J. of Plant Production, Mansoura Univ., Vol. 11 (4):319 - 323, 2020

Journal of Plant Production

Journal homepage: www.jpp.mans.edu.eg
Available online at: www. jpp.journals.ekb.eg

Mean Performance, Type of Gene Action, Combining Ability and Superiority Percentage of some New White Maize Inbred Lines in Top Crosses

Cross Mark

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ABSTRACT

The main objective of the present study was to estimate the combining ability for some new white maize inbred lines. The work of this investigation was carried out in 2018 and 2019 summer seasons. In the first season of 2018, thirteen inbred lines were used as females and three testers were used as males, viz SD 7, SK 12 and SD 1193 at Sids Station. In the second growing season of 2019, all the 39 F_1 top crosses along with three commercial check hybrids *i.e.;* SC 10, SC 128 and SC 2031 were evaluated at Sids and Sakha Agriculture Research Stations. Obtained results could be summarized as follows; mean squares due to crosses and their separating into lines, testers and line x tester exhibited highly significant for all studied traits, except line x tester for ear diameter. The non-additive gene action played a major contribution in inheritance for plant height, ear height, ear length and grain yield. seven inbred lines; L_1, L_2, L_4, L_5, L_7, L_9 and L_{13} were desirable significant of GCA effects for grain yield. The top crosses; L_2 x T_1, L_4 xT_1, L_5x T_1, L_7 xT_1, L_8 x T_2, L_9 x T_2, L_{11} x T_2, L_{12} x T_2, L_{13}x T_2, L_2 x T_3, L_6 x T_3 and L_{10} x T_3 had positive and significant of SCA effects for grain yield. Two crosses; L_9 x T_2 (39.576 ardb/fad.) and L_{13}x T_2 (39.915 ardb/fad.) had significant and out yielded than the highest check SC 2031 (35.049 ardb/fad.).

Keywords: maize, inbred line, top crosses, combining ability, gene action, superiority.

INTRODUCTION

Maize (*Zea mays* L.) is an important cereal crop of the world. It has great worldwide significance as human food, animal feed and as a source of hundreds of industrial products (Troyer 2004). In maize breeding program, analysis of general combining ability (GCA), specific combining ability and hybrid vigor would help to identify best inbred lines for hybrid development and hybrid combinations for better specific combining ability. Combining ability is an effective tool which gives useful genetic information for the choice of parents in terms of their performance in series of crosses (Sprague and Tatum 1942). The development of populations with high combining abilities has a fundamental role in the efficient use of heterosis (Vasal *et al*., 1992). Therefore, germplasm evaluation is a decisive aspect in maize breeding programs. Line × tester is useful in deciding the relative ability of female and male lines to produce desirable hybrid combinations Kempthorne (1957). Numerous investigators reported that the additive gene effects played an effective role in the inheritance of grain yield Paul and Debanth (1999), Irshad-El-Haq *et al.*(2010), El-Badawy (2013) and Kamara *et al*.(2014). While, Kamara (2012), Aly (2013), EL-Hosary and Elgammaal (2013) and Aboyousef (2019) showed that the non-additive gene effects represented the major role in the inheritance of grain yield and other agronomic traits. The main aims of this study were (a) estimate of general and specific combining ability of inbred line for grain yield and other traits. (b) identify the type of gen action that played an effective role in the inheritance of traits. (c) identify the desirable superior inbred lines and the resulting single crosses for yielding potentiality and other related traits for further use in the breeding program.

MATERIALS AND METHODS

The trails of this study were carried out in 2018 and 2019 summer seasons. The used materials (Table 1) were thirteen white inbred lines of maize that were developed at Sids Agriculture Research Station, Agriculture Research Center (ARC), Egypt. These inbred lines were derived from different populations. In the first season of 2018, all the inbred lines were used as females and three testers were used as males, viz SD 7, SK 12 and SD 1193 at Sids Station. In the second growing season of 2019, all the 39 resultant top crosses along with three commercial check hybrids i.e.; SC 10, SC 128 and SC 2031 were evaluated at Sids and Sakha Agriculture Research Stations in a randomized complete block design (RCBDD) with four replications in each location. Plot size was one ridge, six m. long and 0.8 m. apart. Hills spacing was 0.25 m. within the ridge. Two kernels were planted per hill and thinned later to one plant per hill to provide a population of 21,000 plants/fad (faddan = 4200 m2). Recommended practices for maize production were applied. The recorded data were; days from planting to 50% silking, plant height (cm), ear height (cm), ear length (cm), ear diameter (cm) and grain yield (ardb/fed., ardb = 140 kg). The analysis of variance for combined data over locations based on the homogeneity test (Steel and Torrie 1980) were computed. The procedures of Kempthorne (1957) and Singh and Chaudhary (1985) were performed to obtain valuable information about the combining ability of lines and testers as well as their top crosses.

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DOI: 10.21608/jpp.2020.95616

Table 1. Names, code and the pedigree of the studied thirteen white inbred lines and three testers of maize.

Inbred Lines	Number of 2019 season	Pedigree	Inbred Lines	Number of 2019 season	Pedigree
L_1	1	Syn.1 C.1 S_5	L_{10}	23	G_2 Ev.8 S_6
L_2	2	Syn.1 C.1 S_5	L_{11}	26	Syn.1C.1 S_6
L_3	7	G2 Ev.8 S_5	L_{12}	29	Syn.1C.1 S_6
L_4	10	G2 Ev.8 S_5	L_{13}	30	Syn.1C.1 S_6
L_5	11	G2 Ev.8 S_5	Testers		
L_6	12	G2 Ev.8 S_5	T_1	Sd. 7	A.E.D
L_7	13	G2 Ev.8 S_6	T_2	Sk.12	Pop. Sk14
L_8	14	G2 Ev.8 S_6	T_3	Sd. 1193	G_2 Ev.8
L_9	16	G2 Ev.8 S_6			

RESULTS AND DISCUSSION

- **Analysis of variance:**

Analysis of variance for six traits; days to 50 % silking, plant height, ear height, ear length, ear diameter and grain yield(ardb/fad.) are presented in Table (2). Locations mean squares had highly significant for all studied traits, indicated that overall difference environmental conditions between Sakha and Sids locations. Mean squares due to crosses and their partitioning into lines, testers and line × tester exhibited highly significant for all studied traits, except line × tester for ear diameter, meaning that a wide range variability among crosses and their partitions; lines, testers and line × tester. Highly significant interactions between crosses × locations and tester × locations were obtained for all studied traits, except tester × locations for ear diameter, revealed that the crosses and testers behaved somewhat differently from Sakha to Sids locations. Mean squares of line × location interaction for grain yield and line × tester × locations interactions for ear length and grain yield were significant. These results are agreement with those obtained by Sadek *et al*. (2001), Ibrahim *et al*. (2007), Mosa *et al.* (2008), Darwich *et al.* (2016) and Gamea *et al.* (2019).

Table 2. Analysis of variance for days to 50% silking, plant height, ear height, ear length, ear diameter and grain yield traits of 39 top crosses at combined data across two locations (2019)

S.O.V	Df	Days to 50% silking	Plant height (cm)	Ear height (cm)	Ear length (cm)	Ear diameter (cm)	Grain yield (ard./fad.)
Locations	1	65.542**	164129.28**	63042.39**	246.637**	1.785**	6643.227**
Rep /loc	6	15.584	655.957	138.832	2.099	0.141	23.727
Crosses	38	19.078**	1032.518**	427.085**	8.573**	0.102**	244.757**
Lines (L)	12	28.907**	1472.383**	555.798**	14.050**	0.150**	305.666**
Testers (T)	2	91.465**	1719.061**	994.926**	6.842**	0.362**	645.178**
L x T	24	8.131**	755.373**	315.409**	5.979**	0.056	180.934**
Cr x loc	38	6.186**	197.953*	129.454**	3.143**	0.057*	66.030**
L x loc	12	4.340	110.526	56.510	0.426	0.032	37.742**
T x loc	2	16.003**	940.792**	490.407**	26.506**	0.062	232.488**
L x T x loc	24	4.121	124.500	107.591	2.341*	0.054	47.431**
Error	228	3.113	109.466	68.293	1.256	0.036	11.265
CV%		2.9	4.3	6.1	5.8	4.0	10.8

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

- **Mean performance:**

Data in Tables 3 and Table 3 continue show that, mean performance of 39 top crosses and 3 check hybrids for days to 50% silking, plant height, ear height, ear length, ear diameter and grain yield (ardb/fad.) on combined data over two locations of Sids and Sakha. For days to 50% silking, three crosses; $L_3 \times T_3$, $L_5 \times T_3$ and $L_{10} \times T_3$ had desirable significant for earliness compared the earliest check SC128. Twenty five top crosses exhibited significant for short plant than the short check SC 128. For ear height, the crosses; $L_6 \times T_1$, $L_{10} \times T_1$, $L_{10} \times T_2$, $L_4 \times T_3$, $L_5 \times T_3$, $L_7 \times T_3$, $L_9 \times T_3$ and $L_{10} \times T_3$ were significant for lower ear placement compared with the best check SC 128 for this trait. Regarding to data in Table 3 continue, means of grain yield (ardb/fad.) for crosses ranged from 17.653 ardb/fad. ($L_{10} \times T_1$) to 39.915 ardb/fad. ($L_{13} \times T_2$). Two crosses; $L_9 \times T_2$ (39.576 ardb/fad) and $L_{13} \times T_2$ (39.915 ardb/fad) had significant and out yielded than the highest check SC 2031 (35. 049 ardb/fad.).

Table 3. Mean performance of 39 top crosses for the studied traits at combined data over locations of Sids and Sakha during 2019 season.

Lines	Days to 50% silking			Plant height (cm)			Ear height (cm)		
	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3
L_1	64	62	60	253	227	239	145	132	133
L_2	64	61	60	254	237	241	143	132	131
L_3	61	61	57	239	248	238	133	137	132
L_4	61	62	60	241	230	224	136	129	125
L_5	61	61	58	242	236	228	136	135	127
L_6	59	60	58	234	242	246	124	133	131
L_7	62	61	61	273	253	230	151	139	123
L_8	62	61	61	230	253	248	130	142	138
L_9	61	61	59	239	233	225	139	129	124
L_{10}	60	59	58	225	227	229	125	125	126
L_{11}	63	63	61	238	256	247	135	153	140
L_{12}	60	59	62	267	254	242	148	136	140
L_{13}	62	61	61	249	243	240	140	137	137
SC 10		64			269			161	
SC 128		60			255			136	
SC 2031		64			268			151	
LSD 5%		2.0			10			8	
LSD 1%		2.3			13			11	

Table 3. continue.

Lines	Ear length (cm)			Ear diameter (cm)			Grain yield (ard./fad.)		
	T1	T2	T3	T1	T2	T3	T1	T2	T3
L_1	19.9	19.2	19.9	4.7	4.9	4.7	32.91	36.66	31.48
L_2	20.2	18.5	19.9	4.8	4.7	4.7	33.91	27.18	36.66
L_3	18.6	19.4	18.3	4.7	4.8	4.6	26.20	31.59	28.29
L_4	19.1	18.9	18.5	4.7	4.9	4.8	37.60	35.66	28.32
L_5	19.1	18.3	18.5	4.8	4.7	4.9	36.29	29.43	31.82
L_6	17.9	19.7	19.0	4.5	4.7	4.6	19.75	27.35	32.34
L_7	20.9	18.7	18.4	4.8	4.8	4.6	35.19	37.15	26.39
L_8	18.7	20.9	19.6	4.7	4.7	4.5	26.03	37.74	29.52
L_9	18.7	20.3	20.5	4.7	4.9	4.9	27.04	39.57	33.97
L_{10}	17.3	17.8	17.6	4.6	4.7	4.5	17.64	22.74	23.87
L_{11}	18.1	19.6	18.1	4.7	4.7	4.8	24.53	38.10	32.98
L_{12}	21.4	20.7	18.9	4.7	4.9	4.8	29.69	36.11	25.74
L_{13}	20.6	20.9	19.2	4.6	4.8	4.6	32.39	39.92	26.75
SC 10		20.70			4.60			34.96	
SC 128		21.00			4.80			31.97	
SC 2031		20.90			4.90			35.05	
LSD 5%		1.10			0.20			3.34	
LSD 1%		1.40			0.24			4.33	

- **Combining ability effects:**
- **General combining ability effects (GCA):**

GCA effects for line:

General combining ability of 13 lines and 3 testers for six studied traits are presented in Table 4. For days to 50% silking, L_3, L_5, L_6 and L_{10} inbred lines had negative values and desirable significant of GCA effects for this trait (earliness). The inbred lines (L_4, L_5, L_9 and L_{10}) and (L_4, L_6, L_9 and L_{10}) exhibited negative and desirable significant of GCA effects for plant height (shortness) and ear height (lower ear placement), respectively. Four inbred lines; L_8, L_9, L_{12} and L_{13} for ear length and two inbred lines; L_9 and L_{12} for ear diameter had positive values and desirable significant of GCA effects for these traits. Regarding to grain yield, seven inbred lines; L_1, L_2, L_4, L_5, L_7, L_9 and L_{13} were desirable significant of GCA effects for increasing grain yield.

- **GCA effects for tester:**

Data in Table 4 indicated that, the tester line; T_3 had had negative values and desirable significant of GCA effects for days to 50% silking, plant height and ear height, While, T_2 exhibited positive values and desirable significant of GCA effects for ear length, ear diameter and grain yield.

- **Specific combining ability effects (SCA):**

Specific combining ability effects of 39 top crosses for all studied traits are presented in Tables 5 and Table 5 continue. Desirable significant of SCA effects were observed in top crosses: $L_3{\times}T_3$ and $L_{12}{\times}T_2$ for days to 50% silking (earliness); $L_6{\times}T_1$, $L_8{\times}T_1$, $L_{11}{\times}T_1$, $L_1{\times}T_2$, $L_7{\times}T_3$ and $L_{12}{\times}T_3$ for plant height (stem shortness); $L_6{\times}T_1$, $L_8{\times}T_1$, $L_{11}{\times}T_1$, $L_{12}{\times}T_2$ and $L_7{\times}T_3$ for ear height (lower ear placement); $L_7{\times}T_1$, $L_{12}{\times}T_1$, $L_8{\times}T_2$ and $L_9{\times}T_3$ for ear length; $L_2{\times}T_1$, $L_4{\times}T_1$, $L_5{\times}T_1$, $L_7{\times}T_1$, $L_8{\times}T_2$, $L_9{\times}T_2$, $L_{11}{\times}T_2$, $L_{12}{\times}T_2$, $L_{13}{\times}T_2$, $L_2{\times}T_3$, $L_6{\times}T_3$and $L_{10}{\times}T_3$ for grain yield.

Table 4. General combining ability effects (GCA) for all tested lines and testers in combined data over two locations of Sids and Sakha during 2019 season.

Inbred Lines		Days to 50% silking	Plant height (cm)	Ear height (cm)	Ear length (cm)	Ear diameter (cm)	Grain yield (ardb/fad.)
L_1		1.144**	-1.157	1.869	0.408	0.062	2.748**
L_2		1.103**	2.760	0.869	0.308	-0.013	1.643*
L_3		-0.772*	0.468	-0.548	-0.442	-0.021	-2.244
L_4		0.436	-9.115**	-4.548**	-0.383	0.054	2.926**
L_5		-1.022**	-5.615**	-2.131	-0.600**	0.062	1.577*
L_6		-1.731**	-0.574	-5.173**	-0.317	-0.146**	-4.453**
L_7		0.478	11.051**	2.785	0.100	0.021	1.976**
L_8		0.811*	2.801	2.077	0.483**	-0.054	0.161
L_9		-0.606	-8.365**	-3.881*	0.617**	0.112**	2.591**
L_{10}		-1.897**	-13.990**	-8.965**	-1.642**	-0.129**	-9.520**
L_{11}		1.311**	5.760**	7.869**	-0.642**	0.012	0.933
L_{12}		0.019	13.260**	6.327**	1.117**	0.087*	-0.423
L_{13}		0.728*	2.718	3.452*	0.992**	-0.046	2.085**
LSD g_i	5%	0.717	4.250	3.357	0.455	0.077	1.363
	1%	0.929	5.510	4.352	0.590	0.100	1.768
Testers							
T_1		0.849**	3.830**	2.724**	0.034	-0.038*	-1.769**
T_2		0.157	0.436	0.638	0.238*	0.068**	2.848**
T_3		-1.006**	-4.266**	-3.362**	-0.272*	-0.030	-1.080**
LSD g_i	5%	0.344	2.042	1.613	0.219	0.037	0.655
	1%	0.446	2.647	2.091	0.283	0.048	0.849

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

Table 5. Specific combining ability effects of top crosses for days to 50%silking, plant height, ear height, ear length, ear diameter and grain yield in the combined data over two locations of Sids and Sakha during 2019 season.

Inbred Lines		Days to 50% silking			Plant height (cm)			Ear height (cm		
		T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3
L_1		1.06	-0.36	-0.70	9.75**	-12.98**	3.22	5.90**	-5.26	-0.64
L_2		0.98	-0.57	-0.41	6.21	-7.27	1.06	5.03	-4.01	-1.01
L_3		0.359	1.17	-1.53**	-6.62	6.02	0.60	-3.56	1.90	1.65
L_4		-0.59	0.71	-0.11	5.34	-2.14	-3.19	3.44	-1.47	-1.97
L_5		0.35	0.67	-1.03	2.59	0.11	-2.69	0.65	1.36	-2.01
L_6		-0.80	0.63	0.17	-10.08**	0.69	9.39	-7.81**	2.78	5.03
L_7		-0.016	-0.44	0.46	16.92**	0.44	-17.36**	10.36**	0.70	-11.05**
L_8		-0.09	-0.78	0.88	-17.71**	9.06**	8.64	-9.18**	5.03	4.15
L_9		0.19	0.38	-0.57	2.84	0.11	-2.94	5.40	-2.26	-3.14
L_{10}		0.10	-0.19	0.090	-6.16	-0.52	6.68	-3.02	-0.93	3.95
L_{11}		-0.22	0.46	-0.24	-13.04**	8.73*	4.31	-10.60**	9.99*	0.61
L_{12}		-1.18	-1.49*	2.67**	8.96**	-0.89	-8.07*	3.82	-6.10	2.28
L_{13}		-0.14	-0.19	0.30	1.00	-1.35	0.35	-0.43	-1.72	2.15
LSD s_{ij}	5%		1.241			7.36			5.81	
	1%		1.609			9.54			7.54	

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

Table 5. continue.

Inbred Lines	Ear length (cm)			Ear diameter (cm)			Grain yield (ard./fad.)		
	T1	T2	T3	T1	T2	T3	T1	T2	T3
L1	0.199	-0.704	0.505	-0.012	0.057	-0.045	1.000	0.126	-1.126
L2	0.599	-1.229**	0.630	0.088	-0.093	0.005	3.095**	-8.252**	5.157**
L3	-0.201	0.421	-0.220	0.046	0.015	-0.062	-0.728	0.053	0.675
L4	0.216	-0.188	-0.028	-0.079	0.040	0.038	5.510**	-1.049	-4.461**
L5	0.408	-0.571	0.163	0.013	-0.118	0.105	5.546**	-5.931**	0.384
L6	-1.001**	0.596	0.405	-0.054	0.015	0.038	-4.962**	-1.978	6.940**
L7	1.508**	-0.846**	-0.662	0.104	-0.001	-0.103	4.051**	1.392	-5.443**
L8	-1.076*	0.946**	0.130	0.104	-0.001	-0.103	-3.295**	3.794**	-0.499
L9	-1.209**	0.237	0.972**	-0.087	0.032	0.055	-4.719**	3.193**	1.526
L10	-0.301	0.021	0.280	0.029	0.024	-0.053	-2.012	-1.523	3.535**
L11	-0.551	0.746	-0.195	0.013	-0.093	0.080	-5.573**	3.380**	2.193
L12	1.041**	0.162	-1.20**	-0.112	0.057	0.055	0.943	2.748*	-3.691**
L13	0.366	0.412	-0.778	-0.012	0.057	-0.045	1.143	4.047**	-5.190**
LSD S_{ij} 5%		0.788			0.133			2.361	
LSD S_{ij} 1%		1.022			0.173			3.062	

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

D - Variance of combining ability:

The estimates of variance due to general (σ^2GCA) and specific(σ^2SCA) combing abilities and their interactions with locations are presented in Table 6. Data in this Table 6 showed that, σ^2GCA were more than σ^2SCA for days to 50% silking and ear diameter, these results indicated the importance of additive gen action in the inheritance of these traits.

Table 6. Estimates of the variance due to general combining ability (GCA), specific combining ability (SCA) and their interaction with locations for six traits, in the combined data over two locations of Sids and Sakha during 2019 season.

Traits Parameter	Days to 50% silking	Plant height (cm)	Ear height (cm)	Ear length (cm)	Ear diameter (cm)	Grain yield (ard./fad.)
σ^2 GCA	0.72	6.86	4.60	-0.10	0.003	3.23
σ^2 SCA	0.50	78.86	25.98	0.45	0.000	16.69
σ^2 GCA × loc.	0.19	12.54	5.18	0.35	0.000	2.74
σ^2 SCA × loc.	0.25	3.76	9.82	0.27	0.004	9.04

On the other hand, σ^2SCA were higher than σ^2GCA for plant height, ear height, ear length and grain yield, meaning that non additive gene action played a major contribution in the inheritance of these traits. Singh and Roy (2007), Aboyousef *et al.*(2016) and Aboyousef (2019) came the same conclusion for grain yield. The ratio between σ^2GCA × loc. and σ^2SCA × loc. was more than unite for plant height and ear length, these results indicated the additive gene action affected by change with locations more than non-additive gene action for these traits. Motawei (2006) indicated that mean squares due to GCA × location were higher than those due to σ^2SCA × location for all traits. The magnitude of the interactions of σ^2SCA × loc. were more than σ^2GCA × loc. for days to 50% silking, ear height, ear diameter and grain yield, meaning that non-additive gene action seemed greatly affected by locations for these traits. Barakat *et al*. (2003) found that the non-additive gene effects were more interacted with locations for grain yield, Aly (2013) found that The interaction of σ^2SCA × location was higher than those σ^2GCA × location for plant height and grain yield and Aboyousef *et al.* (2018) found that the ratio σ^2 GCA × Loc. / σ^2 SCA × Loc. less than unity for days to 50% silking, ear height and grain yield.

- **Superiority percentage:**

Data in Table 7 cleared that, superiority percentage of 39 top crosses for grain yield relative to three check hybrids under combined data over two locations of Sids and Sakha during 2019 season.

For grain yield superiority percentage of top crosses ranged from -49.55 % to 14.19%, from -44.84% to 24.84 % and from -49.69 % to 13.88 % relative to SC 10, SC 128 and SC2031, respectively. Two crosses; (L_9 x T_2) and (L_{13} x T_2) had significant superiority percentage for grain yield relative to checks; SC 10 and SC 2031. Relative to SC 128, eleven crosses had significant superiority percentage for grain yield.

Table 7. Superiority percentages of the thirty-nine top crosses relative to three check hybrids for grain yield under the combined data of Sids and Sakha during 2019 season.

Crosses	Relative to SC 10	Relative to SC 128	Relative to SC 2031
$L_1 \times T_1$	-5.84	2.95	-6.09
$L_1 \times T_2$	4.87	14.65**	4.59
$L_1 \times T_3$	-9.95*	-1.55	-10.19*
$L_2 \times T_1$	-3.00	6.04	-3.26
$L_2 \times T_2$	-22.26**	-15.01**	-22.47**
$L_2 \times T_3$	4.86	14.65**	4.58
$L_3 \times T_1$	-25.06**	-18.07**	-25.26**
$L_3 \times T_2$	-9.62*	-1.19	-9.86*
$L_3 \times T_3$	-19.08**	-11.53	-19.29**
$L_4 \times T_1$	7.57	17.61**	7.29
$L_4 \times T_2$	2.02	11.54*	1.75
$L_4 \times T_3$	-18.98**	-11.42	-19.20**
$L_5 \times T_1$	3.82	13.50**	3.54
$L_5 \times T_2$	-15.81**	-7.95	-16.03**
$L_5 \times T_3$	-8.98	-0.49	-9.22
$L_6 \times T_1$	-43.49**	-38.22**	-43.64**
$L_6 \times T_2$	-21.75**	-14.45**	-21.96**
$L_6 \times T_3$	-7.47	1.16	-7.72
$L_7 \times T_1$	0.68	10.07	0.41
$L_7 \times T_2$	6.28	16.20*	6.00
$L_7 \times T_3$	-24.51**	-17.46**	-24.71**
$L_8 \times T_1$	-25.53**	-18.58**	-25.72**
$L_8 \times T_2$	7.96	18.03**	7.67
$L_8 \times T_3$	-15.56**	-7.68	-15.78**
$L_9 \times T_1$	-22.65**	-15.43**	-22.86**
$L_9 \times T_2$	13.19**	23.75**	12.89**
$L_9 \times T_3$	-2.81	6.25	-3.07
$L_{10} \times T_1$	-49.55**	-44.84**	-49.69**
$L_{10} \times T_2$	-34.95**	-28.88**	-35.12**
$L_{10} \times T_3$	-31.71**	-25.34**	-31.89**
$L_{11} \times T_1$	-29.83**	-23.29**	-30.02**
$L_{11} \times T_2$	8.99	19.16**	8.70
$L_{11} \times T_3$	-5.65	3.15	-5.90
$L_{12} \times T_1$	-15.07	-7.15	-15.30**
$L_{12} \times T_2$	3.30	12.94*	3.02
$L_{12} \times T_3$	-26.36**	-19.49**	-26.56**
$L_{13} \times T_1$	-7.33	1.32	-7.57
$L_{13} \times T_2$	14.19**	24.84**	13.88**
$L_{13} \times T_3$	-23.48**	-16.34**	-23.68**
LSD 5%		3.34	
LSD 1%		4.33	

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

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متوسط الأداء ونوع الفعل الجيني والقدره علي التآلف ونسبة التفوق لبعض سلالات الذره الشامية البيضاء الجديدة في الهجن القمية

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الهدف الرئيسي من هذه الدراسة هو تقدير القدره علي التآلف لعدد ثلاثة عشر سلاله مرباه داخليا بيضاء مستنبطه حديثا داخل محطه البحوث الزاعيه بسدس- قسم بحوث الذره الشاميه معهد بحوث المحاصيل الحقليه – مركز البحوث الزراعية. نفذت هذه التجربه خلال موسمين زراعين ناجحين هما موسم ٢٠١٨ و ٢٠١٩ داخل كل من محطه البحوث الزراعية بسدس وسخا. خلال موسم ٢٠١٨ تم إجراء التهجين القمي لعدد ١٣ سلاله مرباه داخليا بيضاء مع عدد ٣ من الكشافات البيضاء هم سلاله سدس ٧ و سلاله سخا ١٢ و سلاله سدس ١١٩٣ للحصول علي عدد ٣٩ هجين قمي حيث تم إجراء جميع التهجينات داخل محطه البحوث بسدس. وفي موسم ٢٠١٩ تم تقيم عدد ٣٩ هجين قمي بالإضافة الي عدد ٣ هجن فرديه للمقارنه هم هـ ف ١٠ و ١٢٨ و ٢٠٣١ في كل من محطه البحوث الزراعية بسدس وسخا. تم تصميم التجربة في اربع مكرارت في قطاعات كاملة العشوائية وتم إجراء التحليل الوراثي طبقا لنموزج كمبثورن ١٩٥٧. وكانت الصفات محل الدراسة هي عدد الأيام من الزراعة حتي ظهور ٥٠% من النورة المؤنثة وإرتفاع النبات و الكوز وطول وقطر الكوز ومحصول الحبوب أردب/فدان . وكانت أهم النتائج علي النحو التالي : لعب الفعل الجيني غير المضيف دورا مهما في وراثه صفات ارتفاع النات وارتفاع الكوز وطول الكوز ومحصول الحبوب أردب/ فدان بينما كان للفعل الجيني المضيف الدور الاهم في وراثه صفات عدد الأيام من الزراعة حتي ظهور ٥٠% من النوره المؤنثه وقطر الكوز. أظهرت سبع سلالات (١, ٢ , ٤ , ٥ , ٧ , ٩ , ١٣) بالإضافة الي الكشاف سلاله سخا ١٢تأثيرات معنويه ومرغوبه للقدره العامة علي التآلف لصفة محصول الحبوب. وأظهر عدد ١٢هجين قمي تأثيرات معنويه مرغوبه للقدره الخاصة علي التآلف لصفة محصول الحبوب ، كما اعطي الهجنين ($T_2 \times L_9$) و ($T_2 \times L_{13}$) تفوقا معنويا في المحصول عن أفضل هجن المقارنة (هجين فردي ٢٠٣١) لذلك من الممكن إستخدامهم في برنامج تحسين انتاج الذره الشاميه.