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COMBINING ABILITY AND HETEROSIS FOR SOME BREAD WHEAT GENOTYPES UNDER TWO SOWING DATES

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ABSTRACT

The objective of this work was to study the genetics behavior of some bread wheat genotypes (*Triticum asetivum* L.) under different sowing dates using half diallel crosses analysis among eight parents. The field work was carried out during 2012/2013 to 2014/2015. The eight parents, 28 F_1 and 28 F_2 were evaluated under recommended and late sowing dates in two experiments. The first experiment was planted in recommended sowing date (30 November D1) and the second was planted in late sowing (30 December D2) in 2014/2015 at the Experimental farm of Mallawy Station, Agriculture Research Center, Egypt. The results could be summarized as follows:-

- The analysis of variance revealed highly significant differences among genotypes for all studied traits in F_1 and F_2 under D1 and D2. The results showed highly significant effects for either GCA or SCA in F_1 and F_2 under D1 and D2.
- The highest heterosis effects were registered, compared to better parent, under (D1), for No. of days to maturity by cross (P5xP7), No. of spikes/plant by cross (P6xP8), 100-kernel weight by cross (P2xP7) and grain yield/plant by cross (P7xP8). Under (D2), the highest heterosis effects were found for No. of days to maturity by cross (P1xP5), No. of spikes/plant by cross (P6xP8), 100-kernels weight by crosses (P3xP6), (P2xP7) and grain yield/plant by cross (P6xP8).
- The parental genotypes, Shandaweel-1 (P1) and Line-26 (P8) were good combiners for No. of spikes/plant under (D2), Sids-4 (P5) under (D1, D2) and Sids-12 (P2) under (D2) for days to maturity and Line-26 (P8) for grain yield/plant under (D2).

- The greatest specific combining ability effects in F_1 cross were found under (D1), for days to maturity by cross (P1xP7), No. of spikes/plant by cross (P7xP8), 100-kernel weight by crosses (P2×P7), (P3xP5) and for grain yield/plant by crosses (P1xP7), (P1xP5), (P2xP6), (P4xP5), (P7xP8). Under (D2), for days to maturity by crosses (P1xP5), (P2xP3), 100-kerneal weight by crosses (P2×P7), (P3xP5), (P3×P6), (P4xP8), and for grain yield/plant by crosses (P1xP7), (P1xP4), (P2xP5) and (P6xP8).

INTRODUCTION

Wheat is the most important cereal crop in the world, as well as in Egypt since it is stable food for humans. The total consumption of wheat is about 13 million tons, while the total wheat production is about 8.27 million tons (produced from 2.8 million fed.) with average grain yield of 18.20 ard./fed. (FAO, 13/2014 season), therefore, there is a gap between the national need and the local wheat production, which means that Egypt still imports about 4.73 million tons annually.

Temperature is the important factor for good production of wheat especially during the grain filling period in many parts of the world. In Egypt, the optimum wheat sowing date is the second half of November. However, sowing date is often delayed, after Potato-wheat, onion-wheat and Cucurbits-wheat cropping pattern due to late harvest of these crops caused a delay in wheat sowing tell after 25th December or even some times 15th January. These condition cases great losses of yield due to high temperature during grain filling period. High temperature during post-anthesis, reduces duration of maturation, grain filling, grain number, 1000-kernel weight and grain yield (Kaur and Behl, 2010). Abd-EL-Shafi and Ageeb (1994) reported that grain yield was reduced under heat stress in upper Egypt in late planting, in the range of 30- 46% in comparison with optimal planting.

Wheat breeders are seeking to incorporate late planting date in the wheat germplasm and to develop genotypes that are early in maturity in order to escape the terminal heat stress and, thus, suit well in the maize-wheat as well as in cotton-wheat cropping systems. The true knowledge of the gene action for various bread wheat traits is useful in making decision with regard to appropriate breeding systems. Abd-Allah and Mostafa (2011) found that additive gene effects were positive and significant for 100-kernel weight. Abd-Allah and Hassan (2012) reported that the additive gene effects played a major role in controlling the genetic variation for number of spikes/ plant and grain yield/ plant. It is associated with reduced No. of spike/plant and No. of grain/spike. Delayed planting reduced plant height, days to heading, days to maturity and grain filling duration and ultimately reduction in yield and yield components Din and Singh (2005) and Mahboob *et al*., (2005). In wheat, researchers studied the different genetic parameters and its effects on productivity of grain yield. Therefore, the genetic improvement of wheat is an important aim for increasing yield through breeding programs.

Information about association between early sowing and grain yield, and its components, can help breeders for increasing the selection efficiency. Tawfelis (2006) found significant variation in yield and its components among wheat genotypes under normal and late plantings. He also, reported that delaying sowing date reduced No. of kernels/spike, kernel weight and grain yield.

The objective of this study was to obtain information about genetic variance, heterosis, combining ability under recommended and late sowing dates.

MATERIALS AND METHODS

Eight diverse genotypes of bread wheat *(Triticum aestivum* L.), namely, [Shandaweel-1 (P1), Sids-12 (P2), Giza-168 (P3), Gemmiza-9 (P4) and Sids-4 (P5) as local varieties and Line-11 (P6), Line-13 (P7) and Line-26 (P8) as exotic genotypes], Table (1) shows name, pedigree and origin of the parental genotypes were selected on the basis of a broad range of genetic diversity for major yield components, geographical origin and their suitability for different yield traits. This study was carried out at Mallawy Agricultural Research Station (clay/loam soil), Minia Governorate, Egypt, during three successive seasons from 2012/2013 to 2014/2015.

Table (1): Name, Pedigree and Origin of the eight bread wheat genotypes.

No.	Name	Pedigree	Origin
P1	Shandaweel-1	Site/M0/4/Nac/Th, Ac //3*Pvn/3/Milo/Buc.	Egypt
P2	Sids-12	BUC//7C/ALD/5/MAYA74/0N/1160-1473// BB/GLL /4/CHAT"s"/6/MAYA/VUL// CMH74A6304/*SX.	Egypt
P3	Giza-168	Mil/Buc//Seri CM930468-M-0Y-0M-2Y-0B.	Egypt
P4	Gemmiza-9	Ald"s"/Huac"s" // CMH74A.630 / 5X.	Egypt
P5	Sids-4	MAYA"s"/MoN"s//CMH74A.592/3/GIZA157*2.	Egypt
P6	Line- 11	WAXWING*2//PBW343*2/KUKUNA.	Mexico
P7	Line- 13	WHEAR/S0K0LL.	Mexico
P8	Line- 26	R0LF07*2/KIRITATI.	Mexico

In the first season (2012/2013), the eight parental genotypes were crossed to obtain F_1 seeds for 28 crosses. In the second season (2013/ 2014), the hybrid seeds of 28 crosses were sown to give the F_1 plants. These plants were selfed to produce F_2 seeds. Moreover, the same parents were crossed again to produce F_1 seeds. The new hybrid seeds and part of the seeds obtained from F_1 selfed plants (F_2 seeds). The final experiment (2014/2015) were evaluated the 8 parents, 28 F_1 and 28 F_2 under recommended sowing date (D1) and late sowing date (D2). Planting of (D1) was on 30 November and (D2) was on 30 December, using a randomized complete block design with three replications, plants within rows were spaced 10 cm apart. Two rows were devoted for each parent and F_1 progenies, five rows for F_2 generation for each cross. Data were recorded on 20 randomly selected plants from each replication in case of parents and F_1s, while sixty in F_2 generation in both environments separately for 4 characters viz., days to maturity, No. of spikes/plant, 100-grain weight (g) and grain yield/ plant (g) on individual guarded plants in recommended and late sowing dates. Heterosis was estimated as the deviation of F_1 mean from mid and better parent values. Griffing (1956) model 1 method 2 of diallel analysis was used to estimate general and specific combining ability effects.

RESULTS AND DISCUSSION

1- **The analysis of variance**: The obtained data in Table (2) showed that highly significant among all genotypes for all studied traits under both planting dates, parents (P.) highly significant for all studied characters except F_1 under (D1, D2) for 100-grain weight and F_1 under (D2) only for grain yield/plant was not significant. While, crosses (C.) significant or highly significant in both planting dates in (F_1, F_2) for all studied characters except F_2 under (D1) only for grain yield/plant was not significant. And (P. *vs*. C.) was highly significant in F_2 under (D1) for days to maturity, and F_1, F_2 under (D2) for No. of spikes/plant but (P. *vs*. C.) was significant for 100-grain weight and grain yield/plant in both planting dates except F_2 under (D2) not significant for 100-grain weight. On the other hand GCA and SCA were highly significant with F_1 and F_2 for all studied characters under both planting dates. These results revealed that both additive and non-additive gene effects were involved in controlling for all studied characters. However, the GCA/SCA ratio was more than unity indicating the preponderance of additive and non-additive gene effects in the genetic control for all studied characters under (D1) and (D2). These results are in agreement with those reported by Nayeem and Veer (2000).

2- **Heterosis:** Results in Table (3) showed that the heterosis in the F_1 crosses for the studied traits under recommended and late sowing dates. Under recommended sowing date (D1), significant and negative heterosis effects, compared to better parent, were found for days to maturity by crosses (P1xP5), (P1xP7) and (P5xP7), Moreover, No. of spikes/plant showed that (4 crosses positive and 21 crosses negative) out of 28 crosses were significant or highly significant heterosis effects. And studied trait 100-grain weight showed that (17 crosses) out of 28 crosses were highly significantly and positive heterosis, while (9 crosses) out of 28 crosses were highly significant and negative heterosis effects. However, grain yield/plant showed that the hererosis relative BP% were significant or highly significant and positive in (10 crosses), and (7 crosses) out of 28 crosses were highly significant and negative heterosis effects. Similar findings were reported by Abd-Allah and Abd El- Dayem (2008), Abdel Nour and Zakaria (2010), Abd-Allah and Mostafa (2011), Abd-Allah and Hassan (2012).

Under late sowing date (D2), the results generally paralled with those the recommended sowing date except for significant and negative heterosis effects for days to maturity by crosses (P1xP5), (P1xP8), (P2xP3), (P3xP5), (P3xP8) and (P5xP7), Moreover, No. of spikes/plant showed that (one cross only positive and 26 crosses negative) out of 28 crosses were highly significant heterosis effects. And for 100-grain weight showed that (24 crosses) out of 28 crosses were highly significantly and positive heterosis, while (3 crosses) out of 28 crosses were highly significant and negative heterosis effects. However, grain yield/plant showed that (10 crosses positive and 3 crosses negative) out of 28 F_1 crosses were significant or highly significant heterosis effects. These results are in agreement with those of Joshi *et al*. (2003) and Abd El-Haleem *et al.* (2009) who reported that heterosis above the better parent was significant and negative for heading and maturity indicating that dominance direction was toward the earlier parent.

3 - General combining ability (GCA): Estimate of GCA effects for each parents are shown in Table (4). The best combiners for days to maturity were parent Sids-4 (P5) had negative and highly significant under both planting dates and Sids-12 (P2) under (D2) only, while the prenatal Shandaweel-1 (P1) and Line-26 (P8) showed positive and highly significant for No. of spikes/plant under (D2) only. Line-26 (P8) had positive and significant for grain yield/plant under (D2) only.

4- Specific combining ability (SCA):- Data in Table (5) indicated that the SCA in the 28 F_1 crosses for the studied traits under recommended and late sowing dates. Under recommended sowing date (D1), significant and negative were found for days to maturity by cross (P1xP7), Moreover, for No. of spikes/plant showed that cross (P7xP8) had positive and highly significant, while significant or highly significant and positive SCA were found for 100-grain weight by crosses (P2xP7) and (P3xP5). And studied trait grain yield/plant showed that significant or highly significant and positive SCA by crosses (P1xP5), (P1xP7), (P2xP6), (P4xP5) and (P7xP8). Under late sowing date (D2), the results showed that had significant and negative SCA for days to maturity by crosses (P1xP5) and (P2xP3), for 100-grain weight revealed that crosses (P2xP7), (P3xP5), (P3xP6) and (P4xP8) had significant or highly significant and positive SCA, on the other hand, significant or highly significant and positive SCA for grain yield/plant by crosses (P1xP4), (P1xP7), (P2xP5) and (P6xP8). These crosses could be resealed as conventional variety or used as improved parents for F_1 hybrids. Our results suggest that there are significant differences among genotypes that can be used in breeding for heat tolerance at the development of high yielding wheat varieties. These results are in harmony with those obtained by Ahmad et al (2011), Tharwat (2012), Abd-Allah *et al* (2013), Gheith *et al* (2013), Mohammed and Agit (2013) and Choudhary *et al* (2014).

Table (2): Analysis of variance of the studied traits for 8 parents, 28 F_1 and 28 F_2 crosses under recommended (D1) and late sowing date (D2).

Source of variance	D.f	MS							
		Days to maturity				No. of spikes per plant			
		D1		D2		D1		D2	
		F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2
Reps. (R)		9.95	5.25	1.18	11.23	0.19	9.15	3.06	8.48
Genotypes (G)	35	8.60**	9.53**	17.31**	12.91**	11.65**	9.02**	13.67**	16.98**
Parents (P)	7	19.33**	19.71**	25.14**	31.71**	15.13**	31.88**	21.33**	37.50**
Crosses (C)	27	5.80*	6.36*	15.86**	10.30*	11.24**	7.43*	10.22**	13.34**
P. *vs*. C	1	8.90	108.66**	1.65	5.36	2.70	9.30	39.24**	102.17**
Error	70	2.88	3.19	3.02	5.79	3.62	4.11	3.35	3.54
GCA	7	27.00**	29.81**	58.29**	42.26**	31.55**	15.64**	46.57**	19.15**
SCA	27	3.99**	4.46**	7.07**	5.57**	6.67**	7.36**	5.44**	16.44**
GCA / SCA		6.77	6.68	8.24	7.59	4.73	2.13	8.56	1.16
Error	70	0.96	1.06	1.01	1.93	1.21	1.37	1.12	*1.18*

Table, 2 (Continued)

Source of variance	D.f	MS							
		100-grain weight				Grain yield per plant			
		D1		D2		D1		D2	
		F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2
Reps. (R)	2	0.17	0.35	0.16	0.42	8.96	46.16	4.76	8.03
Genotypes (G)	35	0.93**	1.17**	0.98**	1.40**	51.78**	49.94*	72.87**	58.68**
Parents (P)	7	0.91	3.38**	0.53	1.23**	63.78*	98.99**	28.92	45.51**
Crosses (C)	27	0.86*	1.19**	0.63**	1.16**	43.39*	41.91	81.64**	59.66**
P. *vs*. C	1	2.95*	0.47	13.54**	13.16**	193.02**	377.49**	143.00**	302.26**
Error	70	0.46	0.25	0.31	0.24	23.50	27.85	22.40	13.28
GCA	7	1.70**	2.56**	1.47**	1.66**	80.99**	63.71**	164.99**	102.79**
SCA	27	0.74**	0.83**	0.86**	1.33**	44.48**	46.50**	49.84**	47.65**
GCA / SCA		2.30	3.08	1.71	1.25	1.82	1.37	3.31	2.16
Error	70	0.15	0.08	0.10	0.08	7.83	9.28	7.47	*4.43*

**: significant at 1%   *: significant at 5%

Table (3): Heterosis values over better parents (BP %) of 28 F_1 crosses under recommended (D1) and late sowing date (D2).

Crosses	Days to maturity		No. of spikes per plant		100-grain weight		Grain yield per plant	
	BP %		BP %		BP %		BP %	
	D1	D2	D1	D2	D1	D2	D1	D2
P1 x P2	-1.04	-2.73	-26.67**	-37.50**	8.68**	8.57**	-2.87	0.06
P1 x P3	-0.85	0.22	-20.00**	-25.00**	-18.33**	-10.00**	-13.02**	4.81
P1 x P4	-0.39	0.22	-33.33**	-18.75**	-3.69**	-7.28**	0.38	15.41**
P1 x P5	-2.80*	-5.45**	-26.67**	-56.25**	-16.78**	10.11**	11.97**	-2.28
P1 x P6	-0.39	-1.47	-20.00**	-18.75**	15.30**	14.76**	11.71**	18.11**
P1 x P7	-2.79*	0.00	-20.00**	-25.00**	29.65**	16.19**	9.17*	24.15**
P1 x P8	-1.50	-3.24*	-20.00**	-12.50**	5.49**	17.12**	5.10	18.52**
P2 x P3	0.00	-4.63**	-25.00**	-35.71**	7.76**	20.88**	-20.94**	2.27
P2 x P4	0.66	1.21	-18.18**	-18.18**	1.55**	13.25**	2.51	-4.43
P2 x P5	0.20	1.30	-30.00**	-18.18**	0.70	20.66**	-0.81	8.97*
P2 x P6	-0.39	-1.50	0.00	-23.08**	11.21**	26.40**	17.69**	3.32
P2 x P7	-0.84	-0.52	-9.09**	0.00	37.67**	39.12**	7.08	12.46**
P2 x P8	0.20	1.84	-33.33**	-15.38**	12.40**	15.75**	10.87**	12.63**
P3 x P4	1.78	-1.99	-16.67**	-21.43**	-12.62**	-1.32**	-18.21**	-7.19
P3 x P5	-0.86	-4.63**	-25.00**	-28.57**	3.85**	18.46**	-7.10	-1.79
P3 x P6	-0.39	-0.51	0.00	-14.29**	3.66**	33.25**	-6.61	4.62
P3 x P7	-0.65	0.00	-8.33**	-21.43**	9.28**	7.73**	-12.83**	-7.16

P3 x P8	0.86	-2.94*	0.00	-21.43**	-7.52**	8.68**	-7.94*	0.86

Table, 3 (Continued).

P4 x P5	0.46	-0.53	-9.09**	-45.45**	-18.01**	4.84**	19.86**	-33.44**
P4 x P6	0.46	0.75	9.09**	-23.08**	-16.12**	7.51**	0.39	8.61*
P4 x P7	-0.39	0.00	-18.18**	-9.09**	1.36*	-0.88	-2.93	-30.45**
P4 x P8	1.32	1.96	-16.67**	-23.08**	4.66**	31.35**	10.72**	-1.69
P5 x P6	-1.70	-2.48	-9.09**	-30.77**	-11.01**	17.36**	-12.30**	-15.53**
P5 x P7	-2.98*	-2.96*	-36.36**	-20.00**	-0.17	12.75**	12.23**	10.61**
P5 x P8	1.14	-0.23	-25.00**	-15.38**	-2.27**	15.38**	6.70	5.82
P6 x P7	-1.04	0.00	18.18**	-15.38**	6.90**	20.56**	-10.31*	-3.15
P6 x P8	0.00	-1.50	8.33**	7.69**	4.07**	12.56**	14.74**	25.49**
P7 x P8	-2.14	0.22	33.33**	-7.69**	7.32**	24.43**	25.33**	4.63
L.S.D 5%	± 2.763	± 2.833	± 3.100	± 2.980	± 1.103	± 0.908	± 7.896	± 7.709

**: significant at 1%   *: significant at 5%

Table (4): Estimates of general combining ability (GCA) effect of 8 bread wheat genotypes for the studied traits under recommended (D1) and late sowing date (D2).

Genotype	General combining ability effect							
	Days to maturity		No. of spikes per plant		100-grain weight (gm)		Grain yield per plant	
Parents	D1	D2	D1	D2	D1	D2	D1	D2
Shandaweel-1 (P1)	-0.12	0.83	0.62	1.61**	-0.24	-0.37*	2.32	2.38
Sids-12 (P2)	-0.18	-0.91*	-0.95	-0.66	0.10	0.03	-0.68	1.46
Giza-168 (P3)	0.58	0.79	0.82	0.41	-0.36*	-0.24	0.94	1.09
Gemmiza-9 (P4)	0.85	0.96*	-0.28	-0.69	-0.08	0.03	-1.43	-2.89*
Sids-4 (P5)	-1.98**	-2.71**	-2.02**	-2.29**	0.29	0.28	-1.76	-3.46**
Line- 11 (P6)	0.85	0.16	0.92	0.71	-0.09	0.02	0.95	0.48
Line- 13 (P7)	0.52	1.66**	0.35	-0.26	0.07	0.00	-1.90	-1.60
Line- 26 (P8)	-0.52	-0.74	0.55	1.18*	0.31	0.26	1.59	2.54*
L.S.D.(gi) 5%	± 0.578	± 0.592	± 0.649	± 0.624	± 0.231	± 0.190	± 1.652	± 1.613
L.S.D.(gi-gj) 5%	± 0.874	± 0.894	± 0.980	± 0.942	± 0.349	± 0.281	± 2.500	± 2.440

**: significant at 1%   *: significant at 5%

Table (5): Estimates of specific combining ability effects of 28 F_1 crosses under recommended (D1) and late sowing date (D2).

Crosses	**specific combining ability effects**							
	Days to maturity		No. of spikes per plant		100-grain weight		Grain yield per plant	
	D1	D2	D1	D2	D1	D2	D1	D2
P1 x P2	0.10	-0.82	1.06	-1.94*	-0.10	0.16	-1.73	-3.76
P1 x P3	-0.34	1.49	0.29	-0.67	-0.88*	-0.35	-3.82	-0.32
P1 x P4	0.06	1.32	-1.28	1.43	0.29	-0.20	0.38	4.96*
P1 x P5	-0.77	-2.68**	1.12	-2.97**	-0.29	0.36	5.58*	-0.63
P1 x P6	0.06	-0.22	-0.48	-0.31	0.68	0.43	2.77	2.56
P1 x P7	-2.27*	0.32	0.09	-0.34	0.69	0.51	5.55*	6.77**
P1 x P8	-0.24	-1.65	0.22	0.56	0.12	0.50	-0.67	1.77
P2 x P3	-0.27	-3.12**	-1.81	-1.41	-0.02	0.15	-4.49	-0.34
P2 x P4	-0.20	1.39	-0.04	0.03	0.22	0.32	0.22	-0.13
P2 x P5	1.30	2.72**	-0.98	1.29	0.38	0.44	-0.72	5.31*
P2 x P6	0.13	-0.82	0.76	-1.37	0.15	0.19	6.47*	-0.70
P2 x P7	0.80	0.72	-0.01	0.93	0.87*	0.60*	2.45	4.71
P2 x P8	-0.17	1.42	-2.21*	-0.84	0.12	0.04	0.73	0.65
P3 x P4	1.36	-1.32	-1.14	0.29	-0.06	-0.07	-2.47	0.48
P3 x P5	0.20	-1.32	-0.41	0.89	1.01**	0.61*	3.06	3.05
P3 x P6	-0.64	1.49	-0.68	-0.44	0.26	0.74*	0.55	1.51
P3 x P7	0.36	0.69	-0.78	-0.47	0.01	-0.32	0.53	-0.82
P3 x P8	1.40	-0.95	-0.31	-1.91	-0.40	-0.01	-0.69	-1.95
P4 x P5	1.26	0.85	2.02	-2.01*	-0.52	-0.28	5.93*	-7.20**

Table 5, (Continue).

P4 x P6	0.43	0.32	1.09	-0.67	-0.51	0.09	0.22	3.22
P4 x P7	0.43	-0.48	-1.68	-0.04	0.24	-0.28	-2.30	-8.07**
P4 x P8	1.13	2.22*	-0.88	-1.14	0.16	0.92**	1.41	-0.23
P5 x P6	-0.07	-0.35	0.82	-0.41	-0.10	0.31	-4.62	-4.44
P5 x P7	-0.74	-0.82	-2.28*	0.23	0.36	0.12	-0.37	3.00
P5 x P8	1.30	0.55	-0.48	1.13	0.00	-0.03	0.17	3.04
P6 x P7	-0.57	0.32	1.12	-0.11	-0.02	0.00	-3.68	-2.07
P6 x P8	1.13	-0.98	0.26	1.46	-0.11	-0.09	3.00	6.16*
P7 x P8	-0.87	1.55	4.16**	0.09	-0.10	0.45	7.52**	0.74
L.S.D. (sij)	± 1.772	± 1.816	± 1.988	± 1.912	± 0.708	± 0.582	± 5.063	± 4.943
L.S.D. (sij-sik)	± 2.321	± 2.687	± 2.941	± 2.829	± 1.047	± 0.861	± 7.491	± 7.314
L.S.D. (sij-skl)	± 2.471	± 2.533	± 2.773	± 2.667	± 0.987	± 0.812	± 7.063	± 6.896

**: significant at 1% *: significant at 5%

Generally, this indicated that some parental varieties and crosses could be affectivity used as promising progenitors for high expression of the characters under consideration and that specific combination with high performance could be exploited in hybrid production programs. Consequently, it could be concluded that the crosses (P1xP4), (P1xP7), (P2xP5) and (P6xP8) would be of interest in breeding programs for genetic improvement of wheat for late planting tolerance that could be used in double cropping systems mainly, i.e., cotton-wheat, and late maize-wheat sequences.

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الملخص العربي

القدرة على الأئتلاف وقوة الهجين فى بعض الطرز الوراثية للقمح تحت ميعادين للزراعة

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اجري هذا البحث فى محطة البحوث الزراعية بملوى والتابعة لمركز البحوث الزراعية– بمحافظة المنيا خلال المواسم 2013/12 الى 2015/14م وقد استهدف البحث دراسة مظاهر الفعل الجينى التى تشمل قوة

الهجين والقدرة على الائتلاف لتحديد أفضل الأباء والهجن التى يمكن ادخالها فى برامج التربية لبعض الصفات الاقتصادية فى القمح وقد استخدم فى هذه الدراسة ثمانى اباء من قمح الخبز وقد تم عمل كل التهجينات الممكنة بين الأباء بطريقة التهجين النصف دائرى فى موسم 2013/12م وقد تم تقييم الأباء الثمانى والهجن المتحصل عليها تحت ميعادين للزراعة (30 نوفمبر− 30 ديسمبر) وتم تسجيل القراءات على الصفات (عدد الأيام حتى النضج – عدد السنابل لكل نبات – وزن 100 حبة – محصول الحبوب لكل نبات) على النباتات الفردية واوضحت هذه الدراسة ما يلى:−

1− كان التباين لجميع التراكيب الوراثية معنويا لجميع الصفات بالاضافة الى معنوية التباين الراجع الى القدرة العامة والخاصة على الائتلاف فى جميع الصفات فى الجيل الأول والثانى تحت ميعادى الزراعة .

2− قوة الهجين كانت واضحة ومعنوية بصفة عامة فى جميع الصفات فقد أظهرت الهجن ,(P5xP7), (P1xP5) قوة هجين بالنسبة للأب المبكر فى تاريخ النضج فى ميعادى الزراعة والهجين (P6xP8) بالنسبة للأب الاعلى فى صفة عدد السنابل فى النبات تحت ميعادى الزراعة والهجين (P2xP7) فى الميعاد الامثل والهجن (P3xP6),(P2xP7) فى الميعاد المتأخر بالنسبة للأب الاعلى فى صفة وزن 100 حبة والهجين (P7xP8) فى الميعاد الامثل والهجين (P6xP8) فى الميعاد المتأخر بالنسبة للأب الاعلى فى صفة محصول النبات.

3− أظهرت بعض التراكيب الوراثية قدرة عامة على الائتلاف لبعض الصفات وبذلك يمكن استخدامها كأباء فى التهجينات والانتخاب فى الانعزالات الناتجة لتحسين الصفات على النحو التالى الأبين (سدس12 و سدس4) أظهر قدرة عالية على الائتلاف لصفة التبكير فى النضج تحت الميعاد المتأخر والأبين (شندويل1 و Line-26) لصفة عدد السنابل للنبات فى الميعاد المتأخر والأب Line-26 لصفة محصول الحبوب للنبات فى الميعاد المتأخر.

4− علاوة على ما سبق فقد أمكن تحديد بعض الهجن التى تمثل أهمية كبيرة لمجال انتخاب سلالات متفوقة من نسلها حيث كانت تتميز أيضا بالقدرة الخاصة على الائتلاف وهذه الهجن هى الهجين (P1xP7) تحت الميعاد الامثل والهجن(P1xP5), (P2xP3) تحت الميعاد المتأخر لصفة التبكير فى النضج و الهجين (P7xP8) لصفة عدد السنابل للنبات فى الميعاد الأمثل و الهجن (P2×P7) ,(P3xP5) تحت ميعادى الزراعة والهجن (P3xP6) و(P4xP8) تحت الميعاد المتأخر لصفة وزن 100 حبة و الهجين (P2×P7) تحت ميعادى الزراعة والهجن (P1xP5),(P2xP6),(P4xP5),(P7xP8) تحت الزراعة فى الميعاد الأمثل و الهجين (P6xP8) تحت الزراعة المتأخرة لصفة محصول النبات.