Genetic Parameters for Some F_1 Bread Wheat (*Triticum aestivum* L.) Crosses

Soheir, M.H. Abd Allah and A. K . Mostafa[1]

ABSTRACT

A one-way diallel cross among five common wheat genotypes were evaluated in F_1 at Etay El-Baroud Agricultural Research Station during 2005/2006 and 2006/2007 seasons to study some genetical parameters. Mean squares of genotypes were highly significant for all characters in F_1. Parents vs crosses mean squares, as an indication to average heterosis overall crosses, were found to be highly significant for number of spikes/ plant, number of grains/spike and 1000-kernel weight. (GCA) and (SCA) mean squares were highly significant for all studied traits. Also, GCA/SCA variance ratio were found to be greater than unity for all traits except grain yield /plant. The additive variance (D) was significant for all studied traits except number of kernels/ spike and grain yield/ plant. Dominance components of variation (H_1) and the dominance effects associated with gene distribution (H_2) were highly significant and greater than (D), for all characters. The overall dominance effects of heterozygous (h^2) were significant for number of spikes/plant and number of kernels/ spike. The covariance of additive and dominance (F) was significant for heading and maturity dates. (H_1/D) ^{½} showed the presence of overdominance for most traits. Low heritability narrow sense values were detected for all characters. Therefore, selection would be more effective in postponed to the advanced generations.

Key words: General combining ability, Specific combining ability, Heterosis, Heritability and Genetic components.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is considered one of the most strategic food crops in Egypt .The annual consumption of wheat is about 12.4 million tons, while the annual local production is about 8.2 million tons. Efforts of scientists to minimize the gap between local production and consumption are directed towards two ways i.e., expanding the cultivated wheat area and increasing the wheat productivity from the land unit area.

The main goal of the Egyptian National Wheat program is to develop high yielding cultivars. This could be achieved through, genetic studies of heterosis, combining ability and genetic variation components for wheat genotypes to select promising lines from good crosses .Breeders of self pollinated crops are confronted by two major problems: the first, is identifying the best parental combinations that will result in the highest percentage of desirable progeny, and the second effective selection in early generations. Creating genetic variability and identifying the most promising parental combinations is a difficult task due to the large amount of available germplasm. This is particularly true when attempting to improve quantitative traits such as grain yield where many genes are involved and environmental influence is present (Mather and Jinks, 1971).

In a self pollinated crop like wheat, utilization of heterosis depends mainly upon its direction and magnitude. The heterosis over better parent may be useful in identifying true heterotic hybrid combinations but these hybrids can be of immense practical value if they show the best cultivars of the area (Prassed *et al*., 1998). Exploitation of heterosis depends mainly on general and specific combining abilities of genotypes in the hybrids.

The diallel analysis provides very useful information to plant breeders in making decisions concerning the type of breeding system and selecting promising breeding materials that shows. In this respect, additive and dominance gene effects are important for controlling the genetic system of economic characters.

The objectives of the study are:

1. To show heterosis for the studied characters.
2. Estimate the magnitude of both general and specific combining ability for these characters.
3. To study the gene action and the importance which should be given to these materials.

MATERIALS AND METHODS

This investigation was carried out at Etay El – Baroud Agric. Res. Station ,during the two successive seasons of 2005/2006 and 2006/2007. Five divergent origin common wheat cultivars and lines (*Triticum aestivum* L.em Thell) were chosen for this study Table (1).

In 2005/2006 season, grains from each of the parental genotypes were sown at various dates in order to overcome the differences in time of flowering during this season. All possible cross combinations were made among the five genotypes, without reciprocals, to obtain F_1 seeds of ten hybrids. In 2006/2007 season, the parental genotypes and their ten hybrids were sown on November 15th in a randomized complete block design

---

[1]National Wheat Res. Dept.; Field Crops
Res. Institute, ARC, Egypt
Received February24, 2009, Accepted March 24, 2009

Table 1. Name and pedigree of five parental bread wheat genotypes:

No.	Name	Pedigree
P_1	Line≠	ALD/CEP75630//CEP75234
P_2	Giza 168	MRL/BUC//Seri
P_3	Sakha93	Sakha92/TR810328s
P_4	Sids1	HD2172/Pavon s /1158.571Maya 74s
P_5	Line ≠	SARA//JUP/BJY/3/KAVZ/4BABAX/5/FRTL

with three replications. Each plot consisted of two rows of each parent and F_1. Each row was three meters long and 30cm apart .Plants within row were 20cm apart. Dry method of planting was used. The other wheat growing cultural practices were properly practiced as recommended. Data for the following characters were recorded on 10 individual guarded plants, taken at random from each plot for F_1 and parents. The recorded characters were heading date (day), maturity date (day), number of spikes/plant, number of kernels /spike, 1000-kernel weight (g) and grain yield /plant (g) were recorded. Heterosis (H), according to the formula adopted by Bhatt (1971) as follow: Heterosis % over better parent value (B_p) = [F_1-Bp/ Bp] ×100. Differences between the parental genotypes and their F_1 hybrids were tested for significance using the L.S.D. values test at 0.05 and 0.01 levels of probability. Estimates of both general and specific combining abilities were calculated according to Griffing (1956), method 2, model 1. The diallel analysis, described by Hayman (1954 a and b) and Mather and Jinks (1971), was performed. The analysis involved the computation of parents variance (VOLO=vp), variance of the components of each array (Vr) and covariance of the parents with their offspring in each array (Wr). The estimated genetic components under this model are: component of variation due to additive effects (D), the covariance of dominance and additive in a single array (F), the component of variation due to dominance effects (H_1), and a dominance measure indicating a symmetry of positive and negative effects of genes (H_2). These components were used for computation the genetic parameters according to Mather and Jinks (1971).

RESULTS AND DISCUSSIONS

Analysis of variance for heading date, maturity date, number of spikes/plant ,number of kernels/spike,1000 kernel weight and grain yield/ plant are presented in Table (2).Test of significance indicated that the mean squares of genotypes were highly significant for all traits in F_1 generation. The significance of the mean squares indicated the presence of true differences among these genotypes. Mean squares due to parents, general combining ability and specific combining ability for crosses were significant for all studied traits. These findings indicate that parental varieties and /or lines differed in their mean performance for most of the tested traits. The mean performance of the five parental and ten F_1 genotypes of wheat are presented in Table (3). The parental line (P_1) ranked the first for grain yield/ plant and the second for maturity date and 1000-kernel weight. The parental cultivar Giza 168 (P_2) ranked the first for number of spikes/ plant and number of kernels/ spike, and the second for grain yield/ plant. The parental cultivar Sakha 93 (P_3) ranked the first for heading and maturity dates, and the fourth for number of spikes/ plant, 1000-kernel weight and grain yield/ plant. The parental cultivar Sids1 (P_4) ranked as the latest for earliness (heading and maturity dates), while it ranked first for 1000-kernel weight, second for number of spikes/ plant, number of kernels/ spike and, third for grain yield/ plant. The parental line (P_5) ranked the third for number of spikes/ plant, number of kernels/ spike and 1000-kernel weight, and fifth for grain yield/ plant.

Performance of the tested ten crosses in F_1 generation are presented in Table (3). For heading date in F_1 generation, (P_2×P_5) cross was the earliest (87.33 days), while the latest crosses were (P_1×P_2), (P_1×P_3) and (P_1×P_4) with values of 100.67, 100.17and 100.83 days, respectively. These results agree with those reported by Ehdaie and Waines (1996), Menshawy (2007a) and Shehab Eldeen (2008). Maturity date, was insignificant for all crosses. There were significant differences between the number of spikes/ plant in F_1 generation. In this generation, the (P_2×P_4) cross produced the highest number of spikes/ plant (14.43) followed by the (P_1×P_2) and (P_3×P_4) crosses, while (P_1×P_5) and (P_1×P_4) produced the lowest number of spikes/ plant (12.23 and 12.37 spikes, respectively).

The (P_4×P_5) cross had the highest number of kernels/ spike (53.83). However, the lowest cross in this trait was (P_1×P_5) in F_1 generation (44.83).

For 1000-kernel weight, (P_1×P_3) cross had the heaviest grains (51.03g). Conversely, (P_1×P_5) cross produced the lightest grains where its 1000-kernel weight was (45.33 g).

(P_4×P_5) had the highest grain yield/ plant in the F_1 generation (32.86g) and the lowest cross in this trait was (P_3×P_5) in this generation (23g).

Table 2. Mean squares for all studied characters in F1 generation

Source of Variation	d.f	Heading date	Maturity date	No. of Spikes/Plant	No. of Kernels/ Spike	1000-Kerne Weight	Grain yield/plant
Replication	2	10.464	592.822	2.462	8.962	0.013	32.488
Genotype	14	82.310**	206.498	2.223**	19.497**	0.122**	25.740**
Parents	4	185.584**	593.600*	2.037**	13.136**	0.184**	32.714**
Crosses	9	45.152**	20.448	1.731**	20.917**	0.097**	25.470**
Pvs F1	1	3.640	332.544	7.396**	32.160**	0.103**	0.276
G.C.A	4	159.510**	233.133	3.933**	29.553**	0.124**	17.541**
S.C.A	10	51.430**	195.844	1.539**	15.476**	0.122**	29.020**
Error	28	2.474	213.537	0.047	0.853	0.003	2.148
G.C.A/S.C.A		3.101	1.190	2.556	1.910	1.016	0.604

* and ** Significant differences at 0.05 and 0.01 probability levels, respectively.

Table 3 .The genotypes mean performance for all studied characters in F_1 generation

genotypes	Heading date	Maturity date	No.of Spikes /Plant	No.of Kernels /Spike	1000-Kernel weight	Grain yield/plant
P_1	102	146.87	13.00	44.00	48.77	30.11
P_2	88.27	172.14	15.07	48.17	44.60	29.69
P_3	88	138.00	13.93	43.63	44.90	27.85
P_4	103.67	150.00	14.87	47.67	50.17	28.43
P_5	101.60	150.00	14.10	46.67	45.83	21.93
P_1XP_2	100.67	145.93	14.23	47.50	45.60	27.58
P_1XP_3	100.17	149.67	12.97	47.50	51.03	25.50
P_1XP_4	100.83	146.93	12.37	46.43	49.50	27.16
P_1XP_5	97.07	147.17	12.23	44.83	45.33	29.20
P_2XP_3	98.00	146.33	13.07	45.30	49.20	29.38
P_2XP_4	98.00	144.43	14.43	49.27	46.40	25.82
P_2XP_5	87.33	148.83	13.40	47.43	48.17	29.53
P_3XP_4	97.00	147.100	14.10	49.90	47.17	24.33
P_3XP_5	95.83	148.77	12.93	46.20	47.93	23.00
P_4XP_5	98.20	145.83	13.60	53.83	48.37	32.86
L.S.D5%	1.18	-	0.16	0.69	0.04	1.10
L.S.D1%	1.59	-	0.22	0.93	0.06	1.48

Heterosis effects:

The heterosis values over better parent for the six characters are given in Table (4). The degree of expression of heterosis was different among characters. For heading date, heterosis over better parent ranged from 11.2% in (P_2×P_3) cross to-8.01% in (P_2×P_5). Significant heterosis relative to better parent for this trait was obtained in six crosses out of ten crosses. These results agree with those reported by El-Borhamy (2000), Ashoush *et al*. (2001), Safan (2001), Darwish (2003), Darwish *et al*. (2006) and Shehab Eldeen (2008). With regard to maturity date, the better parent heterosis was negative and significant in (P_1×P_2), (P_2×P_3), (P_2×P_4) and (P_2×P_5) crosses where the heterosis values were positive or insignificant. Relative to better parent, heterosis for maturity date ranged from 0.78 % in (P_1×P_4) and (P_1×P_5) crosses to-14.17 % in (P_2×P_4). Concerning number of spikes/ plant, all studied crosses exhibited significant negative heterosis except for (P_1×P_2) cross which was significant and positive. The heterosis values of these crosses over better parent ranged from 1.43% for cross (P_1×P_2) to-11.24% for cross (P_1×P_4).These results agree with those reported by Abdel-Wahed (2001), Ashoush *et al*. (2001), Safan (2001), Darwish (2003), El–Sayed and Moshref (2005) and Darwish *et al*.(2006).

For number of kernels/ spike, six crosses exhibited positive and significant relative to based on better parent. Heterosis ranged from- 1.10% for cross (P_1×P_5) to 14.13%for cross (P_4×P_5). These results agree with Abdel-Wahed (2001), Safan (2001), Darwish (2003), El–Sayed and Moshref (2005), Darwish *et al*. (2006) and Yahya (2008). For 1000-kernel weight, five crosses exhibited positive and significant heterosis based on better parent .The heterosis values of these crosses ranged from 0.76 % for cross (P4×P5) to 9.94% for cross (P_2×P_3). For grain yield/ plant, three crosses out of ten exhibited positive and highly significant heterosis. The heterosis values ranged from -13.54 % for cross (P_3×P_4) to 30.50 % for cross (P_4×P_5). These results are in agreement with those reported by Abdel-Wahed (2001), Darwish (2003), El-Sayed and Moshref (2005) and Darwish *et al*. (2006).

Combining ability effects:

Table (2) shows the analysis of variance of general combining ability (GCA) and specific combining ability (SCA). Mean squares values for both (GCA) and (SCA) were found to be significant or highly significant for the studied traits in F_1 generation, which could indicate the importance of both additive and non-additive genetic variance in determining the performance of all studied characters. Also, GCA/SCA variance ratio were found to be greater than unity for all studied traits except grain yield/ plant, indicating that additive and additive × additive types of gene action were more important in the inheritance of all characters studied. The presence of both additive and non-additive gene action would suggest that breeding procedures which are known to be effective in shifting gene frequency, when both additive and non-additive genetic variances are involved, would be successful in improving all traits under investigation. The obtained results are in harmony with those previously reached by Ashoush *et al*. (2001), Darwish (2003) and Darwish *et al*. (2006).

General Combining Ability effects (GCA):

Estimates of general combining ability effects for parents are presented in Table (5). Results indicated that the parental line (P_1) showed significant positive combining ability effects for heading date, 1000-kernel weight and grain yield/ plant proving to be a good combiner for grain yield/ plant and its kernel weight component. The cultivar Giza 168 (P_2) exhibited high significant negative general combining ability effects for heading date, maturity date and 1000-kernal weight. However, this cultivar (P_2) recorded high significant positive general combining ability effects for number of spikes/ plant and grain yield/ plant. Data thus indicated that Giza 168 cultivar is a good combiner for earliness measurements and grain yield /plant, although it produced lighter grains. Sakha 93 cultivar (P_3) showed high significant negative general combining ability effects for heading date, maturity date, number of spikes/ plant, number of kernels/ spike and grain yield/ pant. Data indicate that Sakha 93 is a good combiner for earliness measurements. With regard to Sids 1 cultivar (P_4), results showed high significant positive general combining ability effects for heading date, number of spikes/ plant, number of kernels/ spike and 1000-kernel weight. These data indicated that Sids1 is a good combiner for yield components. The parental line (P_5) showed significant positive general combining ability only for maturity date, however, this parental line (P_5) recorded high significant negative general combining ability effects for number of spikes/ plant, 1000-kernel weight and grain yield/ plant. It could be concluded that the mean performance of the parental lines and cultivars could be considered as good indication of their general combining ability effects for most traits under investigation. These results are in agreement with those reported by Ashoush *et al*. (2001), Dreisigacker *et al.* (2005), El–Sayed and Moshref (2005), Salem Nagwa and Abd El Dayem. (2006) and Yahya (2008).

Specific Combining Ability effects (SCA):-

Specific combining ability effects (SCA) for all

Table 4. Percentage of heterosis over better – parent (BP) for all studied characters in F_1 generation

Crosses	Heading date	Maturity date	No.of Spikes /plant	No.of Kernels /Spike	1000-Kernel weight	Grain yield/plant
P_1XP_2	5.82**	-10.54	1.425**	3.07**	-2.32**	-7.76**
P_1XP_3	5.44**	3.82	-3.713**	8.41**	8.97**	-12.02**
P_1XP_4	-1.95	-0.78	-11.244**	1.31	0.07	-7.21**
P_1XP_5	-4.65**	-0.78	-9.717**	-1.10	-4.16**	12.22**
P_2XP_3	11.20**	-7.35	-9.885**	-1.31	9.94**	2.13
P_2XP_4	2.12	-14.17	-3.563**	2.82*	-2.08**	-11.14**
P_2XP_5	-8.01**	-8.96	-8.114**	0.04	6.52**	14.41**
P_3XP_4	1.22	2.28	-2.083**	9.31**	-0.77**	-13.54**
P_3XP_5	1.09	3.45	-7.729**	2.33*	5.66**	-7.58**
P_4XP_5	-4.32**	-1.55	-6.099**	14.13**	0.76**	30.50**

* and ** Significant differences at 0.05 and 0.01 probability levels, respectively.

Table 5. Estimates of general combining ability effects (ĝi) of parents for all studied traits in F_1 generation

Parents	Heading date	Maturity date	No.of Spikes /plant	No.of Kernels /Spike	1000-Kernel weight	Grain yield/plant
P_1	2.869**	0.605	-0.560**	-1.295**	0.054**	0.674*
P_2	-3.160**	-1.229*	0.507**	0.357	-0.095**	0.963**
P_3	-2.236**	-1.467*	-0.112*	-1.024**	-0.001	-1.004**
P_4	2.673**	0.881	0.359**	1.633**	0.094**	0.296
P_5	-0.146	1.210*	-0.193**	0.329	-0.053**	-0.930**
L.S.D(gi)5%	0.629	1.118	0.086	0.369	0.021	0.586
L.S.D(gi)1%	0.848	1.507	0.116	0.498	0.027	0.791
L.S.D(gi-gj)5%	0.994	1.766	0.136	0.584	0.032	0.962
L.S.D(gi-gj)1%	1.341	2.382	0.184	0.788	0.043	1.250

* and ** Significant differences at 0.05 and 0.01 probability levels, respectively.

crosses with respect to the studied traits are given in Table (6). For heading date, four crosses (P_1×P_4), (P_1×P_5), (P_2×P_5) and (P_4×P_5) exhibited significant negative specific combining ability effects. The remaining crosses gave positive significant or insignificant ($\hat{S}_{ij}$) effects. The (P_2×P_5) cross showed the highest desirable ($\hat{S}_{ij}$) value for this trait. Similar results were obtained by El-Sayed *et al*. (2000), Hamada (2003), Abd El-Majeed *et al* (2004), Dreisigacker *et al*. (2005), El-Marakby *et al.* (2007) and Yahya (2008). For maturity date, all crosses showed insignificant SCA values except the (P_4×P_5) cross which had significant negative (SCA) effect. Hence, it could be concluded that this cross is valuable in breeding for earliness. Moreover, the cross (P_1×P_3) had significant positive effect for this trait.

With regard to number of spikes/ plant, four crosses (P_1×P_2), (P_1×P_3), (P_2×P_4) and (P_3×P_4), in the F_1 generation, exhibited significant positive effects. The remaining crosses gave significant negative or insignificant ($\hat{S}_{ij}$) effects. These results agree with Ashoush *et al*.(2001), Darwish(2003), El-Sayed and Moshref (2005), Ashoush (2006), Darwish *et al*. (2006), Salem Nagwa and Abd El Dayem. (2006) and Yahya (2008). Concerning number of kernels/ spike, four crosses (P_1×P_2), (P_1×P_3), (P_3×P_4) and (P_4×P_5), exhibited significant positive ($\hat{S}_{ij}$) effects. Also, these crosses previously exhibited significant useful heterosis for this trait. These results agree with those found by Abdel-Wahed (2001), Ashoush *et al*. (2001), Safan (2001), El-Sayed and Moshref (2005) and Ashoush (2006). For 1000-kernel weight, four crosses (P_1×P_3), (P_2×P_3), (P_2×P_5) and (P_3×P_5) exhibited significant positive ($\hat{S}_{ij}$) effects. The parents P_1 and P_2 were found to be the best combiners for this trait, therefore the hybrids combinations (P_1×P_3), (P_2×P_3) and (P_2×P_5) could be of particular importance in a breeding program for developing either hybrid wheat or pure lines with heavy grains since they surpassed the best performing parents for 1000-grain weight. Similar results were obtained by El-Sayed *et al.* (2000), Ashoush *et al*.(2001), Hamada (2003), Abd El-Majeed *et al.* (2004), Nadia (2005), Ashoush (2006), Darwish *et al*. (2006), Salem Nagwa and Abd El Dayem. (2006) and Yahya (2008). For grain yield/ plant, four crosses (P_1×P_5), (P_2×P_3), (P_2×P_5) and (P_4×P_5) exhibited significantly positive specific combining ability effects. Hence these crosses are considered to be promising hybrids for varietal improvement purpose where they showed high significant positive values of specific combining ability effects and involved two general combiner parents ($P_1$and P_2). In such hybrids, it could be expected that diverse genes contributing to the better general combining ability effects of the parents are available in the hybrids and in the segregating generation. These results agree with those found by El-Sayed *et al*. (2000), Ashoush *et al.* (2001), Hamada (2003), Abd El-Majeed *et al.* (2004), El Sayed (2004), El-Sayed and Moshref (2005), Nadia (2005), Salem Nagwa and Abd Dayem. (2006) and Yahya (2008).

The obtained results concerning general and specific combining ability effects would indicate that the excellent hybrid combinations were obtained from the two possible combinations between the parents of high and low general combining ability effects i.e., high □ high, high □ low and low □ low. It could be concluded that general combining ability effects were generally unrelated to the specific combining ability of their respective crosses. This conclusion was also drawn by Darwish (2003), Ashoush (2006), Darwish *et al.* (2006) and El-Marakby *et al.* (2007).

Genetic Components and heritability :-

Data presented in Table (7) revealed that the additive component values (D) were significant for all traits, except number of kernels/ spike and grain yield/ plant in F_1 generation. These results indicated that the additive gene effects played a major role in the inheritance of most of the studied traits. A dominance component of variation (H_1), also, was highly significant and greater than (D) for all traits. The component of variation due to dominance effects associated with gene distribution (H_2) was highly significant and greater than (D) for all traits. All (H_2) values were smaller than (H_1) values for all traits, indicating that dominance gene effects played a major role in the genetic systems controlling these characters. The overall dominance effects of heterozygous loci (h^2) were insignificant for all traits, except for number of spikes/plant and number of kernels/spike in the F_1 generation indicating that dominance was unidirectional. These results are in agreement with those obtained by Mostafa (2002), Ashoush (2006), Darwish *et al*. (2006) and Seleem (2006).

The covariance of additive and dominance (F) was not significant for all traits in F_1 except heading and maturity dates. It could be generally concluded that the presence of equality of the relative frequencies for dominant and recessive alleles in the studied parents for all traits. These findings were in line with those reached by Ashoush (2006).

The relative size of (D) and (H_1) estimated as $(H_1/D)^{½}$ can be used as a weight measure for the average degree of dominance at each locus. Data in Table (7) showed the presence of overdominance for most traits.

Table 6. Estimates of specific combining ability effects ($\hat{S}_{ij}$) for studied crosses in F_1 generation

Crosses	Heading date	Maturity date	No.of Spikes /plant	No.of Kernels /Spike	1000-Kernel weight	Grain yield/plant
P_1XP_2	3.648**	-0.543	0.953**	0.618*	-0.187**	-1.493
P_1XP_3	2.224**	3.429*	0.306**	1.999**	0.263**	-1.607*
P_1XP_4	-2.019*	-1.652	-0.766**	-1.725**	0.015	-1.246
P_1XP_5	-2.966**	-1.748	-0.347**	-2.020**	-0.255**	2.020*
P_2XP_3	6.086**	1.929	-0.661**	-1.853**	0.228**	1.988*
P_2XP_4	1.177	-2.319	0.234*	-0.544	-0.146**	-2.875**
P_2XP_5	-6.671**	1.752	-0.247*	-1.072*	0.177**	2.057**
P_3XP_4	-0.747	0.586	0.520**	1.471**	-0.164**	-2.399**
P_3XP_5	0.905	1.924	-0.094	-0.925	0.060*	-2.499**
P_4XP_5	-1.638*	-3.357*	0.101	4.051**	0.009	6.054**
L.S.D0.05(S_{ij})	1.623	2.883	0.223	0.954		
L.S.D0.01(S_{ij})	2.190	3.890	0.300	1.286		
L.S.D0.05(S_{ij}-S_{ik})	2.440	4.325	0.336	1.430		
L.S.D0.01(S_{ij}-S_{ik})	3.290	5.835	0.453	1.929		
L.S.D0.05(S_{ij}-S_{kl})	2.223	3.948	0.305			
L.S.D0.05(S_{ij}-S_{kl})	2.999	5.327	0.411			

* and ** Significant differences at 0.05 and 0.01 probability levels, respectively.

Table 7. Estimates of genetic components of variation in a diallel wheat in F_1 generation

character components	Heading date	Maturity date	No.of Spikes /plant	No.of Kernels /Spike	1000-Kernel weight	Grain yield/
D	61.037**	79.688**	0.664**	4.094	0.061**	10.189
H_1	77.178**	105.171**	1.641**	19.252**	0.168**	41.247**
H_2	63.53**	82.855**	0.946**	14.084**	0.090**	30.268**
h^2	0.514	47.717	1.311**	5.667**	0.018	-0.065
F	61.317*	207.505**	-0.077	-0.301	0.075	17.113
E	0.825	71.179**	0.016	0.284	0.001	0.716
$(H1/D)^{½}$	1.060	1.020	1.254	1.473	1.291	1.418
(H2/4H1)	0.205	0.196	0.144	0.182	0.138	0.183
$[(4DH1)^{½}+F]/[(4DH1)^{½}-F]$	2.615	1.401	0.930	0.970	2.186	2.433
h^2/H_2	-0.008	5.76	-1.386	-0.402	0.2	-0.002
h^2 /(n.s)	37.52	5.16	30.77	20.63	0.5	0.00
r^2	0.200	0.088	0.302	0.055	0.307	0.945

* and ** Significant differences at 0.05 and 0.01 probability levels, respectively.

Similar results were obtained by Ashoush (2006) and Darwish *et al*. (2006).

The mean values of (U and V) over all loci ($H_2/4H_1$) were slightly below the maximum value of 0.25, which arises when U=V=0.5 over all loci, indicating that the positive and negative alleles were not equally distributed among the parents for all traits.

The ratio KD/KR=$\{(4DH_1)^{½}+F\}/\{(4DH_1)^{½}-F\}$ were more than unity for all traits, except for number of spikes/ plant and number of kernels/spike where the ratio was less than unity, suggesting that recessive genes were excessive for these traits.

Heritability estimates in narrow sense for all traits are given in Table (7). Low heritability values in narrow sense were detected for all traits, indicating that genetic variance may be due to non-additive genetic effects. This finding is supported by the previous results of genetic components where the (H_1) estimates were found to have a great role in these traits. The results were in agreement with those obtained by Mostafa (2002), El-Sayed (2004), Ashoush (2006) and Darwish *et al*. (2006).

REFERENCES

Abd El-Majeed, S.A., A.M.Moussa and A.A.Abd El-Karim (2004).Combining ability for yield and its components in bread wheat (*Triticum aestivum* L.) crosses. Egypt J. Appl. Sci. 19(7):132-142.

Abd El-Wahed, H.M.(2001). Combining ability in some wheat crosses. M. Sc. Thesis, Fac. Agric. Azhar Univ., Egypt.

Adly, Nadia R.A. (2005). Heterosis and combining ability of a five parents diallel of bread wheat .Egypt. J. Agric. Res., 83(4):1711-1723.

Ashoush, H. A. (2006). Breeding for yield and its components in some wheat crosses (*Triticum aestivum* L.).Alex. Sci. J. 27(3):322-335.

Ashoush, H.A; A A .Hamada and I .H.Darwish (2001). Heterosis and combining ability in F_1 and F_2 diallel crosses of wheat(*Triticum aestivum* L.) .J. Agric. Sci. Mansoura Univ. 26(5):2579-2592.

Bhatt, G.M.(1971). Heterosis performance and combining ability in a diallel cross among spring wheat (*Triticum aestivum* L.).Aust.J. of Agric. Res. 22:359-369.

Darwish, I.H.I. (2003). Diallel cross analysis of wheat (*Triticum aestivum* L.) under stress and normal irrigation treatments .Egypt. J. Breed.2 (1):252-269.

Darwish, I .H .I; E Elsayed and Waffaa Al-Awady (2006). Genetical studies of heading date and some agronomic characters in wheat . Annals of Agric. Sci., Moshtohor. 44(2):427-452.

Dreisigacker, S., A.E. Melchinger, P.Zhang, K.Ammar, C.Flachenecker, D. Hoisington and M.L. Warburton (2005). Hybrid Performance and heterosis in spring bread wheat and their relations to SSR-based genetic distances and coefficients of parentage. Euphytica 144:51-59.

Ehdaie, B. and J. G. Waines (1996). Genetic variation for contribution of pre-anthesis assimilates to grain yield in spring wheat. J. Genet. And Breed. 50(1): 47-55.

El-Borhamy, H. S. (2000). Genetic studies on some quantitative characters in bread wheat (*Triticum aestivum* L.). Ph.D. Thesis, Fac. of Agric. Moshtohor, Zagazig Univ. (Benha Branch).

El- Marakby, A.M., A.A. Mohamed, Afaf F.Tolba and S.H.Saleh (2007). Nature of gene action in the inheritance of earliness, grain yield and grain quality traits in diallel crosses of bread wheat under different environments. Proceeding Fifth Plant, Breeding Conf., 27, 2007. Egypt. J. Plant Breed., 11(1):1665-1679.

El-Sayed, E.A.M.(2004). A diallel cross analysis for some quantitative charecters in bread wheat (*Triticum aestivum* L.). Egypt. J. Agric. Res., 82(4):1665-1679.

El-Sayed, E.A.M., A. M. Tammam and S.A. Ali (2000). Genetical studies on some bread wheat crosses (*Triticum aestivum* L.). Menofiya J. Agric. Res. , 25(2):389-401.

El-Sayed, E.A.M. and M.Kh. Moshref (2005). Breeding for yield, yield components and some agronomic characters in bread wheat .Egypt .J. Agric. Res.83(2):665-679.

Griffing .JB.(1956). Concept of general and specific combining ability in relation to addiallel crosses system .Aust . J .of Biol .Sci. : 463.493.

Hamada, A.A. (2003).Heterosis and gene action of yield and its components and some growth traits in an eight parent diallel cross of bread wheat under three sowing dates . Minofiya J. Agric. Res. 28(3):787-819.

Hayman, B.I. (1954a). The analysis of variance of diallel tables. Biometrics. 10:235-244.

Hayman,B.I. (1954b).The theory and analysis of diallel crosses .Genetics. 39:789-809.

Mather, K. and J.L.Jinks (1971).Biometrical Genetics 2nd ed. Chapman and Hall Ltd, London.

Menshawy, A. M.M. (2007a). Evaluation of some early bread wheat genotypes under different sowing dates. Egypt. J. Plant Breed., 11(1): 25-40.

Mostafa ,A.k.(2002) .Diallel crosses analysis for yield and yield components in wheat .J.Agric .Sci .Mansoura Univ ., 31 (8) : 4873-4883.

Prassed, KD. , M .F.Haque and D. K. Ganguli(1998).Heterosis studies for yield and its components in bread wheat (*Triticum aestivum* L.). Indian J.Genet.58 (1):97-101.

Safan ,A A .(2001).Diallel analysis of grain yield and other agronomic traits in bread wheat (*Triticum aestivum* L.).M.Sc. Thesis Fac. of Agric. Moshtohor, Zagazig Univ. (Benha Branch).

Salem, Nagwa R.A. and S.M.Abd El Dayem. (2006). Genetical study on some bread wheat crosses. Mansoura Univ., vol.31N8).

Seleem , S. A. (2006). Combining ability and type of gene action in common wheat .Menufiya J. Agric. Res. 31(2):399-420.

Shehab Eldeen, M. T. E.(2008). Breeding studies on earliness and drought tolerance in bread wheat . M. Sc. Thesis, Fac. of Agric. Cairo Univ.

Yahya, A. I. A.(2008).Heterosis and combining ability in diallel cross of bread wheat . M. Sc. Thesis. Fac. of Agric. Benha Univ.

الملخص العربي

المقاييس الوراثية فى بعض هجن الجيل الأول لقمح الخبز

سهير محمود حسن عبد الله، أحمد كمال مصطفى

تم تقييم الهجن الناتجة من التهجين أحادى الجهة لخمسة أصناف وسلالات من قمح الخبز للجيل الأول؛ وذلك فى محطة البحوث الزراعية بإيتاى البارود خلال موسمي (٢٠٠٥/٢٠٠٦ – ٢٠٠٦/٢٠٠٧).

بهدف التربية لزيادة المحصول عن طريق تحسين مكونات المحصول وفيما يلى أهم النتائج المتحصل عليها:-

١) كان التباين الراجع الي كل من التراكيب الوراثية والاباء والهجن وقوة الهجن معنوية لمعظم الصفات المدروسة في الجيل الأول وكان الأب الأول (P_1) أفضل الأباء في صفات محصول الحبوب /النبات والتبكير في النضج ووزن الألف حبة في حين كان الأب الثاني (P_2) الأفضل في صفات عدد السنابل /نبات ، عدد الحبوب /السنبلة ومحصول الحبوب / نبات .في حين الأب (P_3) كان الأبكر في الطرد وعدد الأيام للنضج أما الأب (P_4) أعطي أثقل الحبوب وزنا كما كانت أفضل الهجن (P_1 X P_3)، (P_1 X P_5)، (P_4 X P_5) .

٢) كان التباين الراجع للقدرة العامة والخاصة علي التألف معنوياَ لكل الصفات المدروسة . كما كانت نسبة القدرة العامة إلي القدرة الخاصة للخلط تزيد عن الوحدة في كل الصفات عدا صفة محصول الحبوب/ نبات مما يدل علي أهمية التأثير المضيف في هذه الصفات.

٣) كان أفضل الأباء في القدرة العامة علي التألف (P_2) لصفة محصول الحبوب /النبات، (P_4) لصفة عدد الحبوب /السنبلة ووزن الأف حبة .بينما أعطت الهجن (P_1X P_5)، (P_4 X P_5) قدرة خاصة موجبة ومعنوية لصفة محصول الحبوب /النبات.

٤) كان التباين المضيف معنوياَ لصفة عدد الأيام للوصول للنضج مما يوضح أن التأثير الراجع للإضافة هو السائد في هذه الصفة .

كان التباين الراجع لكل من التأثير المضيف والسيادى معنوياً لكل الصفات.

كانت العوامل المضيفة ذات أهمية في وراثة معظم الصفات المدروسة ويؤكد ذلك أن القدرة العامة علي الإئتلاف كانت أكبر من القدرة الخاصة في جميع الصفات المدروسة تقريباً . كما أوضحت الدراسة أن توزيع الجينات الموجبة والسالبة كان غير منتظم لكل الصفات.

٥) كما أظهرت النتائج إن قيم معامل التوريث كانت منخفضة لجميع الصفات التي تم دراستها.