J. Plant Production, Mansoura Univ., Vol.5 (4): 615 - 623, 2014

DIALLEL CROSSES FOR ESTIMATION OF COMBINING ABILITY FOR YIELD AND AGRONOMIC ATTRIBUTES IN MAIZE

Abd El-Mottalb,A. A.
Maize Research Department, Field Crops Research Institute,ARC, Egypt.

ABSTRACT

The present study was carried out to estimate combining ability of 36 hybrids generated by crossing 9 new maize inbred lines in a half diallel model in 2013 season at two locations of Sids and Gemmeiza Agric. Res. Stns. The experiment was laid out in a randomized complete block design with four replications. Number of days to 50 % silking, plant height, ear height, ear length, ear diameter and grain yield (Ard / Fed) were determined. The mean squares, due to general combining ability (GCA) and specific combining ability (SCA) were highly significant for all studied traits. There was preponderance of additive gene action for all studied traits. Estimates of GCA and SCA effects showed that parental lines P_6 and P_8 were generally good combiners for earliness, shortness and lower ear placement, while, P_2, P_3 and P_9 were good combiner for grain yield and can be included in future improvement maize breeding programs. Two crosses exhibited desirable SCA effects for grain yield, four hybrids significantly out yielded the highest yielding check hybrids SC. 162, and twelve hybrids did not differ significantly than the check. These hybrids may be released as commercial hybrids after further testing and evaluation. It could be concluded that P_2, P_3 and P_9 was found to be a good GCA can be used in synthetic variety and hybrids (P_1 x P_2) and (P_7 x P_8) was found to be a good combiner and can use as a potential single cross hybrid combination and tester further.

Keywords: Maize, Diallel Crosses, Combining ability

INTRODUCTION

Maize is the most widely grown cereal in the world. It is a member of the grass family poaceae and is highly cross pollinated crop. It is of great significance due to its demand for food, feed and industrial utilization. The production of hybrid seed requires the development of inbred lines and subsequent controlled crosses to produce commercial hybrid seed. Combining ability is the relative ability of a genotype to transmit its desirable performance to its crosses. The concept of general and specific combining ability was introduced by Sprague and Tatum (1942) and its mathematical modeling was set about by Griffing (1956). The variance due to general combining ability (GCA) is usually considered to be an indicator of the extent of additive type of gene action, whereas variance bee to specific combining ability (SCA) is taken as the measure of non-additive type of gene action in heterosis breeding (Rojas and Sprague, 1952). In maize, many studies, GCA effects for parents and SCA effects for crosses were estimated in maize (Baker *et al.* 1978, El-Shamarka 1995, Abd El-Moula 2005 and Ibrahim 2012). The importance of GCA variance in controlling the inheritance of yield, its component and some morphological trait have been reported early by Gado *et al.* (2000), Al-Naggar *et al.* (2002), Alaminea *et al.* (2006), Ibrahim

(2012) and Abd El-Mottalb *et al.* (2013). However, Sadek *et al.* (2001), Singh and Roy (2007), Abdallah and Hassan (2009), Osman *et al.* (2012) and Kumar *et al.* (2012) reported that the non-additive type of gene action appeared to be more important for inheritance of yield and other agronomic traits.

The objectives of this study were aimed to evaluate the performance of nine parental inbred lines and estimate combining ability in their hybrids for yield and some agronomic traits. These promising lines were never appeared to be tested before for their breeding potential per se inspecific combination (SCA) and their overall performance increases (GCA).

MATERIALS AND METHODS

The experimental material used in the present investigation comprised of nine promising inbred lines selected from maize breeding program at Sids Agric. Res. Stn. ARC based on their performance in S_4 generation. These selected lines were used as parental inbred lines in half diallel cross at Sids Res. Stn. during 2012 season. The 36 F_1 hybrids generated from the a above half diallel crossing were evaluated in a Randomized Complete Block Design (RCBD) with four replications a long with two check single crosses hybrids viz, SC. 162 and SC. 168 at Sids and Gemmeiza Agric. Res. Stns. during 2013 season. Each entry was planted in one row with 6 m and the length row spacing was 0.80 m between rows and 25 cm between the hills. All other agronomic and plant protection practices applicable for maize crop were followed. Data related to No. of days to 50% silking was recorded on plot basis while data related to plant and ear height were recorded on ten randomly selected plants. Five randomly selected ears were used to measure average ear length and diameter. Grain yield from each plot was weighed and adjusted to 15.5% moisture and then converted to ardab per faddan (one ard. = 140 kg and one faddan = 4200 m^2) The mean values were used for combining ability analysis as per the method suggested by Griffings (1956) Method 4 Model 1 to estimate both general and specific combining ability effects.

RESULTS AND DISCUSSION

Analysis of variance

The analysis of variance for combining ability in respect of six traits under study is presented in Table (1). Analysis showed that mean squares due to locations and genotypes x locations interaction were highly significant for all studied traits except for ear length which indicated highly significant differences were obtained among the two locations and as a result, there were changes in genotypes ranking among two locations. Similarly, highly significant differences existed among genotypes for all studied traits, indicating wide diversity between genetic materials which used in this study. The mean squares, due to GCA and SCA were highly significant for all studied traits and this shows the importance of both additive and dominance gene effects. The relative importance of GCA and SCA in the expression of the different traits, the proportions of GCA and SCA variances were calculated. The magnitude of general combining ability variance was much greater than that of specific combining ability variances for all traits, which indicated the preponderance of additive gene action for all traits. The role of additive gene action for grain yield and other some traits have been reported early by Gado *et al.* (2000), Al-Naggar *et al.* (2002), Alaminea *et al.* (2006), Ibrahim (2012) and Abd El- Mottalb *et al.* (2013).

Table 1. Combined analysis of variances for studied traits of 36 single crosses in 2013.

S.O.V	d.f	Mean squares					
		Days to 50% Silking (d)	Plant height (cm)	Ear Height (cm)	Ear length (cm)	Ear Diameter (cm)	Grain yield (ard/fed)
Locations (L)	1	172.67**	59800.35**	3755.55**	1.18	2.76**	557.31**
Rep/ (L)	6	10.70	712.67	502.78	1.72	0.42	5.89
Genotypes (G)	35	21.99**	1759.30**	1270.14**	11.86**	0.08**	150.88**
G x L	35	1.65*	141.60**	115.73**	1.95	0.05**	19.14**
GCA	8	68.19**	6634.35**	5189.22**	36.32**	0.21**	421.36**
SCA	27	8.30**	314.85**	108.93**	4.55**	0.04*	70.74**
GCA x L	8	3.96**	129.81	184.02**	2.52	0.14**	26.11**
SCA x L	27	0.96	145.09*	95.50**	1.78	0.02	17.08**
Pooled error	210	1.0692	84.94	53.25	1.75	0.026	4.821
CV.		1.77	4.17	5.64	7.70	3.56	7.63

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

Mean squares due to GCA x locations interaction were highly significant for all traits except for plant height and ear length. While SCA x locations interaction were significant or highly significant for plant and ear heights as well as grain yield. This indicated that, the magnitude of all types of gene action varied from location to another (Ibrahim, 2012). The magnitude of mean squares for GCA x locations was higher than of SCA x locations for all studied traits, except for plant height, indicating that the additive types of gene action was more affected by environment than the non-additive one. Similar finding were reported by Abd El-Moula (2005), Motawei (2006) and Ibrahim *et al.* (2010).

Mean performance:

Mean performance for the 36 single crosses in addition to the two checks hybrids (SC.162 and SC.168) for all studied traits are presented in Table 2. For number of to 50%silking, all hybrids were significantly earlier than the earliest check hybrid SC. 168 except for P_2 x P_7 hybrid which did not differ significantly from the same check. The earliest hybrids were P_4 x P_6 , P_4 x P_8, P_5 x P_6, P_4 x P_5, P_3 x P_8 and P_5 x P_8. Mean performance for plant and ear heights ranged from 193.75cm and 102.50cm for hybrid P_5 x P_8 to 258.13cm and 155.50cm for P_2 x P_9 respectively. Most hybrids were significantly shorter and had lower ear placement than the check hybrid SC.168. The lowest mean values for the two traits were observed for the P_5 x P_8, P_5 x P_7, P_1 x P_5 and P_1 x P_6. With regard to ear length, mean value ranged from 15.30cm for P_2 x P_7 to 19.95 for P_8 x P_9. The highest mean values were observed for the hybrids P_8 x P_9 , P_6 x P_9 , P_4 x P_9 and P_3 x P_9 . These hybrids did not differ significantly from the check hybrid SC.168, while the other hybrids significantly surpassed the standard check hybrid SC. 162. Regarding ear diameter, three hybrids i.e. P_1 x P_2 , P_2 x P_9 and P_8 x P_9 significantly surpassed the check hybrid SC. 168, whereas, the rest of hybrids did not differ significantly from the check hybrid SC.168.

Concerning grain yield, mean performance ranged from 18.74 ard/fed for hybrid P_6 x P_8 to 37.07 ard/fed for hybrid P_2 x P_3. Four hybrids significantly outyielded the highest yielding check hybrid SC. 162. Also, twelve hybrids exhibited similar yield performance and did not differ significantly from the same check hybrid SC.162. These hybrids may be released as commercial hybrid after further testing and evaluation.

Combining ability effects:

Existence of both additive and dominance gene action in the genetic control of all studied traits in the set of studied genotypes implies that both gene effects should be considered in developing strategies for the selection of superior lines. However, parents may not necessarily have high GCA because the dominance gene effects could also be exploited to enhance these characters (Idahosa and Alika, 2013). The significance of the GCA effects would indicate that at least one of the lines differ in content of favorable genes with additive effects while the significance of SCA indicates that there is complementation between lines at loci with some degree of non-additive effects (Medici *et al.* 2004).

General combining ability effects:

Estimates of general combining ability for the nine parents for all studied traits are presented in Table 3. Parents with negative estimates of GCA effects for number of days to 50%silking, plant height and ear height are considered desirable. While, parents with positive estimates of GCA effect for ear length, ear diameter and grain yield are considered desirable. Both negative and positive GCA effects were observed for number of days to 50%silking. Three of lines (P_4, P_6 and P_8) showed negative and highly significant or significant GCA effects of this trait. The two lines (P_1 and P_2) showed positive and significant GCA effects for number of days to 50%silking. The negative value implies that the inbred lines are good combiners as it indicates the tendency of earliness and the reverse is true for those with positive GCA effects. For plant height, four inbred lines showed negative and significant GCA effects, whereas, three inbred lines showed positive and significant GCA effects. Parents P_5, P_6, P_7 and P_8 were good combiners while P_2, P_4 and P_9 were poor general combiners for these traits (Table 3). This indicated that P5 has a tendency to reduce plant height whereas P_2 has a tendency to increase plant height in their hybrid progenies. In maize, shorter plant height is desirable for lodging resistance. For ear height three inbred lines showed negative and significant GCA effects. These lines (P_8, P_6 and P_5) were good general combiners for ear height. While, two lines P_2 and P_4 showed positive and significant GCA effects and were poor combiners. For ear length and ear diameter, only one line i.e. P_9 exhibited positive and significant GCA effects. This meaning that this parent (P_9) was good combiners and it has a tendency to increase ear length and ear diameter. With respect to grain yield, three inbred lines exhibited positive and highly significant GCA effects (Table 3). The inbred line P_9 exhibited the maximum GCA effects followed by P_3 than P_2, whereas P_7 exhibited lowest GCA effects followed by P_6, P_8 and P_1 indicating the existence of best and poorest general combiners in the studied group of inbred lines, respectively. Inbred lines identified for good general combining ability could be utilized in maize improvement program for improvement of the traits of interest as these lines have potential to transfer desirable traits to their cross progenies. Both positive and negative GCA effects were reported in maize by several investigations, Habliza and Khalifa (2005), Menkir *et al.* (2003), Alaminea *et al.* (2006), Amer and El-Shenawy (2007) and Shushey *et al.* (2013).

Table 2. Means of studied traits for 36 single crosses and two checks based on combined data across locations in 2013.

Crosses	Days to 50% silking (d)	Plant height (cm)	Ear Height (cm)	Ear Length (cm)	Ear diameter (cm)	Grain yield (ard/fed)
P1 X P2	60.38	230.0	143.1	18.8	4.75	34.64
P1 X P3	59.88	216.3	134.4	16.7	4.48	26.85
P1 X P4	58.50	223.1	135.0	16.9	4.50	27.31
P1 X P5	58.75	207.5	113.8	17.2	4.55	28.69
P1 X P6	57.88	208.1	115.0	17.9	4.55	23.21
P1 X P7	59.50	213.8	131.3	15.8	4.53	26.07
P1 X P8	58.38	212.5	116.3	16.3	4.55	24.00
P1 X P9	61.00	223.8	140.0	18.2	4.60	26.70
P2 X P3	59.00	246.3	155.0	18.9	4.63	37.07
P2 X P4	58.75	250.6	153.8	17.0	4.63	30.30
P2 X P5	59.63	235.6	141.9	16.5	4.63	32.10
P2X P6	58.75	226.3	136.9	16.6	4.48	30.14
P2 X P7	63.88	220.6	146.3	15.3	4.38	19.40
P2 X P8	59.38	235.6	137.5	16.3	4.60	32.26
P2 X P9	60.25	258.1	155.5	18.8	4.78	36.28
P3 X P4	57.38	236.9	140.6	17.2	4.58	32.11
P3 X P5	58.38	213.8	125.0	17.2	4.53	32.69
P3 X P6	57.00	220.6	124.4	17.6	4.53	31.25
P3 X P7	58.75	215.0	130.6	17.8	4.50	29.11
P3 X P8	56.63	221.3	123.1	18.7	4.53	29.55
P3 X P9	60.38	226.3	131.3	19.1	4.55	35.30
P4 X P5	56.50	214.4	124.4	15.6	4.43	25.32
P4 X P6	54.88	218.8	128.1	16.3	4.48	27.05
P4 X P7	57.25	222.5	133.8	15.9	4.43	24.49
P4 X P8	56.25	214.4	120.0	17.4	4.53	26.41
P4 X P9	58.00	246.9	140.0	19.2	4.60	31.06
P5 X P6	56.25	205.6	114.4	15.5	4.43	26.94
P5 X P7	58.25	198.8	111.9	15.5	4.50	26.51
P5 X P8	56.75	193.8	102.5	17.0	4.43	23.71
P5 X P9	59.63	213.8	121.3	18.2	4.63	33.62
P6 X P7	57.38	210.0	121.3	16.9	4.48	25.26
P6 X P8	58.50	193.8	105.0	16.2	4.33	18.74
P6 X P9	57.63	223.1	125.6	19.8	4.63	30.66
P7 X P8	57.00	211.3	116.3	16.2	4.45	27.26
P7 X P9	58.00	218.8	123.1	18.8	4.65	31.14
P8 X P9	59.00	232.5	125.0	20.0	4.73	32.24
SC. 162	64.25	269.4	160.0	21.5	4.35	31.77
SC. 168	62.75	235.6	139.4	19.8	4.56	30.51
LSD. 0.05	1.01	9.0	7.2	1.3	0.16	2.15

Table 3. Estimates of general combining ability effects of 9 inbred lines for studied traits combined across the two locations, in 2013.

Parents	Days to 50% silking (d)	Plant height (cm)	Ear height (cm)	Ear length (cm)	Ear Diameter (cm)	Grain yield (ard/fed)
P1	0.97**	-4.84	0.46	-0.12	0.02	-1.80*
P2	1.79**	19.17**	18.75**	-0.32	0.07	3.16**
P3	-0.013	3.90	4.11	0.64	-0.003	3.41**
P4	-1.42**	8.37*	5.72*	-0.32	-0.02	-0.86
P5	-0.48	-12.25**	-8.65**	-0.84	-0.03	-0.07
P6	-1.32**	-8.94**	-9.27**	-0.12	-0.06	-2.41**
P7	0.36	-8.32*	-1.59	-0.79	-0.06	-2.98**
P8	-0.79*	-7.69*	-12.84**	0.08	-0.03	-2.28**
P9	0.91	10.60**	3.31	1.79**	0.12*	3.84**
SE gi	0.37	3.28	2.60	0.47	0.058	0.78
SE gi - gj	0.55	4.93	3.90	0.71	0.086	1.17

***and ** indicate significant at 0.05 and 0.01 probability levels, respectively**

Specific combining ability effects:

The SCA effects were calculated of each of hybrids for all studied traits and are presented in Table 4. The SCA effects for most traits were nonsignificant for all hybrids. Only two crosses exhibited desirable SCA effects for grain yield (P_1 x P_2) and (P_7 x P_8). The hybrid (P_1 x P_2) showed significant positive SCA effects (4.53) and higher mean performance (34.64 ard/fed) for grain yield and the parents were of low x high GCA nature. The potentiality of the hybrid from low x high combination is attributed to the interaction between dominant alleles from good general combiner and recessive alleles from poor combiner.

CONCLUSION

From abase results it could be concluded that two factors are considered important for the evaluation of an inbred line in the production of hybrid maize; characteristics of the line itself and behavior of the line in particular hybrid combination (Rojas and Sprague, 1952). Lines which had higher GCA effects can be used in synthetic variety development more effectively. However, when high yielding specific combinations are desired SCA effects could help in the selection parental material for hybridization. From this investigation we can conclude that P_2, P_3 and P_9 was found to be a good GCA can be used in synthetic variety and hybrids (P_1 x P_2) and (P_7 x P_8) was found to be a good specific combiner and can be used as a potential single cross hybrid combination after further testing.

Table4. Estimates of Specific Combining Ability effects for studied traits of 36 single crosses combined across the two locations, in 2013.

Crosses	No. of Days to 50% silking (d)	Plant height (cm)	Ear height (cm)	Ear length (cm)	Ear Diameter (cm)	Grain yield (ard/fed)
P1 X P2	-0.82	-5.45	-5.53	1.07	0.11	4.53*
P1 X P3	0.49	-3.93	0.36	-1.07	-0.09	-3.5
P1 X P4	0.52	-1.54	-0.62	0.14	-0.04	1.21
P1 X P5	-0.17	3.48	2.50	0.994	0.02	1.80
P1 X P6	-0.21	0.80	-5.62	0.964	0.05	-1.34
P1 X P7	-0.26	5.80	2.95	-0.54	0.02	2.095
P1 X P8	-0.23	3.93	-0.80	-0.83	0.01	-0.68
P1 X P9	0.68	-3.12	6.78	-0.72	-0.08	-4.10*
P2 X P3	-1.21	2.05	2.68	0.34	0.01	1.74
P2 X P4	-0.05	1.96	-0.18	0.44	0.03	-0.75
P2 X P5	-0.12	7.59	2.32	0.47	0.04	0.25
P2X P6	-0.16	-5.09	-2.05	-0.18	-0.07	0.63
P2 X P7	3.29**	-11.3	-0.36	-0.78	-0.18	-9.54*
P2 X P8	-0.05	3.03	2.14	-0.63	0.01	2.62
P2 X P9	-0.89	7.23	0.98	-0.72	0.04	0.52
P3 X P4	0.38	3.48	1.34	-0.36	0.06	0.80
P3 X P5	0.43	0.98	0.09	0.16	0.02	0.60
P3 X P6	-0.10	4.55	0.09	-0.12	0.05	1.49
P3 X P7	-0.03	-1.70	-1.34	0.78	0.02	-0.07
P3 X P8	-0.99	3.93	2.41	0.79	0.02	-0.34
P3 X P9	1.04	-9.37	-5.62	-0.52	-0.10	-0.71
P4 X P5	-0.03	-2.86	-2.14	-0.46	-0.06	-2.50
P4 X P6	-0.82	-1.78	2.23	-0.49	0.02	1.55
P4 X P7	-0.12	1.34	0.18	-0.21	-0.03	-0.43
P4 X P8	0.04	-7.41	-2.32	0.42	0.04	0.78
P4 X P9	0.07	6.78	1.52	0.53	-0.03	-0.68
P5 X P6	-0.39	5.71	2.86	-0.73	-0.02	0.66
P5 X P7	-0.07	-1.78	2.68	-0.11	0.05	0.80
P5 X P8	-0.41	-7.41	-5.45	0.59	-0.05	-2.70
P5 X P9	0.75	-5.71	-2.86	-0.92	-0.00	1.08
P6 X P7	-0.10	6.16	2.68	0.59	0.06	1.88
P6 X P8	2.18*	-10.71	-2.32	-0.93	-0.12	-5.34*
P6 X P9	-0.40	0.36	2.14	0.90	0.03	0.46
P7 X P8	-0.99	6.16	1.25	-0.28	-0.00	3.75*
P7 X P9	-1.71	-4.64	-8.04	0.55	0.05	1.52
P8 X P9	0.45	8.48	5.09	0.88	0.09	1.91
SE Sij	0.89	7.98	6.32	1.15	0.14	1.90
SE Sij- Sik	1.35	12.06	9.55	1.73	0.21	2.87

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

REFERENCES

Abdallah, T.A.E. and M.M. Hassan. (2009). Combining ability analysis for grain yield and some agronomic traits in maize. Egypt. J. App. Sci., 24(11):164-174.

Abd El-Moula, M.A. 2005. Combining ability for grain yield and other traits in some newly developed inbred lines of yellow maize. Egypt. J. Plant Breed., 9(2): 3-70.

Abd El-Mottalb, A.A., M. A. Mostafa and H. A. A. Gamea (2013). Combining ability estimates in some white maize inbred lines for yield and other traits. Egypt. J. Plant Breed. 17 (3): 13-22.

Alaminea, A., M.C. Wali, P.M. Salimath and R.C. Jadeesha. (2006). Combining ability and heterosis for grain yield and ear characters in maize. Karanataka J. Agric. Sci. 19:13-16.

Al-Naggar, A.M., M. S. Radwan and M. M. M. Atta (2002). Analysis of diallel crosses among ten maize populations differing in drought tolerance. Egypt. J. Plant Breed., 6:179-198.

Amer, E. A. and A.A. El-Shenawy (2007).Combining ability for twenty one yellow maize inbred lines. J. Agric. Sci., Mansoura Univ.32(9):7053-7062.

Baker, R. J. (1978). Issues in diallel analysis. Crop Sci. 18:533-536.

El-Shamarka, Sh.A. (1995). Estimation of heterotic and combining ability effects for some quantitative characters in maize under two nitrogen levels. Minufiya, J. Agric. Res., 20(21): 441-462.

Gado, H.E., M. S. M. Soliman and M.A.K. Shalaby (2000). Combining ability analysis of white maize (*Zea mays* L.) inbred lines. J. Agric. Sci. Mansoura Univ. 25:3719-3729.

Griffing, B. (1956). Concept of general and specific combining ability in relation to diallel crossing system. Aust. J. Biol. Sci. 9:463-493.

Habliza, A. A. and K. I. Khalifa (2005). Selection for new yellow maize inbred lines using top cross and stability analysis. Alex. J. Agric. Res. Univ. 50: 41-51.

Ibrahim, Kh.A.M. (2012). Diallel analysis of some yellow maize *(Zea mays L.)* inbred lines for yield and other traits. Egypt, J. Agric. Res., 90 (4): 33-46

Ibrahim, Kh.A.M., M.A. Abd El-Moula and M.E.M. Abd El-Azeem. (2010). Combining ability analysis of some yellow maize (*Zea mays* L.) inbred lines. Egypt. J. Agric. Res., 88(1): 33-50.

Idahosa, D. O. and J. E. Alika (2013). Diallel analysis of six agronomic characters in vigna unguiculata genotypes. Afr. J. Plant Breed.1(1):1-7.

Kumar, T. S., D. M. Reddy, V. S. Naik, S. I. Parveen and P. V. Subbaiah (2012). Gene action for yield and morpho-physiological traits in maize (*Zea mays* L.) inbred lines. J. of Agric. Sci. 4(5): 13-16.

Motawei, A.A.(2006). Additive and non-additive genetic variances of important quantitative traits in new maize inbred lines via line x tester analysis. J.Agric. Sci. Mansoura Univ. 31(11): 6855-6865.

Medici, L. O., M. B. Pereira, P. J. Lea and R. A. Azeevado (2004). Diallel analysis of maize lines with contrasting responses to applied nitrogen. J. Agric. Sci. (Camb.) 143:535-541.

Menkir, A., B. Badu-Apraku, C. The and A. Adepoju (2003). Evaluation of heterosis patterns of ITTAS lowland with maize inbred lines. Maydica 48: 161-170.
Osman, M.M.A., Kh.A.M. Ibrahim and M.A.M. El-Ghonemy (2012). Diallel analysis of grain yield and some other traits in yellow maize (*Zea mays* L.) inbred lines. Assiut J,. Agric. Sci. 43 (6): 16-26
Rojas, B.A. and G.F. Sprague (1952). A comparison of variance components in corn yield trials: III. General and specific combining ability and their interaction with locations and years. Agron. J. 44: 462-466
Sadek, S.E., M.S.M. Soliman and A.A. Barakat (2001).Evaluation of newly developed maize lines using commercial inbred testers. Egypt. J. Appl. Sci.16:406-425.
Shushey, W. Abrha, H.Z. Zeleke and D, W. Gissa (2013). Line x tester analysis of maize inbred lines for grain yield and yield related traits. Asian J. Plant Sci. Res. 3 (5): 12-19.
Singh, P.k. and A.K. Roy. (2007). Diallel analysis of inbred lines in maize (*Zea maiys* L.). Intl. J. Agric. Sci. 3(1):213-216.
Sprague, G.F. and L.A. Tatum (1942). General versus specific combining ability in single crosses of corn. J. Amer. Soc. Agron. 34: 923-932.

استخدام التهجين الدائري فى الذرة الشامية لتقدير القدرة على الإئتلاف لمحصول الحبوب وبعض الصفات المحصولية

أيمن أحمد عبد المطلب
قسم بحوث الذرة لشامية - معهد بحوث المحاصيل الحقلية - مركز البحوث الزراعية - مصر

الهدف من هذه الدراسة تقييم القدرة على الإئتلاف فى ٣٦ هجين فى الجيل الأول الناتج من ٩ سلالات و ذلك بعمل كل الهجن الممكنة بدون العكسية فى موسم ٢٠١٣ بمحطتى البحوث الزراعية بسدس والجميزه .تم تنفيذ التجربة فى تصميم القطاعات الكاملة العشوائية فى أربع مكررات .تم تسجيل القياسات على ستة صفات ميعاد خروج ٥٠% من الحريرة ، ارتفاع النبات ، ارتفاع الكوز ، طول الكوز ، قطر الكوز ، ومحصول الحبوب بالاردب للفدان .

و يمكن تلخيص أهم النتائج فيما يلي:

١- أوضحت النتائج ان التاثيرات الجينية المضيفه تلعب دور هام فى وراثه كل الصفات .
٢- أظهرت النتائج أن السلالتين أرقام ٦ و ٨ ذات تأثيرات سالبة ومعنوية للقدرة العامة على التألف بإتجاه التبكير وقصر النبات وموقع الكوز .بينما السلالات أرقام ٢و ٣ و ٩ أظهرت تقديرات موجبه ومعنوية للقدرة العامة على التألف لصفة محصول الحبوب حيث يمكن استخدامهم فى المستقبل فى برامج التربية .
٣- أشارت النتائج إلي ان الهجينين الفرديين (P_1 x P_2) و (P_7 x P_8) لهما قدرة خاصة على التألف معنوية وموجبة ، وتفوق اربعة هجن على أحسن هحن المقارنة هـ .ف ١٦٢ تفوقا معنويا كما تفوق ١٢ هجين على هجين المقارنة ويمكن الأستفادة من هذه الهجن بعد اجتيازها الأختبارات المستقبلية .

و توصي هذه الدراسة بإدخال السلالات ٢ و ٣ و ٩ في برامج تربية الذرة الشامية لأنها أظهرت تقديرات موجبة و معنوية للقدرة العامة علي التالف لصفة محصول الحبوب بالإضافة لإمكانية الإستفادة من الهجينين (P_1 x P_2) و (P_7 x P_8) في برامج التربية بقسم بحوث الذرة الشامية لإرتفاع قدرتها الخاصة علي التألف المعنوية و الموجبة لصفة محصول الحبوب .

قام بتحكيم البحث

أ.د / أحمد أبو النجا قنديل	كلية الزراعة – جامعة المنصورة
أ.د / خميس إبراهيم خليفة	مركز البحوث الزراعية