance.

Estimates of GCA effects for the 20 inbred lines and 3 testers are presented in Table (4). Seven , nine, nine and two inbred lines have significant negative and (desirable) GCA effects for 50% silking, plant height, ear height and ear position, respectively .The inbred line Gm. 628 was considered the best general combiner for these traits towards earliness and plant shortenss. Six inbred lines i.e. L-1, L-8 , L-13 , L-14 , L-15 and L-17 exhibited desirable and significant positive GCA. effects for grain yield trait

Seven inbred lines have positive and significant GCA effects for number of ears per plant . Generally, these inbred lines would be a valuable source of germplasm to enhance breeding of hybrid varieties in Egypt. The line tester Gm. 1021 considered the best general combiner for grain yield ,while, the line tester Gm 1002 have desirable and significant GCA effects for 50% silking and plant height i.e. towards earliness and low plant height.

Table 3. Estimates of variance of general and specific combining ability and their interaction with the two locations (Gemmeiza and Sids).

Variance	50 % Silking	Plant Height	Ear height	Ear position	Resistance to late wilt	Number of ears/ plant	Grain yield
δ^2 GCA	-0.571 @	29.25	3.54	0.160 @	-0.008@	-2.46 @	0.89
δ^2 SCA	9.788	1451.72	403.63	1.550 @	0.150	51.83	13.625
δ^2 GCA / δ^2 SCA	-0.058 @	0.02	0.009	0.103	-0.053 @	-0.047 @	0.006
δ^2 GCA x Loc.	-0.253 @	18.31 @	4.05	0.644	0.066	8.44	0.033
δ^2 SCA x Loc.	6.715 @	669.21	241.50	2.670	0.650	22.23	0.038
δ^2 GCA x Loc. / δ^2 SCA x Loc.	-0.038 @	0.03 @	0.02	0.241	0.120	0.38	0.868

@ variance estimates preceded by negative sign is considered zero.

Estimates of specific combining ability (SCA) effects of top crosses across two locations (Gemmeiza and Sids) are presented in Table (5). Fifteen top crosses i.e. L-1 x 1004, L-1 x 1021 , L-2 x 1021, L-10 x 1021, L-5 x 1021, L-8 x 1004, L-8 x 1021, L-9 x 1021, L-11 x 1021, L-14 x 1004, L-14 x 1021, L-15 x 1021, L-16 x 1021, L-17 x 1021 and L-20 x 1021 exhibited desirable and positive significant SCA effects for grain yield trait and considered promising top crosses for improving maize yield in future. Thirteen top crosses gave desirable SCA effects towards earliness, eighteen top crosses for low plant height and twelve top crosses for ear height, moreover, the two top crosses L-15 x Gm.1002 and L-15 x Gm.1004 are considered the best general combiners for earliness and low plant height . Fourteen top crosses showed desirable SCA effects for

Table 4. Estimates of general combining ability effects for twenty inbred lines and three testers in the two locations (Gemmeiza and Sids).

Genotypes		50 % Silking	Plant Height	Ear height	Ear position	Resistance to late wilt (%)	Number of ears / plant	Grain yield (ard./fed.)
Inbred lines								
L-1		1.821	48.081	22.817	0.146	-0.219	-1.817	3.798**
L-2		0.404	2.123	1.567	-1.052	-1.052	-3.108	0.006
L-3		0.279	-2.252	-10.475**	-0.229	-0.219	-6.112	-0.785
L-4		-1.096**	-40.960**	-11.225**	2.854	-1.219	-5.067	-3.535
L-5		-0.904**	-31.960**	-14.683**	-0.479	0.198	0.308	-2.202
L-6		-1.138**	-33.335**	-23.433**	-3.979**	-0.594	-6.108	-1.369
L-7		-2.304**	-28.585**	-12.558**	0.063	-0.385	-3.108	-0.952
L-8		0.196	31.206	22.858	3.104	0.198	-0.067	1.798**
L-9		0.363	3.540	2.442	1.188	-1.280	-5.775	-0.160
L-10		0.154	-11.460**	-15.725**	-0.438	0.115	-9.275	0.921
L-11		0.821	-16.460	-2.392	1.146	-0.177	1.267**	-0.285
L-12		0.071	-30.419**	12.767	0.146	-1.810	-4.025	-2.452
L-13		0.320	38.998	16.567	-0.479	0.115	1.850**	3.381**
L-14		4.404	39.165	24.432	0.479	0.615	-1.858	1.590**
L-15		0.696	5.498	8.108	-1.313	1.031	-0.317	1.215**
L-16		-0.346	4.620	-0.142	1.813	1.031	8.267**	-0.119
L-17		0.738	50.206	19.400	1.063	1.031	19.225**	3.965**
L-18		-2.179**	-10.252*	-7.058*	-1.022	0.865	2.933**	-2.119
L-19		-1679**	-17.877**	-7.267*	-0.729	0.406	2.312**	-1.869
L-20		-1.221**	0.123	-6.600*	-2.146**	1.030	10.475**	-0.827
Testers								
Gm.1002		-0.407**	-3.093*	1.929	-0.491	-0.281	-0.383	-0.027
Gm. 1004		0.188	-0.368	0.258	0.633	0.150	-1.027	-0.415
Gm. 1021		0.219	3.461	-2.187*	-0.142	0.131	1.410	0.442**
L.S.D. g_i lines	0.05	0.69	7.92	5.62	0.47	0.44	0.47	0.73
	0.01	0.89	10.43	7.39	0.61	0.57	0.62	0.96
L.S.D. $g_i - g_j$ lines	0.05	0.24	3.70	4.34	0.66	0.62	6.24	0.99
	0.01	0.32	4.82	5.65	0.86	0.80	8.12	1.29
L.S.D. g_i testers	0.05	0.07	3.07	2.18	0.18	0.17	1.83	0.28
	0.01	0.09	4.04	2.86	0.24	0.22	2.41	0.37
L.S.D. $g_i - g_j$ testers	0.05	0.09	1.43	1.68	0.27	0.24	2.41	0.38
	0.01	0.12	1.87	2.19	0.33	0.31	3.15	0.50

Table 5. Estimates of specific combining ability effects of 60 top crosses for seven traits in the two locations (Gemmeiza and Sids).

Top crosses	50 % silking	Plant height	Ear height	Ear position (%)	Resistance to late wilt(%)	Number of ears/ plant	Grain yield
1- L-1 x 1002	-4.115**	6.113	-14.179**	2.117	-2.219	0.923	-2.998
2- " x 1004	1.635	-7.744	8.677	-0.883	1.100**	-0.658	1.265*
3- " x 1021	2.479	1.631	5.502	-1.233	1.119**	-0.265	1.733**
4- L-2 x 1002	-1.698*	-13.179**	-7.304	0.200	0.490	-2.285	-2.850
5- " x 1004	-1.323	32.465	20.927	-0.550	0.683	1.258	-1.956
6- " x 1021	3.021	-19.285**	-13.623**	0.350	-1.173	1.027	4.806**
7- L-3 x 1002	-3.698**	-30.304**	2.638	1.117	-0.344	-1.952	-2.540
8- " x 1004	-3.198**	60.715	7.844	-0.258	1.100**	6.967**	-2.433
9- " x 1021	6.896	-30.410**	-5.206	-0.858	-0.756	-5.015	4.973**
10- L-4 x 1002	-0.698	22.279	4.113	-4.842**	0.656	8.048**	-0.902
11- " x 1004	-0.479	3.423	13.219	5.408	2.100**	-2.158	0.085
12- " x 1021	1.177	-25.702**	-17.331**	-0.567	-2.956	-5.890	0.817
13- L-5 x 1002	-0.865	-39.721**	-23.554	-0.508	1.385**	3.923**	-0.123
14- " x 1004	-0.896	22.298	10.802	-0.883	0.683	-1.283	-1.142
15- " x 1021	1.760	17.423	12.752	1.392	0.702	-2.640	1.265*
16- L-6 x 1002	-2.406**	-2.721	-8.929	-1.258	-0.094	-5.910	-0.706
17- " x 1004	0.688	-1.827	1.677	-0.383	1.475**	3.508**	0.275
18- " x 1021	1.719	4.548	7.252	1.642	-1.381	2.402	0.431
19- L-7 x 1002	-0.021	-7.971	-4.929	0.352	-1.302	-0.160	0.502
20- " x 1004	-0.240	7.298	-2.823	-3.675	0.017	8.008**	-0.610
21- " x 1021	0.261	0.673	7.752	3.350	1.285**	-7.848	0.108
22- L-8 x 1002	-1.271	25.238	33.029	1.783	-1.385	-3.702	-3.235
23- " x 1004	-1.115	-56.619**	-27.615**	-1.592	0.683	1.967	1.233*
24- " x 1021	2.385	31.381	-5.415	-0.192	0.702	1.735	2.002**
25- L-9 x 1002	-2.313**	50.904	24.446	4.200	-1.177	1.006	-2.402
26- " x 1004	-0.906	-27.452**	-13.073**	-2.675	0.892*	-2.450	0.067
27- " x 1021	3.219	-23.452**	-11.373*	-1.525	0.285	1.444	2.330**
28- L-10 x 1002	-1.448	10.404	-13.513**	-0.425	1.198**	0.881	-0.767
29- " x 1004	-0.948	-11.452*	-0.531	-0.050	-0.483	-14.200	0.140
30- " x 1021	2.396	1.048	14.044	0.475	-0.715	13.319**	0.627
31- L-11 x 1002	-2.646**	30.779	20.154	0.492	0.240	1.022	-3.027
32- " x 1004	0.511	-9.702	-5.990	-0.008	-1.317	0.133	0.192
33- " x 1021	2.135	-21.077**	-4.721	-0.483	1.077**	-1.223	2.835**
34- L-12 x 1002	-2.740**	5.513	-4.760	-1.133	0.948*	2.631	-0.642
35- " x 1004	0.354	-1.869	4.760	2.367	-1.483	-10.700	0.002
36- " x 1021	2.358	7.381	-0.040	-1.233	0.535	8.069**	0.640

Table 5. Cont.

Top crosses		50 % Silking	Plant height	Ear height	Ear position	Resistance to late wilt	Number of ears/ plant	Grain yield
37- L-13 x 1002		-1.896*	17.429	-0.179	2.117	1.198**	-0.619	-1.194
38- " x 1004		-1.115	6.590	-0.448	-1.008	-1.983	3.550**	0.581
39 " x 1021		3.010	10.840	0.627	-1.108	0.785*	-2.931	1.775
40- L-14 x 1002		-3.948**	26.779	33.196	-2.717	0.698	10.090**	-5.183
41- " x 1004		1.521	30.423	7.052	5.283	-0.983	-13.992	2.460**
42- " x 1021		2.427	-57.202**	40.248**	-2.567	0.285	3.902**	2.723**
43- L-15 x 1002		-3.740**	-47.304**	-28.346**	-1.300	0.281	-3.577	-2.290
44- " x 1004		-3.396**	-11.910*	-9.615*	-0.050	-0.150	-2.033	-1.777
45- " x 1021		7.135	59.215	36.960	1.350	-0.131	5.610**	4.067**
46- L-16 x 1002		-1.073	-25..054**	-6.721	0.200	0.281	-3.160	-4.194
47- " x 1004		-0.604	-20.410**	-3.865	-1.300	-0.150	7.008**	-0.081
48- " x 1021		1.677	45.465	10.585	1.100	-0.131	-3.848	4.275**
49- L-17 x 1002		-2.063**	25.238	5.863	-0.425	0.281	15.006**	-2.277
50- " x 1004		0.719	-24.744**	-14.781**	-1.300	-0.150	-9.825	0.692
51- " x 1021		1.344	-0.494	8.919	1.725	-0.131	-5.181	1.585*
52- L-18 x 1002		-0.365	-1.554	3.196	2.908	-0.448	-12.077	-0.081
53- " x 1004		-0.146	9.715	6.552	0.158	-0.483	8.967*	-0.100
54- " x 1021		0.510	-8.160	-9.748*	-3.067	0.035	3.110*	0.181
55- L-19 x 1002		-1.021	4.696	0.904	0.242	0.906*	0.090	-1.081
56- " x 1004		-0.615	-17.160*	-7.990	-0.258	-1.400	3.133*	-0.319
57- " x 1021		1.635	12.465*	7.085	0.017	0.494	-3.223	1.400
58- L-20 x 1002		-0.604	-11.679*	-9.888*	-3.092	0.281	-10.244	-3.517
59- " x 1004		0.604	17.965	4.219	1.658	-0.150	12.800**	0.002
60 - " x 1021		0.177	-6.285	5.669	1.433	-0.131	-2.556	3.515**
L.S.D. S_{ij}	0.05	1.54	9.73	9.73	0.81	0.76	2.71	1.26
	0.01	2.03	12.80	12.80	1.05	0.99	3.51	1.66
L.S.D. S_{ij}-S_{ik}	0.05	0.84	4.53	5.31	0.81	0.76	2.71	1.21
	0.01	1.09	5.91	6.92	1.05	0.99	3.52	1.57
L.S.D. S_{ij}-S_{kl}	0.05	1.19	6.41	7.51	1.15	1.07	3.84	1.71
	0.01	1.55	8.36	9.76	1.49	1.39	4.98	2.24

*,** indicate significance at 0.05 and 0.01 levels of probability, respectively.

resistance to late wilt disease. Also, seventeen top crosses have positive and significant GCA effects for number of ears per plant.

These single crosses (top crosses) herein are considered desirable, promising crosses and could be used in maize breeding program.

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القـدرة على التآلـف لبعـض سلالات الـذرة الجديـدة باستخدام تحليل السلالـة × الكشـاف

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- تم تهجين ٢٠ سلالـة جديدة من الذرة الشاميـة الصفراء في جيل الإخصاب الـذاتي السـادس مـع ثـلاث سلالات تجارية كشافة هي جميزة ١٠٠٢ ، جميزة ١٠٠٤ وجميزة ١٠٢١ بمحطـة البحـوث الزراعيـة بالجميزة موسم ٢٠٠٧الصيفي وذلك للحصول على ٦٠ هجين قمي وتم تقييم الـ ٦٠ هجين قمي مع ا ثنين من هجن المقارنةالتجاريـة هي هـ٠ف ١٥٥ – هـ٠ف ١٦٢ بمحطـتي البحوث الزراعيـة بـالجميزة وسدس موسم٢٠٠٨ الصيفي.
- وأخذت البيانات على صفات : عدد الأيام حتى ظهور ٥٠% من الحرابر ، ارتفاع النبات و الكوز سم ، موقـع الكوز ، نسبة النباتات المقاومـة لمرض الذبول المتأخـر % ، عدد الكيـزان لكـل نبـات واحـد و محصول الحبـوب بالإردب/فـدان. وكـانت أهـم النتائج المتحصل عليهاهلـي :-
  ١. التباين الراجع إلى المواقع معنوي بدرجة عالية.
  ٢. التباين الراجع إلى الهجن والسلالات والكشافات والتفاعلات فيما بينهم من جهـة أو فيمـا بيـنهم وبين المواقع من جهة أخرى معنوياً لكل الصفات المدروسة عدا صـفة المقاومـة لمـرض الـذبول المتأخر.

٣. الفعل الجيني غير المضيف كان أكثر أهمية من الفعل الجيني المضيف في درجة التوريث لكل الصفات المدروسة كما كان أكثر تأثراً وتفاعلاً بالمواقع مقارنة بفعل الجين المضيف وذلك لكل الصفات المدروسة عدا صفة المقاومة لمرض الذبول المتأخر.

أظهرت السلالة الكشاف21 10 .Gm تأثيرات موجبة و مرغوبة للقدرة العامة على التآلف وذلك لصفة محصول الحبوب ، أيضا أظهرت السلالة الكشاف Gm.1002 تأثيرات مرغوبة بالنسبة لعدد الأيام حتي ظهور 50 % للحرايروارتفاع النبات المنخفض أي نحو التبكير و قصر طول النبات.

٤. أعطت عشرة هجن قمية للمعاملات أرقام ٢ ، ٣، ٦، ٩ ، ٢٤ ، ٣٩ ، ٤١ ، ٤٢ ، ٤٥ ، ٥١ محصول حبوب أفضل من محصول هجينى المقارنة ١٥٥، ١٦٢. كما أعطت السلالات الخمسة الجديدة المختبرة وهى أرقام ١، ٢، ١٣ ، ١٤ ، ١٥ مع السلالة جميزة ١٠٢١ هجنا قمية أو فردية صفراء جديدة ذات محصول قدرة ٣٣.٣ ، ٣٣.٠، ٣٢.٩ ، ٣٣.٢ ، ٣٤.١ أردباً للفدان ومتفوق معنويا عن القدرة الأنتاجية لهجين المقارنه الأصفرجيزة ١٦٢ .الأمر الذى يجعل هذة الهجن الخمسة الجديدة مبشرة ويمكن ترقيها للتقييم فى مراحل متقدمة ببرنامج التربية للذرة الشامية للاستفادة منها على المستوى القومى.