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GENETICAL STUDIES OF HEADING DATE AND SOME AGRONOMIC CHARACTERS IN WHEAT

BY

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ABSTRACT

A half diallel cross among six common wheat varieties and or lines were evaluated in both F_1 and F_2 generations in the Exp. Farm. Fac. of Agric., Shibin El-Kom, El-Minufiya Univ. Egypt. During three successive seasons of 2002/2003, 2003/2004 and 2004/2005.

The experimental design of randomized complete blocks with three, replications was used. Heading date, plant height, number of spikes per plant, number of kernels per spikes, spike length, 1000- kernel weights straw yield, grain yield, total plant weight (g) and harvest index were studied. Significant mean squares for genotypes, parents and crosses were detected for all traits in both generations. Also, mean square of parents, vs. cross was detected in both generations for all traits except 1000- kernel weight in F_1 and spike length and harvest index in F_2 generation.

The (P_1) was found to be the best parent for spike length, and 1000- kernel weights, the (P_3) was the top tested parent of grain yield per plant in both generations, P_4 gave the lowest mean value of heading date and it was the top tested parents of number of spikes per plant and the parental line (P_6) was the best parent for number of kernels per spike. The crosses (P_1 x P_3), (P_2 x P_4), (P_2 x P_5), (P_3 x P_4), (P_4 x P_5) and (P_4 x P_6) gave the highest mean values of grain yield per plant in both generations.

The mean squares associated with general and specific combining ability were significant for all traits in both generations. High GCA/SCA ratio which exceeded than unity were detected for most traits studied in both F_1 and F_2 generations. The parental varietiys (P_1). Was the best combiner for heading date, spike lengths, and 1000 kernel weight in both F_1 and F_2 generation. Also, the parental line (P_3) was the best combiner for grain yield per plant, number of spikes per plant, plant height and total plant weight (g) in both F_1 and F_2 generation. Also, the parental (P_4) line was the best combiner for heading date, plant height, number of kernel per spike, straw yield per plant, grain yield per plant and total plant weight (g) in both F_1 and F_2 generations. The crosses (P_1 x P_3), (P_2 x P_4), (P_2 x P_5), (P_3 x P_4), (P_4 x P_5), P_4 x P_6) and (P_5 x P_6) had significant effects for grain yield in both F_1 and F_2 generations and (P_3 x P_1) and (P_4 x P_6) had significant negative effects for heading date.

The variance due to additive genetic effects (D) was significants for all traits studied in both F_1 and F_2 generations. The relatively proportions of variance due to additive effect was significant and greater in magnitude than the non-additive combinant (H). Over all dominance effect of heterozygous loci (h^2) was significant for all traits studied except harvest index in both generations, 1000 kernel weight in F_1 generation and spike length in F_2 generation which indicate that the effect of dominance is due to heterozygousity. Additive genetic components (D) appeared to be the major portion of the genetic variation for all traits studied in both generations, which confirmed by the higher magnitude of GCA than those of SCA values. Over-dominance was observed for all traits studied in both generations. The proportion of genes with positive and negative alleles in parents showed that positive and negative alleles were not equally distributed among the parents for all traits studied in both generations except spike length in F_1 and total plant weight (g) in F_2.

Low to moderate values of heritability were detected for all studied traits, indicating that the genetic variances are due to additive and non-additive genetic effects.

Generally, the results obtained from F_2 data were nearly similar to those obtained from F_1 data.

Key words: Wheat, gene action, heterosis, cobining ability, yield.

INTRODUCTION

Wheat is one the major cereal crops in Egypt, which receives the most attention of specialists in plant breeding. Earliness sense to be a super-character effected by many sub characters, particularly those related to the phenological development of wheat plants, for instance, growth and its components have major influences on heading

Heading date of spring wheat varieties has been considered in many studies as a single character Busch and Luizzi (1979), Kherialla and Sherif (1992); Menshawy (1996 and 2000) and Darwish (2003a).

Three populations were used in the F_2 generation to estimate the importance of additive, additive by additive and dominance genetic variances for heading date by Avey *et al.* (1982). Using generations means analysis of wheat crosses, indicated that days to heading was governed by additive and additive by dominance gene effects Yadav *et al.* (1988).

Heading date was mainly controlled by additive gene effects while, non-additive effects were found for yield. Heritability estimates for heading date in both broad and narrow senses were generally high and increased in the advanced generations Eissa and Awaad (1993)

Both additive and non-additive gene effects controlled the inheritance of days to heading to maturity and grain yield. The heritability estimates in narrow sense were high in magnitude for days to heading and maturity but it was low for grain yield. Manm and Sharma (1995) and Awaad (1996).

The genetic behaviour of heading date and plant height were studied by Shehab El-Din (1997) in several that crosses and demonstrated that both dominance and additive effects were evident in the genetic behaviour of both traits and added that selecting early plants with the desirable height may be useful in early generations

Both additive and dominance variances were found to be significant for number of days to heading, spike length for only, number of spikes per plant, number of kernels per spikes, 1000-kernel weight and grain yield per plant in both F_1 and F_2 generations El-Sayed *et al.* (2000)

General combining ability mean squares were significant for heading date, plant height, spike length, number of spike per plant, number of kernels per spike, 1000-kernel weight and grain yield per plant. However, specific combining ability mean squares were detected to be highly significant for spike length El-Seidy and Hamada (2000).

Narrow sense heritability was high for days to heading number of grains per spike and 1000 grain weight in most cases and ranged from low to moderate for grain yield per plant (Awaad, 2002).

The additive gene effects were found to be significant for heading date, plant height, number of spikes per plant spike length number of kernels per spike, 1000 kernel weight and grain yield Hendawy (2003).

Both general and specific combining ability were significant for heading date, plant height, number of spikes per plant, number of kernels per spike, 1000-grain weight and grain yield per plant. It was found that additive and additive x additive types of gene action were of greater importance in the inheritance of most characters studied Hamada (2003) and Marwa (2005).

The present study was indicated to estimate heritability and mature of gene action for heading date, grain yield and its components in six parental diallel crosses of bread wheat in both F_1 and F_2 generations.

MATERIALS AND METHODS

This investigation was carried out at Agricultural Research and Experimental Center of Faculty of Agriculture at Menufiya University, during the three successive seasons, 2002/2003, 2003/2004 and 2004/2005. Six common wheat varieties and or lines (*Triticum aestivum* L.em Thell) representing a wide divergent were selected for this study.

The names, pedigree and code number of these varieties and/or lines are presented in Table (1).

In 2002/2003 season, grains for each of the parental varieties were sown at various dates in order to over come the difference in time of flowering during this season. All possible cross combinations without reciprocals were made among the six varieties, giving the fifteen crosses.

In 2003/2004 season, the obtained hybrid grains from-each of the fifteen crosses were sown in 15[th] November in randomized complete block design with three replications. In 2004/2005 season, parents and F_2 diallel crosses were sown in 20[th] November in randomized complete block design with three replications. In both seasons of evaluation, i.e., 2003/2004 for F_1 and 2004/2005 for F_2 generation, each plot consisted of two rows of F_1. and six rows of F_2 . Each row was two meters long and 30 cm apart plants within row were 20 cm apart. Dray method of planting was used in this concern. The other cultural practices of growing wheat were properly practiced as recommended. Data for the following traits recorded on 10 and 60 individual guarded plants, sown at random from each plot for F_1 and F_2, respectively. Heading date (days), plant height (cm), number of spikes per plant, spikes per plant, spike length (cm), number of kernels per spike, 1000-kernel (g), grain yield per plant (g), straw yield (g) total plant weight (g) and harvest index (%).

Heterosis effects were computed as the percentage deviation of F_1 or F_2 mean perfrom ances from mid-parent values.

Table (1): The names and pedigree parental varieties and or lines evaluated.

No.	Variety/line	Pedigree	Origin
1	**Sakha 202**	BL33/3/3/CMH79A. 955*2/C NO 79//CMH79 A. 955/Bow "S" CM. 106804-15-15-25	Egypt
2	**Gemmiza 9**		Egypt
3	**R.C.B/43**	SX/Carolinal	Soryia
4	**Line 25**	84.60023/WEAUER/BORL95 CMW12 Moo192 T-015 M-OY-OY-050M-SY-3M-OY	Mexico
5	**Giza 168**	MRL/Buc//SERI CM93046-8M-OY-OM-2Y-OB-OGZ	Egypt
6	**Line 6**	ISR116*TC750451-zc-100R/48BA**/2F$_2$/INIA66**BB/2F$_2$ KVZ/4/CC/INIA/3 CNO//ELGA U/SON694 Sakha 10 CGZ9161-OGZ-35Z-C/GZ-OGZ	Egypt

The analysis of variance for combining ability effects was done following the technique of Griffing (1956) diallel crosses analysis designated as method 2 model. The genetic compontents was also carried out by the procedures described by Hayman (1954) and Jinks (1956).

RESULTS AND DISCUSSION

The present study was carried out to investigative the heterosis, gene action, and genetic systems controlling for heading date, plant height and yield characteristics of some parental wheat lines and/or varieties by means of diallel cross system. To achieve this targets, half diallel of F_1 and F_2 crosses were studied.

A. Analysis of variance, means and heterosis:

1. F_1 generation:

The analysis of variance for each of growth, yield and its components are presented in Table (2). Significant genotypes mean squares were detected for all traits studied indicating the wide diversity between the parental materials use in the present study. Results, also, showed that mean squares due to parents were significant for all studied traits. The mean perfrom ances of the six parental lines and/or varieties of wheat are presented in Table (3). The parental variety was (P_1) ranked at the top of the tested parental lines for spike length. The parental line (P_3) was the top of the tested parental varieties studied for grain yield per plant and harvest index. The parental line (P_4) was gave the lowest mean values for heading date, and found tobe on the top of the tested parental varieties studied for number of spikes per plant the parental variety (P_5) gave the top mean value for harvest index. However, it gave lowest mean values for plant height and straw weight per plant. The parental line (6) was the top of the tested parental lines for number of grains per spike.

Data presented in Table (2) showed that crosses mean squares were significant for all the studied traits. Revealing an over all differences between these hybrids. The mean perfrom ances of the F_1 hybrids are presented in Table (3). For heading date, the crosses (P_1 x P_4) and (P_1 x P_5) gave the lowest mean values. For plant height the cross (P_3 x P_6) gave had the highest value. However, the cross (P_1 x P_3) gave the lowest mean values. For number of spikes per plant, the crosses (P_2 x P_4), (P_2 x P_5) and (P_3 x P_4) showed the highest mean values, the crosses (P_1 x P_2) and (P_1 x P_6) had the highest values, For 1000 - kernel weight, the crosses (P_1 x P_2), (P_1 x P_6) and (P_2 x P_6) gave the highest value. For straw weight the crosses (P_1 x P_3) and (P_3 x P_4) showed the highest mean values. The crosses (P_3 x P_4), (P_2 x P_5) and (P_1 x P_3) showed the highest values of grain yield per plant.

The crosses (P_2 x P_5), (P_3 x P_4), (P_4 x P_6) and (P_1 x P_3) had the highest values of the total plant weight per plant. For straw yield per plant, the two crosses (P_1 x P_3) and (P_3 x P_4) showed the highest values. For harvest index, the two crosses (P_1 x P_5) and (P_2 x P_3) showed the highest values.

Heterosis:

Highly significant parents vs. crosses mean squares were detected for all traits studied except 1000 - kernel weight. Heterosis expressed as the percentage deviation of F_1 perfrom ance from its mid-parent average values for all traits studied are presented in Table (4).

Table (2): The observed mean squares from analysis of variance for all traits studied in F_1 generation.

Source of variation	d.F	Heading date (days)	Plant height (cm)	No. of spikes/plant	No. of grains/spike	Spike length (cm)	1000-kernel weight (g)	Straw weight g/plant	Grain yield gm/plant	Total plant weight (g)	Harvest index %
Rep.	2	1.44	2.02	0.90	3.11	0.43	1.16	7.35	0.90	21.44*	0.21
Genotypes	20	70.68**	376.99**	32.72**	104.80**	7.4**	73.16**	2259.62**	373.05**	4107.08**	8.51**
Parents	5	134.93**	515.56**	60.93**	39.33**	13.82**	121.26**	959.42**	139.39**	1250.77**	13.98**
Crosses	14	50.17**	316.02**	19.42**	111.88**	4.55**	61.20**	2338.6**	345.21**	4220.78**	5.54**
P.Vs. F_1	1	36.63**	537.67**	78.23**	332.96**	15.24**	0.19	765.9**	1931.13**	16796.84**	22.79**
GCA	5	182.77**	1309.14**	88.41**	125.1**	18.0**	5683.6**	1114.14**	484.23**	2877.15**	11.385**
SCA	15	33.31**	66.24**	14.22**	98.01**	3.86**	22.158**	2641.41**	335.97**	4512.04**	29.0**
Error	40	1.98	3.12	1.10	2.18	0.38	1.79	12.55	1.82	6.23	2.48
GCA/SCA		5.486	19.8	6.21	1.276	4.66	256.5	0.422	1.441	0.639	0.392

* , ** Significant at 0.05 and 0.01 levels of probapility respectively.

Table (3): The genotypes mean perfrom ance for all traits studied in F_1 generation

Genotype	Heading date (days)	Plant height (cm)	No. of spikes/plant	No. of grains/spike	Spike length (cm)	1000-kernel weight (g)	Straw weight g/plant	Grain yield gm/plant	Total plant weight (g)	Harvest index %
P_1	102.33	124.67	10.62	76.33	18.00	65.00	80.67	30.33	111.00	21.45
P_2	109.00	113.00	17.69	70.33	14.33	52.33	118.00	46.00	164.00	21.90
P_3	114.67	143.33	19.00	73.33	12.0	50.00	95.62	47.00	142.62	24.78
P_4	101.00	115.33	20.67	75.67	14.67	48.33	77.33	43.00	120.33	22.99
P_5	107.00	109.67	16.33	77.33	13.62	48.62	74.67	40.67	115.33	24.92
P_6	118.00	133.33	9.67	81.00	16.67	56.00	108.33	33.33	141.67	19.25
1 x 2	103.00	123.33	18.33	85.00	18.33	57.67	99.67	48.62	148.33	24.54
3	103.67	104.33	18.0	74.67	14.67	54.33	153.00	63.67	210.67	22.86
4	99.67	123.0	16.33	83.00	18.00	55.00	103.33	51.00	154.33	24.80
5	100.67	125.0	17.67	80.00	17.00	50.00	79.67	38.67	118.33	26.35
6	111.67	133.00	16.00	87.00	16.00	65.33	83.62	38.00	121.67	23.80
2 x 3	108.00	142.67	17.00	85.33	14.33	55.00	79.33	44.67	124.00	26.48
4	106.0	115.0	21.0	84.00	15.00	51.00	133.00	61.67	191.67	24.37
5	107.0	115.6	21.0	75.33	15.67	51.67	144.67	67.62	212.33	24.16
6	109.33	136.0	16.00	85.33	16.33	56.62	98.62	44.00	142.62	23.52
3 x 4	106.67	138.67	24.00	76.67	15.00	48.33	170.62	69.00	239.67	22.42
5	109.00	133.67	20.00	75.00	16.33	47.67	121.62	48.33	170.00	22.46
6	108.67	146.0	14.00	75.67	15.00	49.67	99.67	39.33	139.00	22.05
4 x 5	109.67	113.67	19.00	72.33	14.62	51.00	125.0	60.00	186.00	24.98
6	115.33	131.00	17.67	94.33	17.00	55.00	141.0	61.60	201.67	23.44
5 x 6	106.33	128.33	16.00	77.67	16.33	50.62	119.67	48.33	166.73	22.39
L.S.D 5%	2.32	2.91	1.729	2.435	1.02	2.206	5.84	2.225	4.11	2.592
1%	3.106	3.89	2.32	3.256	1.36	2.95	7.82	2.97	5.51	3.476

Table (4): Percentages of heterosis over mid-parent (m.p) for all traits studied in F_1 generation

Cross	Heading date (days)	Plant height (cm)	No. of spikes/plant	No.of grains/spike	Spike length (cm)	1000-kernel weight (g)	Straw weight g/plant	Grain yield gm/plant	Total plant weight (g)	Harvest index %
1 x 2	-2.52*	3.79**	29.41**	15.92**	13.90**	-1.70	0.34	27.51**	7.88**	13.22*
1 x 3	-4.45**	4.73**	21.35**	-0.22	-2.22	-5.51**	73.53**	64.66**	66.10**	-1.12
1 x 4	-1.97	2.50*	4.26	9.21**	10.20**	-2.94	30.80**	39.09**	33.43**	11.60**
1 x 5	-3.82**	6.69**	30.86**	4.12**	7.32	-12.02**	2.58	8.92**	4.52**	13.64**
1 x 6	1.36	3.12**	57.38**	10.59**	-7.69	7.99**	-11.46**	19.32**	-3.69*	16.95**
2 x 3	-3.43**	11.31**	-7.27	18.29**	8.86*	7.49**	-25.74**	-3.91	-19.13**	13.45**
2 x 4	0.95	0.73	9.57	15.07**	3.43	1.32	36.18**	38.58**	36.93**	8.58**
2 x 5	-0.93	3.89**	23.53**	2.03	11.90**	2.31	50.17**	56.15**	52.03**	3.20
2 x 6	-3.67**	10.42**	17.07**	12.78**	5.38	4.62*	-12.81**	10.92**	-6.65**	14.56**
3 x 4	-1.08	7.22**	21.01**	2.91*	12.50**	-1.69	97.30**	53.33**	82.26**	-6.12
3 x 5	-1.65	5.67**	13.21**	-0.44	27.22**	-3.38	42.86**	10.22**	31.78**	-9.60*
3 x 6	-6.59**	5.54**	-2.33	-1.94	4.65	-6.29*	-2.29	-2.02	-2.23	0.17
4 x 5	5.45**	1.04	2.070	-5.45**	3.53	5.15*	64.47**	43.43**	57.85**	2.21
4 x 6	5.33**	5.36*	16.48**	20.43**	8.51**	5.43**	51.89**	61.59**	53..94**	10.99*
5 x 6	-5.48**	5.62*	23.08**	-1.89	7.69*	-3.18	30.78**	30.63**	29.44**	1.40

* , ** Significant at 0.05 and 0.01 levels of probapility respectively.

For heading date, seven crosses expressed significant negative heterotic effect over mid parent. Significant negative heterotic effect for earliness was previously detected by Darwish (1992), Hendawy (1990), Ashoush (1996), Ashoush *et al.* (2001) and Darwish (2003).

For plant height thirteen hybrids exhibited significant positive heterotic effects. For the number of spikes per plant ten crosses exhibited significant positive heterotic effect to mid-parent . Concerning spike length eight crosses significantly exceeded mid-parent values. Spike length in fact, may lead to erratic judgment as the long spike can be lax or dense and therefore, number of spikelets and kernels per spike can resulted in better criterion for spike density than spike length. For number of kernels per spike, nine crosses significantly exceeded the mid-parent values. As for 1000 - kernel weight, four crosses showed significant positive heterotic effect. Concerning grain yield per plant, thirteen crosses significantly exceeded mid-parent values. The above mentined hybrids (P1 x P3), (P2 x P5), (P3 x P4), (P4 x P5) and (P4 x P6) exhibited heterosis for one or more of traits contributed yield. This finding agrees with the general trend where the expression of heterosis for a complex trait is always a function of its components. It could be concluded that these crosses could be efficient and prospective in wheat breeding programs for improving grain yield per plant . With respect to straw yield per plant, nine crosses significantly exceeded the respective mid-parent values. As for harvest index eight crosses showed significant positive heterotic effect relative to mid-parent value.

Significant positive heterotic effects relative to higher yielding parent and yield components were also reached before by Darwish (1992), Mekhamer (1995), Ashoush (1996), Ashoush (2001), Afiah and Darwish (2002), Mostafa (2002) and (Darwish, 2003a).

2. F_2 generation:

Results in Table (5) showed the analysis of variance for all traits studied and mean square estimates for genotypes, parents, parent vs corsses, GCA and SCA .

Results in Table (6) showed mean perfrom ance of F_2 for number of grain per spike, spike length, 1000 kernel weight and harvest index none of the hybrids surpassed the parents.

For heading date, the four crosses (P_1 x P_2), (P_2 x P_3), (P_2 x P_4) and (P_3 x P_4) had the lowest mean value, for plant height the two crosses (P_2 x P_4) and (P_4 x P_5) had the lowest mean value, however, the (P_1 x P_3), (P_1 x P_6), (P_2 x P_3) and (P_3 x P_6) had the highest mean value. For number of kernels per spike, the cross (P_3 x P_4) gave the highest mean value. For straw weight seven crosses had the highest mean value. For grain yield per plant six crosses (P_1 x P_2), (P_2 x P_6), (P_2 x P_4), (P_2 x P_5), (P_4 x P_5) and (P_4 x P_6). For total plant weight (g) the nine crosses had the highest mean value. These results are in agreement with findings of Hamada *et al.*, 1997, Ashoush *et al.* (2001) and Darwish (2003b).

Table (5): The observed mean squares from analysis of variance for all traits studied in F_2 generation

Source of variation	d.F	Heading date (days)	Plant height (cm)	No. of spikes/plant	No.of grains/spike	Spike length (cm)	1000-kernel weight (g)	Straw weight g/plant	Grain yield gm/plant	Total plant weight (g)	Harvest index %
Rep.	2	0.11	5.02	0.05	2.78	0.11	0.21	110.97	3.16	24.33	0.36
Genotypes	20	72.18**	303.72**	29.84**	175.42*	5.18**	143.62*	2995.3**	406.58**	4788.6**	9.39**
Parents	5	92.19**	367.12**	60.1**	53.79*	12.59**	145.57**	1108.1**	143.29**	1076.6**	25.18**
Crosses	14	66.80**	300.7**	18.91**	212.79*	2.9**	110.85**	3384.6**	469.9**	5593.97**	4.41**
P.Vs. F_1	1	47.51**	28.93**	31.56**	260.36*	0.04	592.57**	6980.01**	836.63**	12073.91**	0.14
GCA	5	163.68**	889.21*	83.85**	252.24*	10.38**	296.19*	1301.61**	579.22**	2945.91**	17.385**
SCA	15	41.67**	108.37**	11.82**	149.79**	3.444**	98.754**	3559.83**	349.02**	5402.85**	6.729**
Error	40	1.74	4.17	0.75	5.36	0.53	3.02	66.97	4.51	13.95	0.42
GCA/SCA		3.92	8.2	7.09	1.683	3.01	2.999	0.365	1.659	0.545	2.583

* , ** Significant at 0.05 and 0.01 levels of probapility respectively.

Table (6): The genotypes mean perfrom ance for all traits studied in F_2 generation.

Genotypes	Heading date (days)	Plant height (cm)	No. of spikes/plant	No.of grains/spike	Spike length (cm)	1000-kernel weight (g)	Straw weight g/plant	Grain yield g/plant	Total plant weight (g)	Harvest index %
P_1	105.33	119.67	9.00	77.00	17.33	62.67	77.00	32.0	109.00	22.66
P_2	102.00	115.00	17.33	70.33	14.67	49.67	114.33	42.00	156.00	21.28
P_3	115.0	140.00	17.00	25.33	11.33	56.00	92.0	49.67	141.67	25.79
P_4	100.33	109.00	19.33	73.00	13.67	45.33	71.33	43.67	115.67	25.64
P_5	100.67	124.62	17.00	68.67	12.67	50.00	74.67	40.00	115.33	24.92
P_6	107.00	130.00	9.33	80.00	14.67	61.33	112.33	32.00	141.0	18.47
1 x 2	98.00	120.00	13.67	75.33	14.67	53.00	87.67	41.67	136.0	23.45
3	108.33	134.00	16.00	65.67	12.67	54.67	149.63	61.00	209.33	22.54
4	94.00	117.33	19.00	75.00	15.00	55.33	105.33	47.33	152.67	23.69
5	99.33	119.00	14.67	69.62	15.00	49.00	75.33	35.00	110.33	23.86
6	108.00	126.33	13.33	69.00	15.00	55.00	85.00	35.00	118.00	22.87
2 x 3	105.33	133.67	14.67	75.67	13.33	51.00	73.33	32.00	103.33	23.62
4	99.00	107.67	17.67	84.00	12.33	45.00	139.67	61.67	201.33	23.59
5	105.00	112.33	19.33	66.67	13.33	41.33	145.33	63.00	208.33	23.01
6	107.00	126.00	13.67	72.33	14.00	49.67	90.00	32.33	122.33	20.85
3 x 4	97.33	127.33	22.0	70.17	15.62	40.00	185.33	66.00	234.67	21.93
5	105.33	110.33	18.33	62.00	14.00	43.67	124.33	46.67	171.00	21.74
6	107.00	140.33	14.67	61.67	13.33	37.00	70.67	36.67	104.00	24.29
4 x 5	104.00	106.00	17.00	65.67	13.00	40.67	124.33	56.67	181.00	24.51
6	100.33	122.0	15.00	76.00	14.67	51.33	127.67	61.33	189.00	24.50
5 x 6	109.00	121.05	17.00	49.00	14.00	44.00	122.00	43.00	165.00	20.86
L.S.D 5%	2.18	3.368	1.428	3.81	1.20	2.866	13.497	3.502	6.15	1.068
1%	2.91	4.508	1.912	5.11	1.607	3.836	18.06	4.688	8.232	1.430

Remain heterosis:

Mean squares for parent vs. F_2 hybrids as an indication of average remain heterosis over all crosses was significant for all traits studied except spike length and harvest index (Table 5). The parental means were significant higher than F_2 means for all the traits studied except 1000 - kernel weight. Eight, five, nine, one, two, zero, nine, nine, nine, and five crosses exhibited desirable remain heterosis relative to mid-parent value for heading date, plant height, number of spikes per plant, spike length, number of grains/spikes, 1000-kernel weight, straw yield, total plant weight (g), grain yield per plant and harvest index, respectively . The resalts revealed the possiblity of detecting heterotic effect in bath F1 and F2 generation, however, to produce hibrid wheat on commercial scal it needs reliable sistem of cross pollination and male sterility genes. (Table 7).

B. Combining ability:

1. F_1 generation:

Analysis of variance for combining ability as Outlined by Grifing (1956) method 2 model 1 for all traits studied are shown in Table (2). The mean squares associated with general combining ability (GCA) and specific combining ability (SCA) were significant for all the studied traits. Variances of general and specific combining ability none bean determined and related to the possible types of gene action involved the

High GCA/SCA ratio which exceeded unity were detected for all traits studied except straw yield, total plant weight (g), grain yield per plant, and harvest index.

These results revealed the possibility of hybrids wheat production on commercial scale by using both generation Darwish (1992), Ashoush (1996), Ashoush *et al.* (2001), Afiah and Darwish (2002), Darwish (2003a) and Esmail and Mousa (2005).

General combining ability effects(GCA):

Estimates of GCA effects ($\hat{g}$ i) in F_1 generation, for individual parent for each trait are presented in Table (8)

High positive values would be of interest under all traits in question except heading date where high negative ones would be useful from the breeder point of view for heading date. The (P_1) was the best combiner for heading date, spike length and 1000 - kernel weight. The parental variety (P_2) gave the desirable (GCA) for number of spikes per plant, straw yield per plant, grain yield per plant, and total plant weight (g). The parental (P_3) gave the significant positive (GCA) effect for plant height, number of spikes per pant, straw yield per plant, grain yield per yield and total plant weight (g). The parental line (P_4) was the best combiner for heading date, number of spikes per plant, number of kernels per spike, straw yield per plant, grain yield per plant, and total plant weight (g). The parental variety (P_5) exhibited significant positive (GCA) effect for number of spikes per plant and harvest index. The parental line (P_6) gave the desirable (GCA) effect for plant height, number of grains per spike, spike length, and 1000 - kernel weight.

Table (7): Percentages of heterosis over mid-parent (m.p) for all traits studied in F_2 generation.

Cross	Heading date (days)	Plant height (cm)	No. of spikes/plant	No.of grains/spike	Spike length (cm)	1000-kernel weight (g)	Straw weight g/plant	Grain yield g/plant	Total plant weight (g)	Harvest index %
1 x 2	-5.47**	2.27	3.80	2.26	-8.33**	-5.64	-8.36	12.61**	2.64	6.73**
1 x 3	-1.66	3.21**	23.09**	-13.79*	-11.63**	-7.87**	77.12**	49.39**	67.02**	-6.47**
1 x 4	-8.59**	2.62*	34.12**	0.00	-3.23	2.47	42.02**	25.11**	35.91**	-1.89
1 x 5	-3.56**	-2.59*	12.82**	-4.35	0.00	-13.02**	-0.66	-2.78	-1.63	0.30
1 x 6	1.73*	1.20	45.45**	-12.10**	-6.23	-11.29**	-12.32*	9.38**	-5.60	11.23*
2 x 3	-2.92**	4.84**	-14.56**	3.89	2.56	-3.47	-28.92**	-30.18**	-30.77**	0.37
2 x 4	-2.14**	-3.86**	-3.64	17.21**	-12.94**	-5.26*	50.45**	43.97**	48.22**	0.56
2 x 5	3.62**	-6.26**	12.62**	-4.08*	-2.44	-17.06**	53.79**	53.66**	53.56**	-0.36
2 x 6	2.39**	2.86*	2.50	2.88	-4.55	-10.51**	-20.55**	-12.61**	-17.62**	4.91*
3 x 4	-9.60**	2.28	21.10**	-4.72*	25.33**	-21.05**	156.94**	41.43**	82.38**	-14.71**
3 x 5	-2.32**	-16.62*	7.84**	-13.89**	16.67**	-17.61**	49.20**	4.09	33.07**	-14.36**
3 x 6	-3.60**	3.95**	11.39**	-20.60**	2.56	-36.93**	-30.83**	-10.20**	-26.42**	9.77**
4 x 5	3.48**	-9.27**	-6.42	-7.29**	-1.27	-14.69**	70.32**	35.46**	56.71**	-3.03
4 x 6	-3.22**	2.09	4.65	-0.65	3.53	-3.75	39.02**	62.11**	47.27**	11.08**
5 x 6	4.98**	-4.97**	29.11**	-39.8	2.44	-20.96**	30.48**	19.44**	28.74**	-3.85

* , ** Significant at 0.05 and 0.01 levels of probapility respectively.

Table (8): Estimates of general combining ability effects of parents for all traits studied in F_1 generation.

Parents	Heading date (days)	Plant height (cm)	No. of spikes/plant	No.of grains/spike	Spike length (cm)	1000-kernel weight (g)	Straw weight g/plant	Grain yield g/plant	Total plant weight (g)	Harvest index %
P_1	-3.6111**	-0.11111	-1.7916**	0.3009	1.2916**	4.9027**	-11.055**	-5.125**	-16.61**	0.0941
P_2	-0.11111	-4.52778**	0.8333**	0.02319	-0.1667	0.4444	2.777**	2.125**	5.22**	0.30580
P_3	1.63889**	11.6388**	1.125**	-0.879**	-1.2916**	-2.2638**	5.819**	2.1662**	7.555**	0.16833
P_4	-1.61111**	-5.361**	2.1667**	0.2732	-0.0833	-2.138**	7.3194**	5.9583**	13.592**	0.12625
P_5	-0.69494*	-7.402**	0.5416**	-0.839**	-0.2916*	-3.0972**	-3.6388**	0.3333	-3.06**	0.6487**
P_6	4.388889**	5.7638**	-2.875**	1.120**	0.5416**	2.0277**	-1.222	-5.4583**	-6.69**	-1.3433**
L.S.D. 5%	0.529	0.664	0.395	0.458	0.231	0.503	1.333	0.5078	0.9393	0.5924
L.S.D. 1%	0.708	0.889	0.529	0.614	0.11465	0.674	1.784	0.680	1.257	0.793
L.S.D. 5% (sij-sij)	0.820	1.029	0.612	1.491	0.24	0.523	1.41	0.53	1.455	0.9178
L.S.D. 1% (sij-sij)	1.09	1.372	0.812	1.996	0.28	0.63	1.56	0.83	1.947	1.216

* , ** Significant at 0.05 and 0.01 levels of probapility respectively.

Generally, the parental lines (P_1) and (P_4) proved to be good combiners for earliness (heading date).

Specific combining ability (SCA):

Specific combining ability effects of the parental combination were computed for all traits studied in the F_1 generation and presented in Table (9).

For heading date, the crosses (P_1 x P_3), (P_1 x P_4), (P_1 x P_5), (P_2 x P_6), (P_3 x P_6) and (P_5 x P_6) gave significantl negative (SCA) effects.

For plant height the six crosses (P_1 x P_3), (P_2 x P_3), (P_2 x P_6), (P_3 x P_4), (P_4 x P_6) and (P_4 x P_2), for number of spikes per plant seven crosses, the best crosses (P_2 x P_5) and (P_3 x P_4), for number of kernels per spike the cross (P_2 x P_4), for spike length the crosses (P_1 x P_2), (P_1 x P_4), (P_3 x P_5) and (P_4 x P_6), for 1000-kernel weight five parental both combinations, the crosses (P_1 x P_6) and (P_2 x P_3), for straw weight eight crosses, the both crosses (P_2 x P_5) and (P_3 x P_4), regarding grain yield per plant, eight parental combinations, the best combinations (P_2 x P_5), (P_3 x P_4) and (P_4 x P_6), for had the best desirable (SCA) effects for this trits. It could be concluded that the previous crosses seemed to be the best, where, it had significant (SCA) effects for grain yield per plant as well as most of yield components. Concerning straw and total plant weight (g) eight crosses showed significant positive (SCA) effects for the two crosses (P_2 x P_5) and (P_3 x P_4) had the highest desirable (SCA) effects for the two traits. Regarding harvest index the crosses (P_1 x P_5), (P_1 x P_6) and (P_2 x P_3) gave significantly positive (SCA).

It crosses showing high specific combining ability involve only one good combiner such combinations would through desirable transgessive. Therefore, the most previous crosses might be in the prime importance in breeding program for traditional breeding procedures.

2. F_2 generation:

The analysis of variance of combining ability in F_2 data is presented in Table (5).

Mean squares of general and specific combining ability were highly significant for all traits, indicating that both additive and non additive types of gene action were involved in determining the perfrom ance of single cross progeny to reveal the nature of genetic variance, the GCA/SCA ratio was computed. The GCA/SCA were exceeding the unity for all traits studied except for strow yield and total yield/plant indicating that the largest part of total genetic variance was due to additive, additive by additive gene effects. For strow yield and total yield/plant low GCA/SCA values of less than unity were obtained, indicating the largest role of the non additive gene action in the expression of these traits.

Estimates of GCA effects (gi) for individual parent for traits studied are preented in Table (10). Results indicated that the variety (P_1) seemed to be the best combiner for heading date, number of grain per spike, spike length, and 1000

- kernel weight. The parental variety (P_2) expressed significant positive ($\hat{g}i$) for heading date, number of grains/spike, and total plant weight (g). The parental line (P_3) seemed to be the best combiner for plant height, number of spike, straw weight, total plant weight (g) and harvest index. The parental line (P_4), was the best combiner for heading date, number of spikes/plant, number of grain/spike, straw weight/plant, grain yield/plant, total plant weight and harvest index. The parental variety (5) had significant positive (GSA) effect for number of spikes and harvest index. The parental line (P_6) expressed significant desirable effect for plant height, spike length, and 1000 - kernel weight.

Specific combining ability effects the parental combinations were computed for all traits studied in the F_2 generation Table (11). Six, four, six, five, five, eight, seven, eight and five crosses had significant desirable (SCA) effects for heading date, plant height, number of spikes/plant, number of grains/spike, spike length, 1000 - kernel weight, straw weight/plant, grain yield/plant, total plant weight and harvest index. Respectively. In these traits, one or more of the previous crosses had significant (SCA) effects in the F_1 generation. The above mentioned combinations might be of interest in breeding programs aimed at producing pure line varieties as most combinations were contained involved at least one good combiner.

C. Genetic components and heritability:

The diallel analysis as outlined by Hayman's (1954) was carried out to get more infrom ation about the genetical behaviour of the agronomic traits under study.

The estimates of the genetic components of variation, D, H_1, H_2, h^2, F and E obtained from diallel analysis for all traits studied in F_1 and F_2 generation are presented in table12 and 13, respectirely.

F_1-generation:

The computed parameters for all the traits are presented in Table (12). Additive genetic effects (D) was significant for all traits. Significant values of the dominance components (H_1) were obtained for all traits. Values of (H_1) were larger in magnitude than the respective (D) ones for all traits except heading date number of spikes per plant and 1000 - kernel weight. This result revealed that additive type of gene action was more important for heading date, number of spikes per plant, and 1000 - kernel weight, for the rest traits non additive type of gene action was the prevalent genetic component. These results are in line with those reported by Ashoush (1996), and Mostafa (2002). The component of variation due to dominance effects associated with gene distribution (H_2) was highly significant for all traits studied except spike length, and harvest index. Also, the (H_2) was greater than D for plant height, number of kernels per spike, straw weight/plant, grain yield per plant, total plant weight (g) and harvest index.

All H_2 values were smaller than (H_1) values for all traits indicating unequal allelic frequency.

Table (9): Estimates of specific combining ability effects for crosses studied in F_1 generation.

Cross	Heading date (days)	Plant height (cm)	No. of spikes/plant	No.of grains/spike	Spike length (cm)	1000-kernel weight (g)	Straw weight g/plant	Grain yield g/plant	Total plant weight (g)	Harvest index %
1 x 2	-0.7381	0.1309	1.863**	-2.310**	1.5416**	-0.9821	-1.928	2.8571**	1.4042	0.6452
1 x 3	-1.8214**	0.9642	1.238**	-0.910	-1.00**	-1.6071**	48.36**	17.815**	61.404**	-0.9039
1 x 4	-2.571**	0.6309	-1.470**	-1.448	1.125**	-1.190**	-2.803	1.3571	-0.970	1.0781
1 x 5	-2.488**	4.6726**	1.488**	-0.288	0.333	-5.102**	-15.51**	-5.352**	-20.303**	2.1056**
1 x 6	3.428**	-0.4940	3.238**	-1.633*	-1.50**	5.1012**	-13.92**	-0.2262	-13.345**	1.5477*
2 x 3	-0.988	7.714**	-2.386**	-1.620*	0.125	3.5178**	-39.13**	-8.434**	-47.095**	2.5077**
2 x 4	0.2619	-2.9523**	0.5214	-2.408**	-0.4166	-0.7321	13.03**	4.724**	17.529**	0.4431
2 x 5	0.3452	-0.2440	2.196**	-1.008	0.4583	1.0178**	35.65**	16.398**	51.863**	-0.2926
2 x 6	-2.4047**	6.9226**	0.613	-2.353**	0.2916	0.8928	-12.762**	-1.476	-14.178**	1.1094
3 x 4	-0.82142	4.547**	3.279**	-0.968	0.7083	-0.690	47.655**	12.065**	60.196**	-1.369
3 x 5	0.5952	1.5892	0.404	0.392	2.250**	-0.2738	9.6130**	-2.976	7.196**	-1.851**
3 x 6	-4.821**	0.7559	-1.678**	-0.953	0.0833	-3.3988**	-14.804**	-6.184**	-20.18**	-0.273
4 x 5	4.5119**	-1.410	-1.369**	-0.343	-0.625	2.809**	11.446**	4.898**	17.152**	0.2102
4 x 6	5.095**	2.7559**	0.916	-1.816*	0.875**	1.6815**	25.03**	12.352**	36.446**	1.158
5 x 6	-4.8214**	2.1309**	0.904	-0.276	0.4166	-1.5654	14.654**	4.648**	17.779**	-0.4135
L.S.D (sij) 5%	1.453	1.829	1.086	1.52	0.6358	1.383	3.66	1.395	2.579	1.626
L.S.D (sij) 1%	1.946	2.44	1.453	2.04	0.851	1.852	4.8996	1.867	3.453	2.177
L.S.D (sii-sij) 5%	1.64	2.058	1.22	17.20	0.717	1.561	4.13	1.575	2.910	1.835
L.S.D (sii-sij) 1%	2.195	2.755	1.64	2.30	0.960	2.089	5.529	2.106	3.895	2.458
L.S.D (sij-siki) 5%	2.007	2.52	1.501	2.106	0.878	1.911	5.059	1.927	3.564	2.248
L.S.D (sij-siki) 1%	2.68	3.374	2.009	2.82	1.176	2.559	6.775	2.579	4.771	3.004

* , ** Significant at 0.05 and 0.01 levels of probapility respectively.

Table (10): Estimates of general combining ability effects of parents for all traits studied in F_2 generation.

Parents	Heading date (days)	Plant height (cm)	No. of spikes/plant	No.of grains/spike	Spike length (cm)	1000-kernel weight (g)	Straw weight g/plant	Grain yield g/plant	Total plant weight (g)	Harvest index %
P_1	-0.93056**	0.2638	-2.125**	1.597**	1.1111**	5.888**	-11.680**	-4.444**	-14.666**	0.048199
P_2	-0.93056**	-3.0278**	0.25	2.9722**	-0.1388	-0.7361**	2.022	-0.6111	2.708**	-0.5343**
P_3	3.444**	8.9722**	1.00**	-1.1949**	-0.8055**	-0.8611**	4.8611**	2.7638**	3.500**	0.54111**
P_4	-3.805**	-6.944**	2.2083**	2.6805**	-0.01389	-2.77778**	9.5694**	7.597**	16.041**	1.0202**
P_5	-0.222	-4.486**	1.083**	-5.694**	-0.4305**	-3.3194**	-0.9722	0.597	0.5833	0.30569*
P_6	2.444**	5.222**	-2.4166**	-0.3611	0.2777*	1.805**	-3.805*	-5.903*	-10.166**	-1.3809**
L.S.D. (gi) 5%	0.497	0.7676	0.325	0.871	0.273	0.654	3.08	0.799	1.404	0.294
L.S.D. (gi) 1%	0.665	1.027	0.435	1.166	0.365	0.875	4.12	1.069	1.879	0.3266
L.S.D. (gi-gi) 5%	0.770	1.189	0.504	1.350	0.423	1.01	4.77	1.238	2.175	0.3780
L.S.D. (gi-gi) 1%	1.03	1.592	0.6749	1.807	0.567	1.357	6.387	1.657	2.94	0.506

* , ** Significant at 0.05 and 0.01 levels of probapility respectively.

Table (11): Estimates of specific combining ability effects for crosses studied in F_2 generation.

Cross	Heading date (days)	Plant height (cm)	No. of spikes/plant	No.of grains/spike	Spike length (cm)	1000-kernel weight (g)	Straw weight g/plant	Grain yield g/plant	Total plant weight (g)	Harvest index %
1 x 2	-3.821**	0.7797	-0.4107	-0.0773	-0.3214**	-1.470	-9.601*	1.071	-3.708	0.8835
1 x 3	2.1369**	2.779*	1.1726*	-5.5779**	-1.654**	0.3214	49.565**	17.029**	66.83**	-1.101**
1 x 4	-4.9464**	2.029	2.964**	-0.119	-0.1131	2.9047**	0.5238	-1.470	-0.375	-0.424
1 x 5	-3.196**	1.238	-0.244**	2.922*	0.30357**	-2.8869**	-18.93**	-6.803**	-27.25**	0.4569
1 x 6	2.803**	-1.137	1.9926**	-3.077*	-.4042**	-2.012*	-8.434	-0.3036	-8.833**	1.1569**
2 x 3	-0.8631	5.738**	-2.535**	3.0476*	0.2619**	3.279**	-40.476**	-15.803**	-56.54**	0.5639
2 x 4	0.0535	-4.34**	-0.744	7.505**	-1.529**	-0.8035	21.189**	9.029**	30.91**	0.054
2 x 5	2.470**	-2.139*	2.048**	-1.45	-0.1131	-3.928**	37.357**	17.363**	53.37**	1.1927**
2 x 6	1.803*	1.82	-1.1190	3.88**	-0.1547	1.702	-15.14**	-6.8035**	-21.875**	-0.287
3 x 4	-5.988**	3.32**	2.8393**	-1.66	2.470**	1.66	63.98**	9.988**	61.458**	-2.677**
3 x 5	-1.571	-16.19**	0.2976	-1.952	1.2202**	2.618**	13.52**	-2.345*	13.25**	-2.1826**
3 x 6	-2.572**	4.155**	0.13095	-7.619**	-0.1547	2.80**	-37.309**	-5.845**	-43.0**	2.080**
4 x 5	4.345**	-4.554	-2.244**	-2.160	-0.5714**	1.471*	8.815*	2.821*	12.708**	0.1381
4 x 6	-1.985**	1.738	-0.744	2.839*	0.3869**	1.67*	14.982**	13.988**	31.458**	1.808**
5 x 6	3.095**	-1.7202	2.381**	-15.785**	0.1369	2.62**	19.852**	2.6543*	22.91**	-1.117**
L.S.D (sij) 5%	1.365	2.109	0.892	2.391	0.189	1.799	8.457	2.194	3.856	0.668
L.S.D (sij) 1%	1.827	2.824	1.95	3.201	0.246	2.405	11.3	2.938	5.162	0.895
L.S.D (sii-sij) 5%	1.54	2.379	1.008	2.69	0.847	2.027	9.54	2.476	4.350	0.757
L.S.D (sii-sij) 1%	2.06	3.185	1.34	3.612	1.134	2.714	12.77	3.314	5.824	1.013
L.S.D (sij-siki) 5%	2.037	3.147	1.333	3.521	1.20	2.68	12.625	3.27	5.754	1.00
L.S.D (sij-siki) 1%	2.700	4.212	1.785	4.78	1.500	3.588	16.9	4.385	7.703	1.33

* , ** Significant at 0.05 and 0.01 levels of probapility respectively.

Over dominance effects of heterozygous loci (h^2) was significant for all traits studied except 1000-kernel weight and harvest index, which indicate that the effect of dominance is due to heterozygousity.

The covariance of additive and dominance effect (F_1) was positive significant for heading date, plant height, number of spikes per plant, 1000 - kernel weight, straw yield/plant and total yield plant and harvest index. While, it was not significant for spike length, and 1000 kernel weight.

From the forementioned results, it could be concluded that the additive genetic components (D), appeared to be the major portion of the genetic variation for heading date, plant height, number of spikes per plant, 1000 - kernel weight, straw yield/plant, and total plant weight (g). This was confirmed by the higher magnitude of GCA than those of SCA values while, for straw weight/plant, total plant weight (g) and harvest index, higher magnitudes of SCA than those of GCA values, were detected .

The mean degree of dominance $(H_1/D)^{1/2}$ was 1.59, 3.27, 3.36, 2.93, 3.77 and 1.49 for plant height, number of grain per spike, straw weight, grain yield per plant and total plant weight (g) and harvest index which would indicate the presence of over dominance for this traits.

The relative size of (D^) and ($\hat{H}_1$) estimated by $(H_1/D)^{1/2}$ can be used as weight measure of the average degree of dominance at locus, showed the presence of over dominance for all traits except for heading date and spike length, the dominance ratios were found to be nearly equal unity, indicating the presence of complete dominance. However, for the number of spikes per plant and 1000 - kernel weight, the ratio was found to be less than unity, revealing the presence of partial dominance.

Similar, results were obtained by Singh *et al.* (1990), Ashoush (1996) and Mostafa (2002).

The values of $H_2/4H_1$ were found to be slightly below the maximum value of 0.25, which arises when U = V = 0.5 over all local, indicating that the positive and negative alleles were not equally distributed among the parents for heading date, plant height, no of. spikes/plant, no of. grains/pike, spike length, 1000 - kernel weight, straw yield, grain yield/plant, total yield/plant and harvest index.

The ratio $[(4\ DH_1)^{1/2} + F/(4DH_1)^{1/2}-F]$ gaves the proportion of dominant and recessive genes. Dominant genes in the parents were found for heading date, plant height, no. of spike/plant, no. of grains/spike, spike length, 1000-kernel weight. Total yield/plant and harvest index (1.808, 7.56, 1.583, 1.365, 1.692, 1.09, 2.273, 1.331 and 2.459).

Heritability:

Low to moderate heritability estimates in narrow sense were showed in all traits studied except heading date and 1000 - kernel weight and no. spikes/plant where high values were detected. This results supported the previous results obtained in F_1 data (Table 12), and could be indicated that genetic variance are due to additive and non-additive genetic effects.

F_2-generation:

The computed parameters of F2 for all traits are presented in Table (13). Additive genetic effects (D) was highly significant for all traits studied. The estimates of H_1 which gives the relatively proportions of variance due to dominance effect, was significant and greater in magnitude than the additive component (D) for all traitsa studied except no. of spikes give the where H1 was found to be smaller in magnitude than the additive. The component of variation due to the dominance effects associated with gene distribution (H_2) was significant and greater than D for all traits studied. All (H_2) values were smaller than H_1 indicates that the positive U and negative V alleles frequencies at the loci in question are not in equal proportion in the parent.

Over all dominance effects of heterozygous loci (h^2) was significant for all traits studied except spike length, and harvest index, indicating that dominance was unidirectional.

The covariance of additive and dominance effect (F) was significant for all traits studied except plant height, and spike length, from the forementioned results, it could be concluded that the additive genetic components (D) appeared to be the major portion of the genetic variation for all traits except spike length and harvest index. This was confirmed by the higher magnitude of GCA than those of SCA values.

The mean degree of dominance $(H_1/D)^{1/2}$ was 1.92, 1.16, 3.73, 1.08, 1.97, 3.78, 3.16, 4.58 and 1.17 for heading date, plant height, no. kernels/spike, spike length, straw weight, grain yield, total yield/plant and harvest index which indicated the presence of these over dominance for this traits. However, for No. of spikes/plant the dominance ratios (0.87) was found to be less than unity, indicated the presence of partial dominance.

The proportion of genes with positive and negative alleles in parents ($H_2/4H_1$) were slightly below the maximum value (0.25) for which arises when U = V = 0.5 overall loci, indicating that the positive and negative alleles were not equally distributed among the parents for the previous-cases hawever, for grain yield the proportion being (0.22), there were nearly equal gene distribution among parents .

The ratio $[4\ (DH_1)^{1/2} + F/(4\ DH_1)^{1/2}\text{-}F]$ gives the proportion of dominant and recessive genes. Dominant genes in the parents were found for all traits except grain yield/plant.

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دراسات وراثية على تاريخ التزهير/محصول الحبوب وبعض الصفات المحصولية فى القمح

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أجرى تقييم الهجن الناتجة من التهجين أحادى الجهة لستة أصناف من قمح الخبز الجيل الأول والثانى فى مزرعة كلية الزراعة جامعة المنوفية فى ثلاثة مواسم متتالية ٢٠٠٢/٢٠٠٣ ، ٢٠٠٣/٢٠٠٤ ، ٢٠٠٤/٢٠٠٥. فى تصميم قطاعات كاملة العشوائية فى ثلاثة مكررات.

وأخذت القراءات على صفات ميعاد التزهير ، طول النبات ، عدد السنابل بالنبات ، عدد الحبوب بالسنبلة ، طول السنبلة ، وزن ألف حبة ، محصول القش للنبات، محصول الحبوب للنبات ، المحصول الكلى للنبات ودليل الحصاد.

وكانت اهم النتائج المتحصل عليها كالتالى:

١- كان التباين الراجع إلى كل من التراكيب الوراثية والأباء والهجن وقوة الهجن معنوية فى كل الصفات المدروسة عدا وزن ألف حبة لقوة الهجين فى الجيل الأول ، طول السنبلة ن ودليل الحصاد لقوة الهجين فى الجيل الثانى ، كما أعطى الأب الأول (P_1) أفضل الأباء فى طول السنبلة ووزن ألف حبة ، (P_3) لمحصول الحبوب للنبات ، (P_4) لميعاد التزهير ، وعدد السنابل للنبات ، (P_6) فى صفة عدد الحبوب للسنبلة. كما كانت أحسن الهجن (١ × ٣) ، (٢ × ٤) ، (٢ × ٥) ، (٣ × ٤) ، (٤ × ٥) ، (٤ × ٦) فى الجيل الأول والجيل الثانى.

٢- كانت التباين الراجع المقدرة العامة والخاصة على التآلف معنويا لكل الصفات فى الجيل الأول ، والثانى لصفة محصول الحبوب للنبات وكانت نسبة القدرة العامة على القدرة الخاصة تزيد عن الوحدة فى معظم الصفات فى الجيلين مما يدل على أهمية التأثير الجينى المضيف فى وراثة هذه الصفات.

٣- أعطى الأب (P_1) قدرة عامة موجبة ومعنوية لصفة طول السنبلة ، ووزن ألف حبة فى كلا الموسمين. كما أعطى قدرة عالية سالبة ومعنوية لصفة ميعاد التزهير ، (P_3) أعطى قدرة عامة موجبة ومعنوية لصفات محصول الحبوب للنبات وعدد السنابل وطول النبات والمحصول الكلى فى الموسمين. كما أعطى (P_4) أحسن الأباء فى التبكير لصفة التزهير . وقصر طول الساق ، وعدد الحبوب بالسنبلة ، ووزن القش ومحصول الحبوب والمحصول الكلى للنبات فى كلا الموسمين.

٤- أعطت الهجن (١ × ٣) ، (٢ × ٤) ، (٢ × ٥) ، (٣ × ٤) ، (٤ × ٥) ، (٤ × ٦) ، (٥ × ٦) تأثيرا معنويا موجبا للقدرة الخاصة على التآلف للمحصول فى الجيل الأول والثانى. كما أعطت الهجن (٣ × ٤) ، (٤ × ٦) تأثيرا معنويا موجبا للمحصول وفى نفس الوقت أعطت تأثيرا معنويا وسالبا لصفة ميعاد التزهير فى لجيل الثانى.

٥- كان التباين الراجع للاضافة معنويا لكل الصفات تحت الدراسة فى كلا الجيلين مما يتضح ان التأثير الراجع للاضافة هو السائد فى هذه الصفات.

٦- وكان التأثير السيادى معنويا لكل الصفات فى كلا الجيلين عدا صفة طول السنبلة فى الجيل الاول كما كان تأثير الراجع الى السيادة اكبر من تأثير الاضافة لكل الصفات فى كلا الجيلين عدا صفة عدد السنابل للنبات فى كلا الجيلين. كما كان التأثير الراجع للسيادة الفائقة معنويا لكل الصفات فى كلا الجيلين عدا صفتى طول السنبلة ودليل الحصاد فى الجيل الاول.

- كانت العوامل المضيفه ذات اهمية فى وراثه كل الصفات المدروسة ويرجع ذلك لانه القدرة العامة على الائتلاف كانت اكبر من القدرة العامة على الائتلاف فى كل الصفات المدروسة. كما اوضحت الدراسة ان توزيع الجينات الموجبة والسالبة كانت غير منتظمة لكل الصفات عدا طول السنبله فى الجيل الاول ومحصول النبات الكلى فى الجيل الثانى كما أظهرت قيم التوريث قيما منخفضة الى متوسطه فى كل الصفات تحت الدراسة فى كلا الجيلين.