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GENERAL AND SPECIFIC COMBINING ABILITY OF NEW WHITE MAIZE INBRED LINES FOR SOME AGRONOMIC TRAITS

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ABSTRACT

Seven new white maize inbred lines were crossed with three testers in 2021 growing season at Ismailia Research Station. The resulting 21 crosses plus four standard checks were evaluated in 2022 growing season at three locations (Ismailia, Sakha and Sids) to estimate combining ability effects and identify the superior crosses. A randomized complete block design (RCBD) with three replications was used. The data were collected on number of days to 50% silking, ear height, plant height, number of rows per ear, number of kernels per row and grain yield. Mean squares due to locations were significant or highly significant for all studied traits. Mean squares due to crosses and their partitions; lines, testers and lines × testers interaction were significant or highly significant for all studied traits, except testers for number of kernels per row. The parental lines (Ism7246 and Ism7253) possess high desirable GCA effects for grain yield, earliness and lower ear placement. The two single crosses (Ism6084×Sk13) and (Ism7246×Sk13) and the three three-way crosses (Ism8093×SC10), (Ism6084×SC131) and (Ism7253×SC131) out-yielded the standard checks SC10 and TWC321, respectively. Ear height and plant height were controlled mainly by additive gene effects meanwhile, number of days to 50% silking, number of rows per ear, number of kernels per row and grain yield were controlled by non-additive gene effects.

Key words: ***Zea mays, line × tester, GCA, SCA, Additive, Non-Additive, Gene action.***

INTRODUCTION

The concept of general combining ability (GCA) and specific combining ability (SCA) is useful for characterizing the inbred lines in its crosses as defined by Sprague and Tatum (1942). Combining ability estimates of inbred lines are very important for maize improvement not only in choosing parents and crosses but also in illustrating the relation between additive and non-additive portions of the genetic effects in the available germplasm. Line × tester design has widely been used for evaluation of new inbred lines by crossing them with testers. The value of any inbred line in hybrid breeding ultimately depends on its ability to combine very well with other lines to produce superior hybrids (Kempthorne 1957). This design was widely used in maize by several workers like, Mosa *et al* (2017), Motawei *et al* (2019), Mousa *et al* (2021) and Abd El-Latif *et al* (2023). The choice of a suitable tester for testing the developed inbred lines is an important decision; it should include simplicity in use, ability to classify the relative merit of lines and maximizes the genetic gain (Hallauer 1975 and Menz *et al* 1999). However it is difficult to identify testers having all these characteristics. Liakat and Teparo (1986) used four types of testers (open-pollinated variety, three-way cross, single cross and inbred line). They concluded that the inbred line as tester was very effective for evaluating the inbred lines. Same conclusion was reported by Al-Naggar *et al* (1997), Menz *et al* (1999) and Mosa *et al* (2004). Meanwhile Grogan and Zuber (1957), El-Ghawas (1963), Sedhom (1992) and Mosa (2004) indicated the superiority of single cross as tesrer for evaluation of inbred lines. The information on the type of gene effects is very important for the breeder in making decisions for the expected response to selection for different traits. There is no agreement among researchers on the mode of gene effects controlling maize yield or its related characters. Ejigu *et al* (2017), Singh *et al* (2017), Motawei *et al* (2019) and Abd El-Latif *et al* (2020) showed that non-additive gene effects were predominant in the inheritance of maize grain yield. Meanwhile, Soliman and Sadek (1999), El-Shenawy *et al* (2003) and Mosa (2004) indicated that the additive gene effect played an important role in the inheritance of grain yield. This investigation was conducted to estimate the general (GCA) and Specific (SCA) combining ability effects of the new white maize inbred lines and identify the superior crosses.

MATERIALS AND METHODS

The materials used in this study were seven new white maize inbred lines, *i.e.* Ism6084, Ism8135, Ism7246, Ism7253, Ism7280, Ism8093 and Ism8094 developed at Ismailia Agricultural Research Station. These inbred lines were crossed with three genetically diverse testers, *i.e.* inbred line Sk13, single cross 10 (SC10) and single cross 131 (SC131) in the 2021 season at Ismailia Agricultural Research Station. The resulting 21 crosses along with the two single crosses SC10, SC Hytch 2031 and the two three-way crosses TWC321 and TWC Pioneer Fada as commercial check hybrids were evaluated at three research stations (Ismailia, Sakha and Sids) during May month in 2022 the summer season. An experiment was installed using a randomized complete block design with three replications. The plot consisted of one row 6 m long, spaced apart 0.80 m between rows and 0.25 m between hills. The trial was hand planted with two seeds per hill, and then thinned to one plant per hill after three weeks of planting, giving 25 plants per row, to get a total plant density of 21000 plant/feddan. The experiment was managed using recommended agronomic practices. Data were recorded on six traits, *i.e.* number of days to 50% silking, plant height(cm), ear height (cm), number of rows per ear, number of kernels per row and grain yield (ard/fed) adjusted at 15.5% grain moisture content (ardab=140 kg and feddan=4200 m^2). Combined analysis of variance across three locations was performed when homogeneity of error variances were detected according to Snedecor and Cochran (1989). Combining ability effects were computed according to line × tester analysis for studied traits when the mean squares due to crosses were significant based on the method described by Kempthorne (1957). Calculation of analysis of variance and line × tester analysis were carried out using computer application of Statistical Analysis System (SAS, 2008).

RESULTS AND DISCUSSION

A combined analysis of variance for number of days to 50% silking, plant height, ear height, number of rows per ear, number of kernels per row and grain yield across the three locations is presented in Table 1. Highly significant differences were detected between three locations (Loc) for all studied traits, indicating that these locations were differing for soil and climate conditions. The mean squares due to genotypes (G) and their partition; crosses (C), checks (Ch) and (C *vs* Ch) were significant or highly significant for all traits, except (Ch) for number of days to 50% silking and number of rows per ear and (C *vs.* Ch) for number of rows per ear, number of kernels per row and grain yield, revealing the existence of variability among crosses, checks and their versus for most studied traits. Mean squares due to (G × Loc) and their partition; (C × Loc), (Ch × Loc) and (C *vs.*Ch × Loc) interactions were significant or highly significant for all studied traits, except (C × Loc) interaction for number of rows per ear, (Ch × Loc) interaction for number of days to 50% silking, plant height and ear height and (C *vs.*Ch × Loc) interaction for number of days to 50% silking and for number of rows per ear, indicating that genotypes and their partitions (C), (Ch) and (C *vs.* Ch) performances differ from one location to another for most traits. These results are in harmony with those obtained by Ibrahim *et al* (2021), Mousa *et al* (2021) and Abd El-Latif *et al* (2023).

Table 1. Mean squares of locations, genotypes (crosses, checks and crosses versus checks) and their interaction for six studied traits.

SOV	df	Number of days to 50% silking	Plant height (cm)	Ear height (cm)	Number of rows per ear	Number of kernels per row	Grain yield (ard/fed)
Location (Loc)	2	812.21**	46331.04**	24369.44**	24.48**	23.45**	3310.89**
Rep/Loc	6	6.72	760.19	279.71	0.25	21.38	34.57
Genotypes (G)	24	32.44**	1622.87**	1057.65**	1.46**	12.44**	49.46**
Crosses (C)	20	20.75**	762.28**	703.76**	1.70**	11.88**	56.06**
Checks (Ch)	3	2.40	748.78**	500.18**	0.21	20.17**	19.61*
C *vs.* Ch	1	356.30**	21457.09**	9807.84**	0.32	0.29	7.01
G × Loc	48	3.72**	281.94**	236.72**	0.80**	19.47**	25.88**
C × Loc	40	4.11**	291.59**	226.96**	0.65	17.31**	25.82**
Ch × Loc	6	1.23	162.11	81.84	1.94**	19.53**	26.71**
Cr *vs.* Ch × Loc	2	3.31	448.49**	896.46**	0.30	62.31**	24.63*
Error	144	1.43	86.46	59.11	0.46	4.08	6.49

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

Table 2, showed that mean squares due to lines (L), testers (T) and (L × T) and their interactions with locations (Loc) for number of days to 50% silking, plant height, ear height, number of rows per ear, number of kernels per row and grain yield were significant or highly significant except, for number of kernels per row of (T) and (T × Loc), for number of rows per ear of (L × Loc), (T × Loc) and (L × T × Loc) and for ear height of (L × T × Loc). These results are in accordance with those obtained by Abo Yousef *et al* (2016), Ibrahim *et al* (2021), Mousa *et al* (2021) and Abd El-Latif *et al* (2023).

Table 2. Mean squares due to lines, testers, line × tester and their interactions with locations for six studied traits.

SOV	df	Number of days to 50% silking	Plant height (cm)	Ear height (cm)	Number of rows per ear	Number of kernels per row	Grain yield (ard/fed)
Lines (L)	**6**	**18.60****	**328.74****	**1125.78****	**1.25****	**10.78***	**57.19****
Testers (T)	**2**	**74.62****	**4099.96****	**2610.07****	**2.37****	**1.79**	**21.58***
L×T	**12**	**12.84****	**422.77*****	**175.03****	**1.81****	**14.12****	**61.24****
L×Loc	**12**	**2.93***	**239.50****	**429.79****	**0.83**	**17.94****	**20.54****
T×Loc	**4**	**3.68***	**1054.76****	**484.47****	**0.87**	**4.02**	**55.66****
L×T×Loc	**24**	**4.78****	**190.44****	**82.63**	**0.53**	**19.22****	**23.49****
Error	**120**	**1.44**	**82.35**	**53.44**	**0.49**	**4.18**	**6.11**

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

Mean performance of the 21 crosses and the four check hybrids for all studied traits are presented in Table 3. For number of days to 50% silking, the single crosses of the tester inbred line Sk13 with seven white inbred lines ranged from 62.44 days for (Ism8094×Sk13) to 66.33 days for

(Ism6084×Sk13). The six single crosses (Ism8135×Sk13), (Ism7246×Sk13), (Ism7253×Sk13), (Ism7280×Sk13), (Ism8093×Sk13) and (Ism8094×Sk13) were significantly earlier than the checks SC10. Meanwhile, the three-way crosses of the two testers SC10 and SC131 with seven white inbred lines ranged from 61.22 days for (Ism7246×SC131) to 66.33 days for (Ism8135×SC10). All the three-way crosses were significantly earlier than the check TWC321, except the three-way cross (Ism8135×SC10). For plant height, the single crosses of tester inbred line Sk13 with seven white inbred lines ranged from 229.67 cm for the cross (Ism8135×Sk13) to 252.00 cm for the cross (Ism6084×Sk13). All the single crosses were significantly shorter than the check hybrid SC2031. While, the three way-crosses of the two testers SC10 and SC131 with seven white inbred lines ranged from 242.22 cm for (Ism7246×SC131) to 259.33 cm for (Ism7253×SC10). All the three-way crosses were significantly shorter than the best check hybrid TWC321. For ear height, the single crosses of tester inbred line Sk13 with seven white inbred lines ranged from 106.89 cm for the cross (Ism7253×Sk13) to 129.89 cm for the cross (Ism6084×Sk13). All the single crosses had significantly lower ear placement than the check hybrid SC2031, except the single cross (Ism6084×Sk13). Meanwhile, the three way-crosses of the two testers SC10 and SC131 with seven white inbred lines ranged from 108.00 cm for (Ism7253×SC131) to 138.67 cm for (Ism8135×SC10). Nine three-way crosses had significantly lower ear placement than the check hybrid TWC321. For number of rows per ear, the single crosses of tester inbred line Sk13 with seven white inbred lines ranged from 13.87 for the cross (Ism8094×Sk13) to 14.87 for the cross (Ism7253×Sk13). Two single crosses were not significantly increased from the best check SC10. Meanwhile, the three-way crosses of the two testers SC10 and SC131 with seven white inbred lines ranged from 13.78 for Ism8135×SC10 to 15.41 for the three-way cross (Ism8093×SC10). One three-way cross (Ism8093×SC10) was significantly increased than the best check TWC Fada. Regarding number of kernels per row, the single crosses of the tester inbred line Sk13 with seven white inbred lines ranged from 40.76 for the cross (Ism8093×Sk13) to 44.09 for the cross (Ism7253×Sk13).

Tabel 3. Mean performance of crosses along with four checks for six studied traits across three locations.

Line	Number of days to 50% silking			Plant height (cm)			Ear height (cm)		
	Tester			Tester			Tester		
	Sk13	SC10	SC131	Sk13	SC10	SC131	Sk13	SC10	SC131
Ism6084	66.33	64.33	61.33	252.00	259.22	249.56	129.89	133.56	121.00
Ism8135	65.11	66.33	61.67	229.67	257.67	251.44	118.11	138.67	127.89
Ism7246	63.11	63.33	61.22	248.78	258.22	242.22	114.78	120.33	109.44
Ism7253	62.56	62.89	61.67	224.44	259.33	247.00	106.89	118.78	108.00
Ism7280	64.56	63.33	64.56	247.67	257.78	247.89	116.44	119.00	115.67
Ism8093	64.00	63.00	61.33	251.67	257.33	248.11	117.89	130.33	113.44
Ism8094	62.44	63.89	62.67	242.44	258.00	247.33	122.33	132.22	111.56
Check SC10	66.56	-		285.89	-		149.00	-	
Check SC2031	67.11	-		275.11	-		136.44	-	
Check TWC321	-	66.11		-	264.11		-	131.67	
Check TWC Fada	-	67.22		-	279.11		-	136.11	
LSD 0.05	1.12			8.66			7.16		
Line	**Number of rows per ear**			**Number of kernels per row**			**Grain yield (ard/fed)**		
	Tester			Tester			Tester		
	Sk13	SC10	SC131	Sk13	SC10	SC131	Sk13	SC10	SC131
Ism6084	14.58	14.66	14.82	41.67	42.09	43.84	31.48	26.06	31.34
Ism8135	14.81	13.78	14.31	42.56	43.89	43.93	27.25	23.88	28.07
Ism7246	13.97	14.31	14.53	41.82	42.64	41.56	31.97	28.97	29.56
Ism7253	14.87	14.76	14.18	44.09	41.73	41.20	29.08	29.22	31.64
Ism7280	14.18	14.65	13.96	43.76	41.91	41.84	28.27	29.56	23.82
Ism8093	14.51	15.41	13.80	40.76	41.58	43.89	26.15	31.34	26.09
Ism8094	13.87	14.62	13.87	42.58	41.13	40.47	29.89	29.68	25.54
Check SC10	14.64	-		42.20	-		28.94	-	
Check SC2031	14.29	-		43.34	-		28.43	-	
Check TWC321	-	14.53		-	40.41		-	28.92	
Check TWC Fada	-	14.56		-	43.76		-	25.85	
LSD 0.05	0.63			1.88			2.37		

Two single crosses were not significantly increased from the best check SC2031. Whereas, the three-way crosses of the two testers SC10 and SC131 with seven white inbred lines ranged from 40.47 for (Ism8094×SC131) to 43.93 for the three-way cross (Ism8135×SC131). Four three-way crosses were not significantly increased from the best check TWC Fada. In case of grain yield, the single crosses of tester inbred line Sk13 with seven white inbred lines ranged from 26.15 (ard/fed) for (Ism8093×Sk13) to 31.97 (ard/fed) for (Ism7246×Sk13).

The two single crosses (Ism6084×Sk13) and (Ism7246×Sk13) were significantly out-yielded the best check hybrid SC10, while the two single crosses (Ism7253×Sk13) and (Ism8094×Sk13) were not significantly increased from the best check SC10. Meanwhile, the three-way crosses of the two testers SC10 and SC131 with seven white inbred lines ranged from 23.82 (ard/fed) for (Ism7280×SC131) to 31.64 (ard/fed) for (Ism7253×SC131). The three hybrids (Ism8093×SC10), (Ism6084×SC131) and (Ism7253×SC131) were significantly out-yielded the best check hybrid TWC321, while the five three-way crosses (Ism7246×SC10), (Ism7253×SC10), (Ism7280×SC10), (Ism8094×SC10) and (Ism7246×SC131) were not significantly out-yielded the best check TWC321. These crosses are recommended for further evaluation to accurately identify the promising crosses as future commercial hybrids for high yielding.

General combining ability effects for parental inbred lines and three testers across three locations are presented in Table 4. Positive GCA effects are desirable for improvement of grain yield and yield component traits, while negative GCA effects are desirable when selecting for earliness, short plants and lower ear placement. The results revealed that, the tester SC131 and the three white inbred lines (Ism7246, Ism7253 and Ism8093) exhibited significant or highly significant and negative estimates of GCA effects for number of days to 50% silking, indicating that these inbred lines had favorable allele frequency for early maturity. For plant height, tester Sk13 and inbred line Ism7253 had highly significant and negative GCA effects toward shortness. Regarding ear height, the two testers Sk13 and SC131 in addition to the three white inbred lines (Ism7246, Ism7253 and Ism7280) exhibited significant or highly significant and negative estimates of GCA effects toward lower ear placement. For number of rows per ear, significant and positive GCA effects were obtained for the tester SC10 and the inbred line Ism6084.

Tabel 4. General combining ability effects of seven inbred lines and three testers for six studied traits across three locations.

Line	Number of days to 50% silking	Plant height (cm)	Ear height (cm)	Number of rows per ear	Number of kernels per row	Grain yield (ard/fed)
Ism6084	0.68**	4.18*	7.85**	0.28*	0.20	1.11*
Ism8135	1.05**	-3.16	7.93**	-0.10	1.13**	-2.12**
Ism7246	-0.76**	0.32	-5.44**	-0.13	-0.32	1.65**
Ism7253	-0.95**	-5.83**	-9.07**	0.20	0.01	1.46**
Ism7280	0.83**	1.69	-3.26*	-0.14	0.17	-1.30**
Ism8093	-0.54*	2.95	0.26	0.17	-0.26	-0.65
Ism8094	-0.32	-0.16	1.74	-0.28*	-0.94*	-0.15
LSD g_i 0.05	0.46	3.46	2.79	0.27	0.78	0.94
0.01	0.60	4.57	3.68	0.35	1.03	1.24
LSD g_i-g_j 0.05	0.66	4.99	4.02	0.39	1.13	1.36
0.01	0.88	6.68	5.38	0.52	1.51	1.82
Tester Sk13	0.70**	-7.04**	-2.25**	-0.01	0.13	0.64*
Tester SC10	0.56**	8.80**	7.26**	0.20*	-0.19	-0.13
Tester SC131	-1.25**	-1.77	-5.01**	-0.19*	0.06	-0.51
LSD g_i 0.05	0.31	2.31	1.86	0.18	0.52	0.63
0.01	0.41	3.09	2.49	0.24	0.70	0.84
LSD g_i-g_j 0.05	0.43	3.27	2.63	0.25	0.74	0.89
0.01	0.58	4.37	3.52	0.34	0.99	1.19

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

Regarding number of kernels per row, the inbred line Ism8135 exhibited highly significant and positive GCA effects. In case of grain yield, the tester Sk13 and the three white inbred lines (Ism6084, Ism7246 and Ism7253) exhibited significant or highly significant and positive estimates of GCA effects, hence three inbred lines (Ism6084, Ism7246 and Ism7253) along with the inbred tester Sk13 are recommended for developing high yielding maize hybrids.

According to these results, inbred line (Ism7253) is recommended for developing maize hybrids characterized with early maturity, short plant, low ear placement and high grain yield. These results are in agreement with other investigators (Hundera 2017, Motawei *et al* 2019, Abd El-Latif *et al* 2020 and Habiba *et al* 2022), who reported, significant and positive GCA effects (desirable) for grain yield and its components. Meanwhile, negative and significant GCA effects were desirable for days to 50% silking, plant height and ear height.

Specific combining ability effects of 21 crosses for six studied traits across three locations are presented in Table 5. Results showed that the desirable SCA effects were exhibited by four crosses (Ism8094×Sk13), (Ism7280×SC10), (Ism6084×SC131) and (Ism8135×SC131) for number of days to 50% silking, two crosses (Ism8135×Sk13) and (Ism7253×Sk13) for plant height, three crosses (Ism8135×Sk13), (Ism7280×SC10) and (Ism8094×SC131) for ear height, two crosses (Ism8135×Sk13) and (Ism8093×SC10) for number of rows per ear, two crosses (Ism7253×Sk13) and (Ism8093×SC131) for number of kernels per row and five crosses (Ism7280×SC10), (Ism8093×SC10), (Ism6084×SC131), (Ism8135×SC131) and (Ism7253×SC131) for grain yield. The current results are in general agreement with the findings of many researchers such as Larièpe *et al* (2017), Motawei *et al* (2019), Abd El-Latif *et al* (2020) and Habiba *et al* (2022).

Estimates of additive gene effects (GCA) and or non-additive gene effects (SCA) for studied traits across the three locations are presented in Table 6. The additive gene effects (GCA) were the most important component controlling the inheritance of plant height and ear height, while the non-additive gene effects (SCA) played the important role of number for days to 50% silking, number of rows per ear, number of kernels per row and grain yield. These results are in agreement with those reported by many researchers; among them Badua-Aprakua *et al* (2015), Hosana *et al* (2015) and Habiba *et al* (2022) for number of days to 50% silking, ear height and plant height, Motawei *et al* (2019) for days to 50% silking, Ejigu *et al* (2017), Singh *et al* (2017), Abd El-Latif *et al* (2020), Ibrahim *et al* (2021) and Habiba *et al* (2022) for grain yield.

Tabel 5. Specific combining ability effects of 21 crosses for six studied traits across three locations.

Line	Number of days to 50% silking			Plant height (cm)			Ear height (cm)		
	Tester			Tester			Tester		
	Sk13	SC10	SC131	Sk13	SC10	SC131	Sk13	SC10	SC131
Ism6084	1.64**	-0.22	-1.41**	5.44	-3.18	-2.27	3.99	-1.85	-2.14
Ism8135	0.04	1.41**	-1.45**	-9.56**	2.60	6.95*	-7.86**	3.19	4.68
Ism7246	-0.14	0.22	-0.08	6.07	-0.32	-5.75	2.18	-1.78	-0.40
Ism7253	-0.51	-0.04	0.55	-12.11**	6.94*	5.18	-2.09	0.30	1.79
Ism7280	-0.29	-1.37**	1.66**	3.59	-2.14	-1.46	1.66	-5.30*	3.64
Ism8093	0.52	-0.33	-0.19	6.33*	-3.84	-2.49	-0.42	2.52	-2.10
Ism8094	-1.25**	0.33	0.92*	0.22	-0.06	-0.16	2.55	2.93	-5.47*
LSD S_{ij} 0.05	0.81			6.11			4.92		
0.01	1.08			8.18			6.59		
LSD S_{ij}-S_{ik} 0.05	1.14			8.56			6.96		
0.01	1.53			11.57			9.32		
Line	Number of rows per ear			Number of kernels per row			Grain yield (ard/fed)		
	Tester			Tester			Tester		
	Sk13	SC10	SC131	Sk13	SC10	SC131	Sk13	SC10	SC131
Ism6084	-0.10	-0.23	0.33	-1.00	-0.25	1.25	1.22	-3.44**	2.22*
Ism8135	0.52*	-0.72**	0.20	-1.03	0.62	0.41	0.212	-2.39**	2.18*
Ism7246	-0.30	-0.16	0.45	-0.32	0.83	-0.51	1.162	-1.07	-0.10
Ism7253	0.27	-0.04	-0.23	1.62*	-0.42	-1.20	-1.542	-0.63	2.17*
Ism7280	-0.08	0.19	-0.11	1.12	-0.40	-0.72	0.42	2.47**	-2.89**
Ism8093	-0.06	0.64**	-0.58*	-1.45	-0.31	1.75*	-2.35**	3.61**	-1.26
Ism8094	-0.25	0.31	-0.06	1.06	-0.07	-0.99	0.88	1.44	-2.32**
LSD S_{ij} 0.05	0.47			1.38			1.66		
0.01	0.63			1.84			2.23		
LSD S_{ij}-S_{ik} 0.05	0.67			1.95			2.35		
0.01	0.89			2.61			3.15		

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

Table 6. Estimates of additive gene effects (GCA) and non-additive gene effects (SCA) for studied traits across the three locations.

Genetic component	Number of days to 50% silking	Plant height (cm)	Ear height (cm)	Number of rows per ear	Number of kernels per row	Grain yield (ard/fed)
Additive gene effects (GCA)	1.00	47.38	40.32	0.03	0.05	0.74
Non-additive gene effects (SCA)	1.27	37.82	13.51	0.15	1.10	6.13
GCA/SCA	0.79	1.25	2.98	0.20	0.04	0.12

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القدرة العامة والخاصة على الإئتلاف لسلالات جديدة من الذرة الشامية بيضاء الحبوب لبعض الصفات المحصولية

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

تم تهجين سبعة سلالات جديدة من الذرة الشامية بيضاء الحبوب مع ثلاثة كشافات موسم ٢٠٢١ فى محطة البحوث الزراعية بالإسماعيلية. تم تقييم التهجينات الناتجة البالغ عددها ٢١ بالإضافة إلى أربعة من الهجن التجارية كهجن مقارنة فى ثلاثة مواقع (الإسماعيلية، سخا، سدس) خلال موسم ٢٠٢٢. تم إستخدام تصميم القطاعات الكاملة العشوائية فى ثلاثة مكررات ، وتم أخذ صفات عدد الأيام اللازمة حتى خروج٥٠٪ من حرائر النورات المؤنثة، إرتفاع النبات، إرتفاع الكوز، عدد صفوف الكوز، عدد الحبوب بالصف ، محصول الحبوب بالأردب للفدان. أوضحت النتائج أن التباين الراجع للمواقع كان معنوياً أو عالى المعنوية لجميع الصفات المدروسة. وكانت التباينات الراجعة للهجن ومجزئاتها (السلالات والكشافات وتفاعل السلالة × الكشاف) معنوياً أو عالى المعنوية لجميع الصفات المدروسة باستثناء تباين الكشاف لصفة عدد الحبوب لكل صف. أظهرت السلالات (Ism7246، Ism7253) قدرة عامة على الإئتلاف معنوية ومرغوبة لمحصول الحبوب وللتبكير ولموقع الكوز المنخفض. أوضحت النتائج أن الهجينين الفرديين (Ism6084×Sk13) ، (Ism7246×Sk13) والثلاثة الهجن الثلاثية (Ism8093×SC10)، (Ism6084×SC131) ، (Ism7253×SC131) تفوقت معنوياً على أعلى هجن مقارنة SC10، TWC321 على الترتيب. تبين أن الفعل الجينى المضيف له الدور الأهم والرئيسى فى وراثة إرتفاع النبات وإرتفاع الكوز بينما كان للفعل الجينى غير المضيف الدور الأهم فى وراثة عدد الأيام اللازمة حتى خروج٥٠٪ من حرائر النورات المؤنثة، عدد صفوف الكوز، عدد حبوب الصف و محصول الحبوب.