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Analysis of Combining Ability for Yield and Other Traits of Yellow Maize Inbred Lines Using Diallel Crosses

Aboyousef, H. A.[1]; M. S. Abd El-Latif[1] ; A. M. Abu Shosha [1] and A. M. El. Mohamed [2*]

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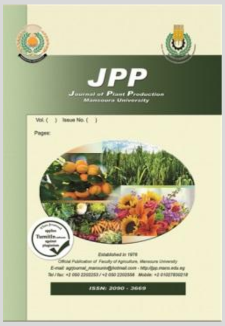
[1]Maize Research Department, Field Crops Research Institute, ARC, Egypt.
[2]Agronomy Department, Faculty of Agricultural, Minia University, El-Minia, 61519, Egypt.



ABSTRACT

In this investigation, nine inbred lines of yellow maize from various sources were evaluated to determine the type of gene action and combining ability. At the Sids Agric. Res. Sta. all possible combinations of these lines were developed in a half diallel during the 2022 growing season (Griffing's 1956 method 4 model 1), giving 36 crosses. In 2023 season 36 crosses along two commercial hybrids SC.168 and SC.3444 were evaluated in replicated trials conducted at three locations; Sakha, Gemmeiza and Sids Agric. Res. Sta. Recorded were the days to mid-silking, plant height (PHT) cm, ear height (EHT) cm, ear position (%) and grain yield (ardab/fed). The findings revealed significant differences among the three locations for all the studied traits, suggesting that the environmental conditions varied among all three locations. Except for plant height, the mean squares of genotypes, crosses, and their interactions with locations were highly significant for traits under study. The findings revealed that for all traits under study, the variances in general and specific combining abilities were highly significant, suggesting that both additive and non-additive gene action played an essential role in the inheritance of these traits. The parental lines Sd.3299, Sd.3234, Gz.658 and Mall.5035 had favorable GCA effects on grain yield. Eight crosses (Sd.3187 × Sd.3234), (Sd.3187 × Gz.658), (Sd.3195 × Sd.3299), (Sd.3299 × Sd.3242), (Sd.3300 × Sd.3234), (Sd.3300 × Mall.5035), (Sd.3220 × Sd.3242) and (Sd.3242 × Gz.658) had positive and significant SCA influence on grain yield.

Keywords: *Zea mays*, Diallel, GCA, SCA, Gene action.

INTRODUCTION

One of the main objectives of the National Maize Research Program is to breed and release high-yielding maize hybrids with the aim of satisfying the growing demand for maize in the rural animal feed and poultry industries. To choose the best breeding program for improving the qualities they want, maize breeders may evaluate the combining ability for agronomic and yield characteristics through carrying out a diallel analysis among specific sets of inbred lines. In this respect, Debnath and Sarker (1990), Gado (2000), Amer (2000) and Abd El-Mottalb (2014), reported that general (GCA) and specific (SCA) combining ability impacts from crosses of a fixed set of parents have been primarily estimated using diallel. Several investigations focused on the effects of GCA and SCA and how they influence the inheritance of traits such grain yield and other traits. According to Hallauer and Miranda (1981), while, developing a maize breeding program for producing and releasing new inbred lines and crosses, it is important to take into consideration both GCA and SCA effects. Sprague and Tatum (1942) first proposed the concept of general and specific combining ability, and Griffing (1956) developed a mathematical basis for it. In the research of El-Hosary (1989), Khalifa *et al.* (2001), Soliman *et al.* (2001), and Abd El-Azeem *et al.* (2021), GCA (additive gene action) had greater effects on plant and ear height, days to mid-silking, and grain yield. The inheritance of grain yield and other agronomic attributes, however, were mainly determined by SCA (non-additive gene action), according to studies by Abd El-Aziz *et al.* (1994), Dawood *et al.* (1994), El-Zeir *et al.* (1997), Amer *et al.* (1998), Soliman (2000), and Abd El-Mottalb and Gamea (2014). In the present study, the objectives were to: (1) identify the varying importance of GCA and SCA and how they interact with locations for agronomic parameters including grain yield in a diallel set of maize. (2) identify superior parental lines and suitable crosses for those lines to be used in the maize breeding program. (3) develop yellow single-cross hybrids exhibiting higher yields than the commercial cross.

MATERIALS AND METHODS

Nine yellow maize inbred lines with different genetic background were used to create half-diallel crosses (excluding reciprocals) in 2022 growing season at Sids Agricultural Research Station (Table 1). In 2023 growing season the resulted 36 F_1 crosses and two commercial yellow check hybrids; SC.168 and SC. Pioneer 3444. The results F_1 crosses were evaluated in three locations, i.e. Sids, Sakha, and Gemmeiza Agric. Res. Sta. using replicated yield trails. A randomized complete block design (RCBD) with three replicates was used in each location. The plots included hills 25 cm apart on one side of a single ridge which was 6 m long and 80 cm apart. Each hill has two kernels planted, although they were later thinned to one plant per hill. All agricultural approaches to growing maize were used as recommended. Data were recorded for number of days to mid-silking (DTS), plant height (PHT) cm, ear height (EHT) cm, ear position (Epos) % and grain yield (GY) (ardab/fed.). after adjusted to 15.5% moisture content. Analysis of variance was performed for the combined data across three locations according to Snedecor and Cochran (1989). GCA and SCA abilities were computed using methods 4, model 1 (fixed model) of Griffing (1956).

* Corresponding author.
E-mail address: ahmed.elmahdy@mu.edu.eg
DOI:

Table 1. Sources of parental inbred lines used in current study.

Parents		Source
P1	SD.3187	Local
P2	SD.3195	France EG-9
P3	SD.3299	Comp.21
P4	SD.3300	China CTHS
P5	SD.3220	Pop.45 Ev-3
P6	SD.3234	Bank-92
P7	SD.3242	Bank-107
P8	Gz.658	Cargill-922
P9	Mall.5035	Comp.21

RESULTS AND DISCUSSION

Analysis of variances:

Analysis of variance for all studied traits combined over three locations are presented in Table 2.

The findings revealed significant differences in all three locations for all attributes under study, suggesting that the environmental conditions varied among the three locations Soliman *et al.* (2005), Gabr *et al.* (2008), Zare *et al.* (2011), Aly (2013), Abd El-Azeem *et al.* (2021), Mosa *et al.* (2023), and Abd El-Azeem and Aly (2025) all presented results that agree with these findings. For all attributes under study, except for plant height, the mean squares of genotypes, crosses, and their interactions with locations were highly significant. These results suggest that the genetic diversity among these materials can be utilized to produce hybrids that have high yielding potential and perform differently according to the location. These findings mean that the tested genotypes are influenced by varying environmental conditions. These results agree with those reported by Aly and Mousa (2011) and Abd El-Azeem *et al.* (2024) for DTS, PHT, Epos%, LWR% and GY. Abd El-Azeem *et al.* (2009), El-Hosary (2020) and Abd El-Azeem *et al.* (2021) for DTS, PHT, EHT and GY.

Table 3 illustrates the variances in general (GCA) and specific (SCA) combining abilities and their interaction.

Table 2. Analysis of variance for five studied traits combined over three locations.

SOV	df	DTS(days)	PHT(cm)	EHT(cm)	Epos%	GY(ardab /fed)
Locations (Loc)	2	609.76**	22687.54**	26368.67**	1418.73**	466.99**
Rep/Loc	6	2.52	418.09	437.92	24.43	5.82
Genotypes (G)	37	16.01**	2321.05**	2093.19**	88.66**	247.15**
Crosses (C)	35	14.30**	2415.65**	2176.07**	87.36**	247.61**
Check (Ck)	1	14.22**	144.50	938.89**	223.14**	4.71
C *vs.* Ck	1	77.79**	1186.84**	346.74	0.01	473.66**
G × Loc	74	3.47**	141.62	159.91**	15.35**	31.18**
C × Loc	70	3.42**	146.28	165.36**	16.01**	26.41**
Ck × Loc	2	2.89	54.50	64.06	6.04	15.78
C *vs.* Ck × Loc	2	5.49*	65.59	64.75	1.47	213.52**
Error	222	1.58	110.85	97.26	6.83	9.44
CV%		2.09	4.33	7.07	4.58	10.91

***Significant at P≤ 0.05 and **significant at P≤0.01.**
DTS = days to 50% silking (days) PHT = plant height, cm EHT = ear height, cm
Epos% = ear position % GY = grain yield arad/ fed

Table 3. Analysis of variances for GCA and SCA and their interaction for five studied traits combined across three locations

SOV	df	DTS(days)	PHT(cm)	EHT(cm)	Epos%	GY(ardab /fed)
GCA	8	46.82**	8310.57**	8305.13**	320.38**	662.46**
SCA	27	4.66**	669.00**	360.00**	18.31**	124.69**
GCA/SCA		10.04	12.42	23.07	17.50	5.31
GCA × Loc	16	4.58**	217.97*	376.65**	33.03**	37.70**
SCA × Loc	54	3.08**	125.04	102.76	10.97**	23.06**
Error	210	1.48	1.74	95.50	6.77	9.241
GCA × Loc /SCA × Loc		1.54	1.74	3.67	3.01	1.63

***Significant at P≤ 0.05 and **significant at P≤0.01.**
DTS = days to 50% silking (days) PHT = plant height, cm EHT = ear height, cm
Epos% = ear position % GY = grain yield (ardab/fed)

The findings revealed that variances in general and specific combining abilities were highly significant for all traits under study, suggesting that both additive and non-additive gene actions played a significant role in the inheritance of these traits. The results presented agree with those confirmed by Dawood *et al.* (1994), Amer *et al.* (1998), Gado (2000) for DTS, PHT, EHT, for DTS, PHT, EHT, Amer (2002) for DTS, PHT, EHT, Soliman *et al.* (2005) for DTS, PHT, EHT, GY, Abd El-Mottalb *et al.* (2013) for PHT, EHT, GY, Abd El-Mottalb and Gamea (2014) for DTS, PHT, EHT, GY, Haydar (2020) for GY, El-Hosary (2020) for DTS, Onejeme *et al.* (2020) for PHT and Abd El-Azeem *et al.* (2021) for DTS, PHT, Epos% and GY. Furthermore, the magnitude of GCA was more than that of SCA for all studied traits meaning that the additive genes are responsible for most the genetic variation for these traits. These results were agreed with by Unay *et al.* (2004) and Abd El-Azeem and Aly (2025). Except for PHT and EHT for SCA × Loc, the mean squares obtained from GCA × Loc. and SCA × Loc. were significant or highly significant for all traits under study. However, for all traits under study, the magnitude of the GCA × Loc. interaction was larger than the SCA × Loc. interaction, suggesting that the environment has more of an impact on the additive than on the non-additive components of gene action.

Mean performances

Mean performances of the 36 crosses and two checks for five traits combined across three locations are presented in Table 4.

Depending on the results, the crosses for DTS ranged from 58.22 days for cross (Sd.3300 × Sd.3220) to 63.33 days for cross (Sd.3242 × Gz.658). The results showed that 20 crosses were significantly earlier than the earliest check

SC.168 (61.4 days). Plant height ranged from 215.33 cm for the cross (Sd.3195 × Sd.3220) to 273.44 cm for the cross (Sd.3299 × Sd.3234). 12 crosses were significantly shorter than the check SC.168. Ear height ranged from 111.67 cm for the cross (Sd.3300 × Sd.3220) to 174.78 cm for the cross (Sd.3299 × Sd.3234) ten crosses surpassed significantly lower ear placement than check hybrid SC.3444. Mean ear position ranged from 50.43 % for the cross (Sd.3220 × Mall.5035) to 63.84 % for the cross (Sd.3299 × Sd.3234) one cross surpassed significantly lower ear position % than check hybrid SC.3444. For grain yield the results showed that one cross (Sd.3234 × Gz.658) (36.6 ardab/fed.) were significantly superior to highest check hybrid SC.168 (33.7 ardab/fed.). Furthermore, five crosses (Sd.3187 × Gz.658) (35.30 ardab/fed), (Sd.3195 × Sd.3299) (33.80 ardab/fed), (Sd.3299 × Sd.3234) (34.45 ardab/fed), (Sd.3300 × Sd.3234) (36.03 ardab/fed) and (Gz.658 × Mall.5035) (34.23 ardab/fed) did not differ significantly from SC.168, the highest check (33.67 ardab/fed.).

Table 4. Mean performances of the 36 crosses along with two checks for five traits superiority percentage relative to the two checks combined across three locations.

Crosses	DTS (days)	PHT (cm)	EHT (cm)	Epos %	GY (ardab/fed)	Superiority % relative to check hybrids	
						SC168	SC3444
Sd.3187 × Sd.3195	58.67	220.22	124.11	56.40	18.93	-43.77**	-42.01**
Sd.3187 × Sd.3299	60.33	245.56	142.67	57.97	26.68	-20.77**	-18.28**
Sd.3187 × Sd.3300	58.67	221.44	123.89	55.92	20.26	-39.84**	-37.95**
Sd.3187 × Sd.3220	59.56	226.33	121.44	53.60	21.23	-36.93**	-34.96**
Sd.3187 × Sd.3234	59.89	258.44	152.00	58.69	32.23	-4.28	-1.28
Sd.3187 × Sd.3242	59.44	245.00	140.67	57.30	24.26	-27.94**	-25.68**
Sd.3187 × Gz.658	62.11	251.22	151.22	59.93	35.30	4.85	8.14
Sd.3187 × Mall.5035	61.56	250.78	142.44	56.78	29.63	-12.00**	-9.25*
Sd.3195 × Sd.3299	59.78	261.67	150.89	57.52	33.80	0.38	3.52
Sd.3195 × Sd.3300	59.33	239.33	129.89	54.07	20.73	-38.43**	-36.50**
Sd.3195 × Sd.3220	58.67	215.33	118.67	54.99	20.63	-38.73**	-36.81**
Sd.3195 × Sd.3234	61.00	256.11	142.44	55.65	23.77	-29.39**	-27.18**
Sd.3195 × Sd.3242	59.78	262.89	145.22	55.24	24.76	-26.46**	-24.15**
Sd.3195 × Gz.658	61.33	249.00	140.00	56.15	29.47	-12.46**	-9.72*
Sd.3195 × Mall.5035	60.44	250.11	130.78	52.29	27.44	-18.50**	-15.95**
Sd.3299 × Sd.3300	59.44	259.33	154.00	59.32	30.51	-9.39*	-6.55
Sd.3299 × Sd.3220	59.11	220.78	122.11	55.03	20.99	-37.67**	-35.72**
Sd.3299 × Sd.3234	60.78	273.44	174.78	63.84	34.45	2.32	5.53
Sd.3299 × Sd.3242	60.33	262.11	162.67	61.89	32.56	-3.31	-0.28
Sd.3299 × Gz.658	61.44	250.00	155.33	62.00	27.44	-18.49**	-15.94**
Sd.3299 × Mall.5035	61.33	250.44	152.33	60.55	29.73	-11.70**	-8.93*
Sd.3300 × Sd.3220	58.22	217.89	111.67	51.17	22.43	-33.38**	-31.29**
Sd.3300 × Sd.3234	60.11	252.00	150.78	59.67	36.03	7.01	10.36*
Sd.3300 × Sd.3242	60.11	241.78	141.89	58.55	25.93	-22.98**	-20.57**
Sd.3300 × Gz.658	60.00	228.89	132.56	57.55	32.26	-4.19	-1.19
Sd.3300 × Mall.5035	59.44	240.33	136.33	56.54	32.28	-4.13	-1.12
Sd.3220 × Sd.3234	58.56	222.89	120.67	53.93	27.06	-19.63**	-17.11**
Sd.3220 × Sd.3242	58.78	223.78	117.33	52.36	25.45	-24.40**	-22.03**
Sd.3220 × Gz.658	59.78	224.33	124.22	55.24	20.09	-40.34**	-38.48**
Sd.3220 × Mall.5035	58.33	215.44	109.00	50.43	26.14	-22.35**	-19.92**
Sd.3234 × Sd.3242	60.89	262.44	157.78	60.00	24.36	-27.66**	-25.40**
Sd.3234 × Gz.658	60.78	250.67	150.11	59.55	36.64	8.23	11.62**
Sd.3234 × Mall.5035	61.00	254.89	148.89	58.32	33.61	-0.17	2.96
Sd.3242 × Gz.658	63.33	253.44	155.67	61.12	33.04	-1.87	1.21
Sd.3242 × Mall.5035	62.67	254.44	144.11	56.59	29.79	-11.52**	-8.75*
Gz.658 × Mall.5035	62.11	228.89	131.11	57.00	34.23	1.66	4.85
G. mean	60.20	242.82	139.16	57.03	27.89	-	-
SC.168	61.44	248.33	150.89	60.57	33.67	-	-
SC.3444	63.22	254.00	136.44	53.53	32.65	-	-
LSD 0.05	1.17	9.78	9.16	2.43		2.85	
LSD 0.01	1.54	12.90	12.08	3.20		3.76	

DTS = days to 50% silking (days) PHT = plant height, cm EHT = ear height, cm
Epos% = ear position % GY = grain yield (ardab/fed)

Superiority percentage of 36 crosses relative to the two check hybrids SC.168 and SC.3444 for grain yield across the three locations are presented in table 4. The percentage of crossings with superior grain yield ranged from (-43.77 and -42.01) for the (Sd.3187 × Sd.3195) cross to (8.23 and 11.62) for the cross (Sd.3243 × Gz.658) regarding SC.168 and SC.3444, respectively. Two crosses (Sd.3234 × Gz.658) and (Sd.3300 × Sd.3234) were positive and significant or highly significant superiority % relative the check SC.3444. While four crosses (Sd.3187 × Gz.658), (Sd.3195 × Sd.3299), (Sd.3299 × Sd.3234) and (Gz.658 × Mall.5035) were positively and insignificant superiority % relative to the check SC.168 and SC.3444, also three crosses (Sd.3300 × Sd.3234), (Sd.3234 × Mall.5035), and (Sd.3242 × Gz.658) were positively and insignificant superiority % relative to the check SC.168 and SC.3444 respectively.

General combining ability effects:

Table 5 illustrates the (GCA) effects for all studied traits for nine inbred lines combined across three locations

The results revealed that the parental lines Sd.3195, Sd.3300 and Sd.3220 were found having significant and negative GCA effects for DTS in regard to earliness. For PHT, the inbred lines Sd.3187, Sd.3300, and Sd.3220 exhibited negative and significant GCA effects. For EHT, the inbred lines Sd.3195, Sd.3300, Sd.3220, and Mall.5035 exhibited negative and significant GCA effects. The inbred lines Sd.3195, Sd.3220 and Mall.5035 revealed significant and negative GCA effects for ear position % regarding low ear placement. The best inbred lines for GCA effects were Sd.3299, Sd.3234, Gz.658 and Mall.5035 for GY (ardab/fed.).

Table 5. General combining ability (GCA) effects estimation for nine inbred lines for six traits combined across three locations.

Inbred lines	DTS(days)	PHT(cm)	EHT(cm)	Epos%	GY(ardab/fed)
Sd.3187	-0.19	-3.37**	-2.12	0.05	-2.08**
Sd.3195	-0.37*	1.72	-4.47**	-1.99**	-3.37**
Sd.3299	0.14	11.53**	14.50**	3.12**	1.86**
Sd.3300	-0.89**	-5.94**	-4.61**	-0.49	-0.38
Sd.3220	-1.51**	-25.12**	-24.02**	-4.22**	-5.58**
Sd.3234	0.20	12.61**	12.03**	1.92**	3.55**
Sd.3242	0.54**	9.04**	7.44**	0.97**	-0.42
Gz.658	1.33**	-0.88	3.85**	1.76**	3.60**
Mall.5035	0.76**	0.39	-2.61*	-1.11**	2.82**
LSD g_i 0.05	0.29	2.46	2.29	0.61	0.71
LSD g_i 0.01	0.38	3.24	3.02	0.80	0.94
LSD g_i-g_j 0.05	0.44	3.69	3.43	0.91	1.07
LSD g_i-g_j 0.01	0.57	4.86	4.53	1.21	1.41

***Significant at P≤ 0.05 and **significant at P≤0.01.**
DTS = days to 50% silking (days) PHT = plant height, cm EHT = ear height, cm
Epos% = ear position % GY = grain yield (ardab/fed)

Specific combining ability effects:

Table 6 illustrates the (SCA) effects of 36 crosses for all the attributes under study combined across three locations.

The findings indicated that the eight cross (Sd.3187 × Sd.3234), (Sd.3187 × Gz.658), (Sd.3195 × Sd.3299), (Sd.3299 × Sd.3242), (Sd.3300 × Sd.3234), (Sd.3300 × Mall.5035), (Sd.3220 × Sd.3242) and (Sd.3242 × Sd.Gz.658) exhibited significant and positive SCA influence on grain yield towards high yielding. Regarding days to mid silking, four crosses (Sd.3187 × Sd.3195), (Sd.3187 × Sd.3242), (Sd.3220 × Mall.5035) and (Sd.3234 × Gz.658) expressed significant negative SCA effects.

Table 6. Specific combing ability (SCA) effects of 36 crosses for five studied traits combined across three locations.

crosses	DTS(days)	PHT(cm)	EHT(cm)	Epos%	GY(ardab/fed)
Sd.3187 × Sd.3195	-0.97**	-20.96**	-8.46**	1.31	-3.51**
Sd.3187 × Sd.3299	0.19	-5.43	-8.88**	-2.24**	-0.99
Sd.3187 × Sd.3300	-0.44	-12.07**	-8.54**	-0.66	-5.17**
Sd.3187 × Sd.3220	1.06**	12.00**	8.42**	0.74	1.01
Sd.3187 × Sd.3234	-0.32	6.38*	2.93	-0.30	2.87**
Sd.3187 × Sd.3242	-1.10**	-3.50	-3.81	-0.75	-1.12
Sd.3187 × Gz.658	0.78*	12.65**	10.33**	1.09	5.90**
Sd.3187 × Mall.5035	0.79*	10.93**	8.01**	0.81	1.00
Sd.3195 × Sd.3299	-0.19	5.58	1.69	-0.65	7.41**
Sd.3195 × Sd.3300	0.40	0.73	-0.19	-0.47	-3.41**
Sd.3195 × Sd.3220	0.35	-4.10	8.00**	4.16**	1.69
Sd.3195 × Sd.3234	0.97**	-1.05	-4.27	-1.31	-4.30**
Sd.3195 × Sd.3242	-0.59	9.30**	3.09	-0.77	0.66
Sd.3195 × Gz.658	0.17	5.33	1.46	-0.64	1.36
Sd.3195 × Mall.5035	-0.14	5.17	-1.31	-1.64	0.10
Sd.3299 × Sd.3300	0.01	10.92**	4.95	-0.34	1.14
Sd.3299 × Sd.3220	0.29	-8.46**	-7.53**	-0.91	-3.18**
Sd.3299 × Sd.3234	0.24	6.47*	9.09**	1.77*	1.15
Sd.3299 × Sd.3242	-0.54	-1.29	1.57	0.76	3.22**
Sd.3299 × Gz.658	-0.22	-3.48	-2.18	0.09	-5.90**
Sd.3299 × Mall.5035	0.24	-4.31	1.28	1.51	-2.84**
Sd.3300 × Sd.3220	0.43	6.12*	1.14	-1.15	0.51
Sd.3300 × Sd.3234	0.60	2.50	4.20	1.22	4.97**
Sd.3300 × Sd.3242	0.27	-4.15	-0.10	1.04	-1.15
Sd.3300 × Gz.658	-0.63	-7.12*	-5.85*	-0.74	1.16
Sd.3300 × Mall.5035	-0.62	3.06	4.39	1.11	1.95*
Sd.3220 × Sd.3234	-0.33	-7.43*	-6.50*	-0.80	1.20
Sd.3220 × Sd.3242	-0.44	-2.97	-5.24	-1.42	3.57**
Sd.3220 × Gz.658	-0.24	7.50	5.23	0.67	-5.82**
Sd.3220 × Mall.5035	-1.11**	-2.65	-3.53	-1.28	1.02
Sd.3234 × Sd.3242	-0.05	-2.04	-0.85	0.09	-6.66**
Sd.3234 × Gz.658	-0.95**	-3.89	-4.92	-1.15	1.41
Sd.3234 × Mall.5035	-0.16	-0.94	0.31	0.48	-0.65
Sd.3242 × Gz.658	1.27**	2.46	5.22	1.36	1.98*
Sd.3242 × Mall.5035	1.17**	2.19	0.12	-0.31	-0.50
Gz.658 × Mall.5035	-0.17	-13.45**	-9.29**	-0.68	-0.08
LSD S_{ij} 0.05	0.71	5.97	5.56	1.48	1.73
LSD S_{ij} 0.01	0.93	7.87	7.33	1.95	2.28
LSD S_{ij}-S_{ik} 0.05	1.07	9.03	8.41	2.24	2.62
LSD S_{ij}-S_{ik} 0.01	1.41	11.91	11.09	2.95	3.45
LSD S_{ij}-S_{kl} 0.05	0.97	8.24	7.68	2.04	2.39
LSD S_{ij}-S_{kl} 0.01	1.28	10.87	10.12	2.70	3.15

***Significant at P≤ 0.05 and **significant at P≤0.01.**
DTS = days to 50% silking (days) PHT = plant height, cm EHT = ear height, cm
Epos.% = ear position % GY = grain yield (ardab/fed)

Regarding plant height, six crosses expressed significant negative SCA effects namely (S.3187 × Sd.3195), (Sd.3187 × Sd.3300), (Sd.3299 × (Sd.3220), (Sd.3300 × Gz.658), (Sd.3220 × Sd.3234), and (Gz.658 × Mall.5035). For ear height seven crosses had negative and significant SCA effects toward lower ear placement namely (Sd.3187 × Sd.3195), (Sd.3187 × Sd.3299), (Sd.3187 × Sd.3300), (Sd.3299 × Sd.3220), (Sd.3300 × Sd.Gz.658), (Sd.3220 × Sd.3234), and (Gz.658 × Mall.5035). For ear position%, one cross (Sd.3187 × Sd.3299) had significant and negative SCA effects on ear position percentage.Based on these findings, it is suggested that previous crosses be released as new, potential hybrids in maize breeding and production assignments.

CONCLUSION

Four inbred lines; Sd.3299, Sd.3234, Gz.658 and Mall.5035 had good general combining ability effects for grain yield for high yielding ability. While for number of days to 50% silking date three inbred lines Sd.3195, Sd.3300 and Sd.3220 had negative and significant GCA effects for earliness. Eight crosses had positive and significant SCA effects for grain yield toward high yielding namely (Sd.3187 × Sd.3234), (Sd.3187 × Gz.658), (Sd.3195 × Sd.3299), (Sd.3299 × Sd.3242), (Sd.3300 × Sd.3234), (Sd.3300 ×Mall.5035), (Sd.3220 × Sd.3242) and (Sd.3242 × Gz.658).

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تحليل القدرة على التآلف للمحصول وبعض الصفات لسلالات نقية من الذرة الشامية الصفراء باستخدام الهجن التبادلية

هشام عبدالحميد ابويوسف[1]، محمود شوقي عبداللطيف[1]، أحمد مصطفي ابوشوشه[1] و أحمد محمد المهدي محمد[2]

[1]قسم بحوث الذرة الشامية, معهد بحوث المحاصيل الحقلية, مركز البحوث الزراعية, مصر
[2]قسم المحاصيل, كلية الزراعة, جامعة المنيا, المنيا, مصر

الملخص

استخدمت في هذه الدراسة تسع سلالات صفراء من الذرة الشامية الصفراء مشتقة من مصادر وراثية مختلفة لدراسة القدرة الائتلافية وطبيعة الفعل الجيني. في الموسم الزراعي 2022 تم إجراء كافة التهجينات الممكنة بين السلالات التسعة في نظام تزاوج الدياليل النصف دائري باستخدام طريقة جريفينج 1956 الطريقة الرابعة (4) النموذج الأول (1) للحصول على 36 هجين بمحطة البحوث الزراعية بسدس. في الموسم الزراعي 2023 تم تقييم الـ 36 هجين بالإضافة إلى هجينين مقارنة هما هجين فردي 168 وهجين فردي 3444 في تصميم القطاعات كاملة العشوائية في ثلاث مكررات في ثلاث محطات بحثية هما سدس وسخا والجميزة. تم أخذ البيانات على صفات عدد الأيام حتى ظهور 50% من الحريرة، ارتفاع النبات، ارتفاع الكوز، النسبة المئوية لموقع الكوز على النبات ومحصول الحبوب أردب / فدان. أظهرت نتائج التحليل التجميعي وجود اختلافات معنوية بين الثلاث مواقع لكل الصفات تحت الدراسة مما يدل على أن الجهات الثلاث مختلفة في الظروف البيئية. كما أظهرت النتائج أن التباينات الراجعة للتراكيب الوراثية وكذلك تفاعلها مع المواقع عالية المعنوية لكل الصفات تحت الدراسة. كما أظهرت النتائج أن تباينات كلاً من القدرة العامة والخاصة على التآلف عالية المعنوية لكل الصفات تحت الدراسة. كما أظهرت النتائج أن أفضل السلالات كانت السلالة سدس 3299 والسلالة سدس 3234 والسلالة جيزة 658 والسلالة ملوي 5035 والتي تمتلك قدرة ائتلاف عامة ومرغوبة لصفة المحصول. كما أظهرت النتائج أن أفضل السلالات كانت السلالة سدس 3195 والسلالة سدس 3300 والسلالة سدس 3220 والتي تمتلك قدرة ائتلاف عامة ومرغوبة لصفات التبكير. كما أظهرت النتائج أن ثمانية هجن هي (سدس 3187 × سدس 3234), (سدس 3187 × جيزة 658), (سدس 3195 × سدس3299), (سدس 3299 × سدس 3242), (سدس 3300 × سدس 3234), (سدس 3300 × ملوي 3035), (سدس 3220 × سدس 3242), (سدس 3242 × جيزة 658) تمتلك قدرة خاصة على التآلف لصفة محصول الحبوب/فدان. كما أظهر الهجين (سدس 3234 × جيزة 658) تفوق عالي المعنوية على أعلى هجن المقارنة لذلك يوصى باستخدام مثل هذه الهجن في برامج التربية وتقديمهم كهجن مبشرة بعد اجتياز الاختبارات المتقدمة في المستقبل القريب.