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BREEDING FOR YIELD AND ITS COMPONENTS OF WHEAT UNDER TWO LEVELS OF NITROGEN FERTILIZATION

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ABSTRACT: *This investigation aimed to study genetic system for yield and some of its components of eight parents, Gemmeiza 9, Giza 168, Sakha 94, Misr 1, Sham 6, Yacora, Ug 2 and Ug 4 and their crosses of wheat under two nitrogen fertilizer levels, 35 and 70 kg N/fed. in 2010/2011 and 2011/2012 seasons at Etay El-Baroud Agricultural Research Station, Egypt. General and specific combining ability estimates were obtained by employing Griffing (1956 b) diallel cross analysis designated as method II model I. Nitrogen fertilizer levels mean squares were found to be highly significant for all traits studied, indicating overall differences between the two different nitrogen fertilizer levels for all traits. Genotypes, parents, the resultant twenty eight crosses and parents vs. crosses mean square estimates were found to be highly significant for all traits studied under the two nitrogen fertilizer levels and their combined data. The interactions of genotypes, parents and the resultant crosses with the two different nitrogen fertilizer levels were found to be highly significant for all traits studied. The interactions of parents vs. crosses with the two different nitrogen fertilizer levels were found to be highly significant for all traits studied, except biological yield/plant which found to be only significant and harvest index (%) which found to be non significant. General combining ability and specific combining ability mean squares were found to be highly significant for all characters under examination of two nitrogen fertilizer levels (35, 70 kgN/fed) with the combined data. The GCA/SCA ratios were found to be greater than unity for all the studied traits, indicating that additive and additive × additive types of gene action were of greater importance in the inheritance of all traits studied. The interactions of two different nitrogen fertilizer levels with general and specific combining abilities mean squares were found to be highly significant for all traits studied. The wheat Sham 6 exhibited highly significant general combining ability effects in grain yield and some contributory components i.e., spike length, no. of grains/spike, no. of spikelets/spike, 1000-grain weight and no. of grains/spikelet. For most yield and yield components traits, hybrid combination Ug 2 x Ug 4 showed significant specific combining ability effects at the two different nitrogen fertilizer levels and their combined data. However, the cross Sham 6 x Yacora showed significant specific combining ability effects for number of spikes per plant, grain yield/plant and biological yield/plant.*

Key words: *Heterosis, general and specific combining ability, diallel cross, nitrogen fertilization and wheat.*

INTRODUCTION

Wheat (*Triticum aestivum L.*) is the first important and strategic cereal crop for the majority of world's populations. It has been described as the 'King of cereals' because of the acreage it occupies, high productivity and the prominent position it holds in the international food grain trade.

Use of half diallel technique to obtain genetical information for the studied characters *i.e.* yield and yield components in wheat is very important technique. In this respect, additive and dominance gene effects are importance of controlling the genetic system of the inheritance of these characters.

The differential response of genotypes when subject to different nitrogen levels possess a major problem of relating phenotypic performance to genetic constitution and makes, it difficult to decide which genotype should be selected.

Heterosis is a complex genetical phenomenon, which depends on the balance of different combinations of gene effects as well as on the distribution of plus and minus alleles in the parents of a mating. Combining ability analysis is the most widely used biometrical tool for classifying lines in terms of their ability to combine in hybrid combinations. With this method, the resulting total genetic variation is partitioned into general combining ability, as measure of additive gene action and specific combining ability, as measure of non-additive gene action.

The objectives of the present study are to establish: (1) To evaluate eight wheat genetic recourses under different conditions (two nitrogen fertilizer levels). (2) To evaluate heterosis expression for grain yield and its contributory traits. (3) The magnitude of both general and specific combining abilities and their interaction with the two nitrogen fertilizer levels, as two different environmental conditions (two nitrogen fertilizer levels) according to Griffing (1956 b).

MATERIAL AND METHODS

The experiments was carried out at Etay El-Baroud Agricultural Research Station, Egypt during the two successive seasons 2010/2011 and 2011/2012. Eight common wheat varieties and lines wide divergent origins were selected for this study. The names pedigree, code number and origins of these varieties and lines are presented in Table (1).

In 2011/2012 season, the parental varieties and their possible 28 crosses were sown on 17th November under two nitrogen fertilizer levels (35 and 70 kg. nitrogen per faddan), which would be mentioned in the text as stress condition (S) and normal condition (N), respectively. The two experiments were arranged in a randomized complete block design (RCBD) with three replicates per each fertilizer level.

Each plot consisted of two rows with 30 cm. between rows; each row was two meters long and apart, plants within row 10 cm. apart allowing a total of 40 plants per plot. Ten guarded plants were randomly selected from each plot for subsequent measurements: number of spikes per plant, spike length, number of spikelets per main spike, number of grains per main spike, 1000 grain weight, number of grains/spikelet, grain yield (g/plant), straw yield (g/plant), biological yield /plant and harvest Index (%)

Two steps are involved in the analysis of the data. The first step consists of the ordinary analysis of variance for testing the null hypothesis that these are no genotypic differences among the F1's and the parents. Only when the significant differences among these are established, there is needed to proceed for second step analysis, i.e., the combining ability analysis, (Griffing approach, method II model I 1956 b).

In 2010/2011 season, grains from the parental varieties were sown at various dates in order to overcome the differences in time of flowering during this season. All possible cross combinations without reciprocals were made among the eight varieties, giving of twenty eight crosses.

Table (1). Name, pedigree and source of the studied bread wheat genotypes.

No.	genotypes	pedigree
1	*Gemmeiza9*	*ALD"s"/HUAC//CMH74A-63015XcBm4583-5Gm-1Gm-0Gm*
2	*Giza 168*	*MRL/Buc//Seri CM93046-8M-oY-OM-2Y- OB-OGZ*
3	*Sakha 94*	*opata /Rayon//Kauz CMBW 90Y3180-0TOPM-3Y-010M-10M -010Y-M-0S*
4	*Misr 1*	*KAUZ /6/ ATL 66 /H567.71 // ATL 66 /5/ PMN5 // S948*
5	*Sham 6*	*CMSS 96Y 02567S-040Y-020M-050SY-020SY-4M-OY*
6	*Yacora*	*Ciano67//Sonra6411/Klein Rendidor/3/IL8156Y-2M-1Y-OM-302M*
7	*Ug 2*	*SSER 11/MLAN*
8	*Ug4*	*PGO/SER1//BAV92*

The average heterosis overall crosses were calculated partitioning the genotypes sum of square to its components i.e., parents, crosses, and parents vs. crosses. Useful heterosis for each trait of individual cross was expressed as percent increase of F1 performance above the better parent values. To test the significance of the useful heterosis effect.

The combined analysis was calculated over the nitrogen fertilizer levels to test the interaction of the different genetic components with the two different nitrogen fertilizer levels, and that was done whenever the homogeneity of variance was detected.

RESULTS AND DISCUSSION

For better representation and discussion of the results obtained herein, it would be preferred to outline these results into three parts as follow:

1- Variation and Mean performance.
2- Heterosis.
3- Griffing's approach.

1. Variation and interaction with nitrogen fertilizer-levels:

The analysis of variance of each nitrogen fertilizer levels together with the combined data for all traits studied is presented in Table (2).

Nitrogen fertilizer levels mean squares were found to be significant for all traits studied with the mean values of normal nitrogen fertilizer level (70 kgN./fed), being higher than those of the low nitrogen fertilizer level (35 kgN./fed) in all cases, except 1000-grain weight.

Genotypes, parents and F1 hybrids mean square estimates were found to be highly significant for all traits studied under the low and normal nitrogen fertilizer levels as well as the combined data, indicating overall differences among these populations.

Parents vs. crosses mean squares as an indication to average heterosis overall crosses under the two nitrogen fertilizer levels and their combined data, were found to be highly significant for all traits studied, except spike length under normal nitrogen fertilizer level.

The interaction of genotypes, parents and F1 hybrids with the two different nitrogen fertilizer levels was found to be highly significant for all traits studied, indicating that these genotypes were inconsistent from nitrogen fertilizer level to another.

The interactions of parents vs. crosses with the two different nitrogen fertilizer levels were found to be highly significant for all traits studied, except harvest index. It could therefore be concluded that the test of potential parents for expression of heterosis would be necessarily conducting over a number of environmental conditions. These results are agreement with those obtained by El-Sayed (1997), Al-Gazar (1999) and Hendawy *et. al.,* (2005).

2- Heterosis:

Useful heterosis expressed as the percentage deviation of F1 mean performance from the better parent for all traits studied are presented in Table (3). High positive values of heterosis would be of interest in all characters studied.

As for number of spikes per plant, three hybrid combinations exhibited significant under low and normal nitrogen fertilizer levels as well as the combined analysis. These results were in harmony with those recorded by Hendawy (1990), Ashoush (1996), El-Hosary *et.al.,* (2000), Bayoumi (2004), Dawwam *et. al.,* (2007), Akbar *et.al.,* (2010) and Rady *et.al.,* (2011).

Concerning number of spikelets per spike, twenty five crosses were found to exhibit highly significant heterosis under the two nitrogen fertilizer levels and the combined data. These findings were in agreement with those confirmed by Comber (2001), Akbar *et.al.,* (2010), Kumar *et. al.,* (2011) and Arab (2012).

Concerning spike length, four crosses studied were found to exhibit highly significant positive useful heterosis under stress nitrogen fertilizer level and the

Table 2

Table 2

Table 2

Table (3): Percentage of heterosis over better parent for yield and yield components traits studied under the tow nitrogen fertilizer levels.

Crosses	No. of spikes / plant			No. of spikelets/ spike			Spike length (cm)		
	Low (N)	Normal (N)	Comb (N)	Low (N)	Normal (N)	Comb (N)	Low (N)	Normal (N)	Comb (N)
Gemmeiza 9x Sakha 94	-22.86**	1.36**	-10.28**	0.77**	0.54**	0.65**	-0.50	-5.35**	-3.07**
Gemmeiza 9x Giza 168	2.70**	11.17**	7.28**	0.00	0.59**	0.30	-0.08	1.15**	0.57
Gemmeiza 9x Misr 1	-12.82**	13.32**	0.75	6.32**	7.93**	7.13**	-1.19**	1.30**	0.13
Gemmeiza 9x Sham 6	-5.77**	-6.06**	-5.92**	7.72**	5.18**	6.40**	2.50**	-5.22**	-1.13**
Gemmeiza 9x Yacora	-25.78**	-21.13**	-23.37**	17.02**	9.54**	13.10**	1.83**	-4.70**	-1.63**
Gemmeiza 9x Ug 2	-18.70**	-15.92**	-17.26**	15.37**	7.20**	11.06**	-15.59**	-14.41**	-14.96**
Gemmeiza 9x Ug 4	-37.95**	-17.23**	-27.19**	14.27**	11.16**	12.66**	-1.37**	-6.18**	-3.92**
Sakha 94x Giza 168	-5.15**	-7.63**	-6.49**	-0.54	-0.81**	-0.68**	-7.87**	-7.21**	-5.64**
Sakha 94x Misr 1	-4.69**	-5.34**	-5.63**	2.17**	5.08**	3.64**	-0.79*	-5.97**	-1.19**
Sakha 94x Sham 6	-30.50**	-28.40**	-29.29**	3.14**	-1.16**	0.90**	2.70**	-8.14**	-3.18**
Sakha 94x Yacora	-10.05**	-10.39**	-11.65**	14.65**	8.06**	11.20**	8.66**	-4.70**	1.31**
Sakha 94x Ug 2	-19.33**	-12.21**	-15.25**	9.33**	2.54**	5.75**	-0.20	-11.60**	-6.47**
Sakha 94x Ug 4	-44.93**	-35.31**	-39.41**	6.65**	0.90**	3.66**	-14.11**	-10.16**	-10.97**
Giza 168x Misr 1	-9.68**	19.08**	5.87**	5.59**	8.51**	7.06**	-0.74*	0.11	-0.30
Giza 168x Sham 6	-4.44**	10.38**	3.57**	5.21**	0.99**	3.01**	7.80**	-1.52**	4.38**
Giza 168x Yacora	-0.43	3.65**	1.78**	16.51**	8.66**	12.40**	-2.04**	-2.97**	-1.98**
Giza 168x Ug 2	26.22**	27.57**	26.95**	9.14**	3.38**	6.11**	-13.03**	-8.07**	-10.49**
Giza 168x Ug 4	-8.15**	-10.78**	-9.57**	7.59**	5.91**	6.72**	-0.38	-4.71**	-1.81**
Misr 1x Sham 6	-19.56**	9.52**	-3.28**	6.58**	9.58**	8.09**	2.99**	-4.00**	-0.64*
Misr 1x Yacora	-11.77**	1.62**	-5.41**	11.94**	7.54**	9.63**	-4.74**	-0.28	-1.52**
Misr 1x Ug 2	-12.79**	-2.93**	-7.27**	8.22**	5.27**	5.94**	-11.98**	-9.71**	-10.80**
Misr 1x Ug 4	-15.23**	12.22**	0.14**	4.19**	1.79**	2.94**	-6.27**	-7.36**	-6.84**
Sham 6x Yacora	-0.85	37.75**	19.90**	10.98**	5.98**	8.36**	3.05**	1.42**	2.16**
Sham 6x Ug 2	-21.80**	-29.46**	-26.20**	9.14**	3.86**	6.36**	0.13	-11.97**	-6.44**
Sham 6x Ug 4	-37.35**	-24.13**	-30.02**	3.74**	3.25**	3.49**	6.53**	-3.59**	1.65**
Yacora x Ug 2	-17.62**	-10.45**	-13.76**	9.00**	6.89**	7.89**	18.16**	-3.59**	5.85**
Yacora x Ug 4	-8.44**	22.81**	8.36**	9.95**	3.20**	6.41**	-2.61**	-2.09**	-2.34**
Ug 2x Ug 4	7.07**	14.70**	10.18**	8.87**	3.00**	5.11**	0.27	-1.64**	-0.73*
L.S.D 5%	0.86	0.70	0.77	0.54	0.45	0.49	0.63	0.56	0.58
L.S.D 1%	1.14	0.93	1.01	0.72	0.60	0.64	0.83	0.74	0.76

Table (3): Cont.

Crosses	Straw yield/plant (g)			Grain yield/plant (g)			Biological yield/plant (g)			Harvest index (%)		
	Low (N)	Normal (N)	Comb (N)	Low (N)	Normal (N)	Comb (N)	Low (N)	Normal (N)	Comb (N)	Low (N)	Normal (N)	Comb (N)
Gemmeiza 9x Sakha 94	-11.40**	31.57**	10.96**	-36.98**	-7.73**	-21.29**	-24.40**	10.97**	-5.71**	-9.82**	-15.10**	-12.58**
Gemmeiza 9x Giza 168	10.51**	11.98**	11.27**	3.35**	13.46**	8.93**	-0.06	8.19**	4.30**	5.55**	10.51**	8.10**
Gemmeiza 9x Misr 1	23.41**	28.81**	26.18**	-11.63**	-8.33**	-9.86**	1.13**	3.74**	2.50**	-12.36**	-10.88**	-11.61**
Gemmeiza 9x Sham 6	52.74**	34.01**	37.40**	-13.24**	-8.38**	-10.64**	10.91**	11.79**	11.37**	-21.78**	-18.04**	-19.88**
Gemmeiza 9x Yacora	38.18**	25.65**	31.45**	-10.78**	-13.50**	-12.31**	6.28**	-0.74**	2.39**	7.62**	12.04**	9.86**
Gemmeiza 9x Ug 2	21.46**	18.55**	19.93**	-22.43**	-16.85**	-19.44**	-10.52**	-11.91**	-13.13**	-9.28**	-5.61**	-7.41**
Gemmeiza 9x Ug 4	30.73**	29.05**	29.85**	-27.17**	-20.85**	-23.78**	-16.47**	-13.46**	-14.88**	-12.80**	-8.54**	-10.64**
Sakha 94x Giza 168	-27.27**	-32.71**	-30.13**	8.19**	2.62**	5.12**	-11.95**	-16.48**	-14.38**	22.87**	22.87**	22.87**
Sakha 94x Misr 1	10.43**	39.89**	25.54**	-19.54**	8.33**	-4.53**	-5.92**	21.87**	8.74**	-0.68	-1.16	-0.93
Sakha 94x Sham 6	-1.35	-23.55**	-13.90**	-24.01**	-20.34**	-21.97**	-17.44**	-26.41**	-26.74**	4.27**	8.25**	6.35**
Sakha 94x Yacora	75.86**	71.36**	73.44**	-8.71**	-13.20**	-11.23**	20.77**	14.37**	17.22**	4.85**	-0.37	2.12**
Sakha 94x Ug 2	9.86**	30.08**	20.49**	-19.06**	-6.00**	-11.80**	-10.20**	-0.36	-4.73**	9.46**	5.15**	7.21**
Sakha 94x Ug 4	5.87**	1.69**	3.68**	-30.04**	-35.98**	-33.34**	-24.30**	-32.17**	-28.64**	7.11**	1.98**	4.43**
Giza 168x Misr 1	-6.53**	-2.25**	-4.34**	16.73**	11.05**	13.60**	-5.87**	-3.85**	-4.81**	26.95**	22.73**	24.78**
Giza 168x Sham 6	11.32**	-2.98**	3.23**	0.13	10.40**	5.79**	-9.01**	-2.56**	-5.55**	10.05**	13.29**	11.72**
Giza 168x Yacora	38.43**	37.27**	37.81**	-1.57**	-8.88**	-5.95**	12.37**	5.84**	8.75**	32.04**	25.66**	28.76**
Giza 168x Ug 2	-1.20	-6.67**	-4.07**	22.85**	19.63**	21.07**	-4.06**	-11.80**	-8.88**	36.76**	35.64**	36.18**
Giza 168x Ug 4	-4.51**	-8.10**	-6.39**	-12.59**	-19.28**	-16.28**	-27.57**	-32.48**	-30.84**	23.00**	19.55**	21.22**
Misr 1x Sham 6	11.72**	30.49**	19.46**	-6.61**	9.62**	2.13**	-0.04	18.58**	9.78**	-6.58**	-7.56**	-7.08**
Misr 1x Yacora	97.13**	135.64**	117.81**	0.84	23.16**	13.38**	34.40**	59.83**	48.48**	-10.38**	-9.03**	-9.69**
Misr 1x Ug 2	-0.50	23.91**	12.33**	-9.76**	0.89	-4.02**	-9.12**	4.50**	-3.73**	3.62**	-3.46**	0.00
Misr 1x Ug 4	36.55**	39.07**	37.87**	-3.23**	24.14**	11.51**	1.51**	19.83**	11.17**	-4.67**	3.60**	-0.44
Sham 6x Yacora	157.27**	143.79**	150.03**	49.54**	62.15**	56.63**	87.09**	88.77**	88.02**	-9.12**	-9.09**	-9.10**
Sham 6x Ug 2	35.45**	31.41**	33.33**	-10.63**	-21.29**	-16.74**	7.67**	-2.72**	1.90**	-12.66**	-17.73**	-15.33**
Sham 6x Ug 4	38.70**	36.22**	37.40**	-19.21**	-25.38**	-25.89**	-3.37**	-5.81**	-4.71**	-14.47**	-15.13**	-14.82**
Yacora x Ug 2	71.21**	60.40**	65.40**	0.48	-1.97**	-0.90	25.13**	18.36**	21.38**	-13.22**	-13.80**	-13.52**
Yacora x Ug 4	102.87**	126.68**	115.66**	26.29**	49.87**	39.54**	52.98**	74.91**	65.12**	-16.58**	-14.31**	-15.86**
Ug 2x Ug 4	42.34**	43.50**	42.94**	32.14**	22.26**	26.48**	32.67**	26.20**	29.07**	-0.38	-3.12**	-1.80*
L.S.D 5%	1.51	1.41	1.44	1.56	1.37	1.44	0.51	0.46	0.48	1.73	1.29	1.49
L.S.D 1%	2.01	1.88	1.88	2.08	1.82	1.88	0.68	0.61	0.63	2.30	1.72	1.96

Table (3): Cont.

Crosses	No. of grains/ spike			No. of grains/spikelet			1000-grain weight (g)		
	Low (N)	Normal (N)	Comb (N)	Low (N)	Normal (N)	Comb (N)	Low (N)	Normal (N)	Comb (N)
Gemmeiza 9x Sakha 94	15.09**	-7.34**	2.36**	14.25**	-7.84**	1.88**	19.34**	21.00**	20.16**
Gemmeiza 9x Giza 168	-1.83*	-1.22	-1.51	-1.82**	-0.68**	-1.63**	4.29**	2.66**	3.49**
Gemmeiza 9x Misr 1	-4.30**	-2.99**	-3.63**	-9.98**	-10.11**	-10.05**	9.03**	2.24**	5.68**
Gemmeiza 9x Sham 6	4.63**	-11.51**	-5.25**	-2.87**	-12.73**	-10.50**	12.88**	13.26**	12.10**
Gemmeiza 9x Yacora	16.87**	6.39**	11.13**	-0.12*	-2.89**	-1.57**	20.67**	16.43**	18.57**
Gemmeiza 9x Ug 2	-6.78**	-10.35**	-8.66**	-7.81**	-10.77**	-9.34**	10.95**	16.39**	13.55**
Gemmeiza 9x Ug 4	-19.85**	-25.86**	-23.06**	-28.98**	-32.88**	-31.00**	33.04**	27.06**	30.09**
Sakha 94x Giza 168	31.74**	8.27**	18.41**	32.45**	9.11**	19.39**	8.35**	5.37**	6.89**
Sakha 94x Misr 1	22.06**	4.26**	9.61**	28.66**	4.03**	14.87**	1.80**	3.51**	2.64**
Sakha 94x Sham 6	30.19**	3.05**	14.78**	33.28**	5.11**	17.51**	13.03**	10.00**	11.56**
Sakha 94x Yacora	18.63**	12.81**	14.08**	21.53**	8.76**	14.38**	13.60**	-2.40**	5.68**
Sakha 94x Ug 2	39.87**	15.86**	26.23**	48.43**	21.72**	33.48**	-2.08**	2.28**	0.00
Sakha 94x Ug 4	21.02**	-0.05	9.06**	29.86**	8.40**	17.84**	-2.59**	-5.96**	-4.24**
Giza 168x Misr 1	4.97**	5.78**	5.38**	-0.58**	-2.49**	-1.55**	3.85**	3.79**	3.82**
Giza 168x Sham 6	9.02**	-1.59	1.35**	3.63**	-1.55**	-1.34**	9.04**	-0.41	4.47**
Giza 168x Yacora	22.73**	8.59**	14.99**	5.36**	-0.07	2.52**	18.67**	4.76**	11.79**
Giza 168x Ug 2	3.76**	-1.00	1.25	9.53**	1.01**	5.09**	2.26**	2.24**	2.25**
Giza 168x Ug 4	4.82**	-3.64**	0.30	-0.50**	-9.01**	-5.17**	4.67**	7.62**	6.12**
Misr 1x Sham 6	4.79**	7.29**	6.06**	-0.67**	-2.09**	-1.89**	6.63**	2.50**	4.63**
Misr 1x Yacora	12.88**	17.96**	15.66**	0.88**	9.68**	5.49**	11.68**	9.27**	10.49**
Misr 1x Ug 2	-1.18	8.42**	3.71**	-1.55**	3.02**	0.75**	2.51**	7.09**	4.70**
Misr 1x Ug 4	-3.64**	1.10	-1.37	-2.00**	-0.40**	-1.19**	16.41**	6.03**	11.31**
Sham 6x Yacora	5.40**	8.32**	7.00**	-4.99**	2.21**	-1.22**	18.47**	5.31**	11.96**
Sham 6x Ug 2	3.10**	-4.00**	-3.76**	3.81**	-6.47**	-1.78**	9.16**	17.05**	12.93**
Sham 6x Ug 4	-5.13**	0.36	-2.19*	-2.11**	-2.81**	-4.88**	19.46**	23.41**	21.37**
Yacora x Ug 2	23.76**	8.86**	15.60**	13.55**	1.83**	7.41**	17.80**	24.35**	19.57**
Yacora x Ug 4	18.42**	14.99**	16.54**	7.72**	11.41**	9.65**	16.02**	14.06**	15.05**
Ug 2x Ug 4	18.20**	12.93**	15.38**	10.05**	9.64**	9.84**	9.01**	15.07**	11.91**
L.S.D 5%	1.77	1.76	1.73	0.11	0.09	0.10	19.34	0.48	0.47
L.S.D 1%	2.36	2.34	2.27	0.15	0.13	0.13	4.29	0.64	0.62

combined analysis, however, four hybrid combinations showed highly significant positive useful heterosis under the stress nitrogen fertilizer level and two crosses showed highly significant useful heterosis under normal nitrogen fertilizer level. These results were in harmony with those observed by Al-Kaddoussi and Hassan (1991), Hendawy (1994 a), Hewezi (1996), Seleem *et.al.,* (2011), El-Shal (2005) and Rady *et.al.,* (2011).

Concerning number of grains per spike, fourteen crosses showed highly significant useful heterosis under the two nitrogen fertilizer levels and the combined, the best crosses were Sakha94 x Ug2 and Sakha94 x Giza 168. These results were in agreement with those recorded by El-Seidy and Hamada (2000), Seleem (2001), Bayoumi (2004), Sharief *et.al.,* (2006) and Rady *et.al.,* (2011).

As for no. of grains spikelet, eleven crosses studied were found to exhibit highly significant positive useful heterotic effect under two nitrogen fertilizer levels and the combined data. The best crosses were Gemmeiza 9 x Sakha 94 and Giza 168 x Yacora under low nitrogen fertilizer level (35 kgN./fed), and the cross Misr 1 x Yacora under normal nitrogen fertilizer level (70 kgN./fed) and , the combined data. Significant heterosis was found also by Arab (2012)

Concerning 1000-grain weight, twenty five crosses showed highly significant useful heterosis under the two nitrogen fertilizer level and the combined. The best cross was Giza 168 x Sham 6 under stress nitrogen fertilizer level and their combined data and the cross Sakha 94 x Ug 2 under the normal nitrogen fertilizer level. These results were in harmony with those obtained by Shrief *et.al.,* (2006), Hendawy *et.al.,* (2007), Akbar *et.al.,* (2010) and Rady *et.al.,* (2011).

As for straw yield per plant, twenty crosses showed highly significant useful heterosis under the two nitrogen fertilizer levels and the combined analysis and one cross under the normal nitrogen fertilizer level and the combined analysis. The best crosses were Sham 6 x Yacora, Misr 1 x Yacora and Yacora x Ug 4 under tow nitrogen fertilizer levels and their combined data.

Concerning grain yield per plant, seven crosses showed highly significant useful heterosis under the two nitrogen fertilizer level and the combined analysis and four crosses under the normal nitrogen fertilizer level and the combined analysis. The best crosses of these superior six crosses were Sham 6 x Yacora and Yacora x Ug 4 under tow nitrogen fertilizer levels and their combined data. These findings agrees with the general trend where the expression of heterosis for a complex trait could be explained on the basis of component interaction, as numerical value recorded for a complex trait is always a function of its components. It could be calculated that these crosses would be efficient and prospective in wheat breeding programme for improving grain yield especially under low input conditions. Heterosis for grain yield per plant was previously found by Seleem (1993), Hendawy (1994 a), El-Sayed (1997), Saad (1999), Darwish and Ashoush (2003), El-Sayed and Moshref (2005), El-Shal (2005),Sharief *et. al.,* (2006), El-Borhamy *et.al.,* (2008), Mekhamer (2009), Akbar *et.al.,* (2010) and Kumar *et.al.,* (2011).

Concerning biological yield per plant, ten crosses showed highly significant useful heterosis under the two nitrogen fertilizer level and the combined analysis, three crosses under the normal nitrogen fertilizer level and the combined analysis and two crosses under the stress nitrogen fertilizer level and the combined analysis. The best cross of these superior ten crosses was Sham6 x Yacora, followed by Yacora x Ug4 under tow nitrogen fertilizer levels and their combined data. Significant heterosis was also found by Hewezi (1996), El-Gazar (1999), El-Sayed and Moshref (2005) and Mekhamer (2009).

As for harvest index, eleven crosses showed highly significant useful heterosis under the two nitrogen fertilizer level and the combined analysis. The best cross of these superior eleven crosses was Giza168 x Ug2, followed by Giza168 x Yacora under tow nitrogen fertilizer levels and their combined data. Similar results were previously reported by El-Sayed and Moshref (2005), El-Shal (2005), Mekhamer (2009) and Rady *et.al.,* (2011).

Griffing's approach:

Estimates of both general combining ability (GCA) and specific combining ability (SCA), mean squares were computed according to Griffing (1956 b) method 2 model 1. The combined analysis was calculated over two nitrogen fertilizer levels (35, 70 kgN/fed) with their combined data to test the interaction of the different genetic components with the two different environmental conditions, and that was done whenever the homogeneity of variances was detected. The analysis of variance of each nitrogen fertilizer levels together with the combined data for all traits studied are previously mentioned in Table (2).

General combining ability and specific combining ability mean squares were found to be highly significant for all characters under examination of two nitrogen fertilizer levels (35, 70 kgN/fed) with the combined data. This would indicate the importance of both additive and non-additive genetic variance in determining the performance of all traits studied.

The GCA / SCA ratios were found to be greater than unity for most studied traits, indicating that additive and additive × additive types of gene action were of greater importance in the inheritance of all traits studied. It is therefore could be concluded that, the presence of large amount of additive effects, suggests the potentiality for obtaining further yield and yield components improvements. Also, selection procedures based on the accumulation of additive effect would be successful in improving these character studied. However, to maximize selection advance, procedures which are known to be effective in shifting gene frequency when both additive and non-additive variances are involved, would be preferred. These results were in harmony with those recorded by El-Sayed (1997), Hendawy (1998), Mahrous (1998), Seleem (2001), Abd El-Aty (2004), El-Sayed and Moshref (2005), Hendawy *et. al.,* (2005), Dawwam *et. al.,* (2007), El-Shamarka *et. al.,* (2009), Rady *et. al.,* (2011) and Adel and Ali (2013).

The interactions of two different nitrogen fertilizer levels with general and specific combining ability mean squares were found to be highly significant for all traits studied, except number of spikelets per spike which found to be only significant Table (2). This indicate that additive and non-additive genetic variance behave differently from nitrogen fertilizer level to another. The interactions of specific combining ability mean squares with the two different nitrogen fertilizer levels were found to be highly significant for all traits, except number of spikelets per spike which found to be only significant. The significant interaction of additive gene effects with nitrogen fertilizer levels for these traits indicated that, selection for these characters would not be effective in a single environment and more environments would be required. Similar results were recorded by Sharma *et. al.,* (1991), Hendawy (1998), Seleem (2001), Awan *et. al.,* (2005), Chowdhary *et. al.,* (2007) El-Marakby *et. al.,* (2007), El-Shamarka *et. al.,* (2009) and Rady *et. al.,* (2011).

3-A. General combining ability effects:

Estimation of the general combining ability effects (ĝi) of the individual parental lines for each trait under the two nitrogen fertilizer levels with their combined data are given in Table (4). General combining ability effects computed herein were found to be differed significantly from zero in most cases. High positive values of general combining ability effects would be of interest in most traits in question.

Concerning number of spikes per plant, highly significant effects were detected for Misr 1, Sham 6, Yacora and Ug 2 under two nitrogen fertilizer levels and their combined data, while, Ug 4 under normal nitrogen fertilizer level (70 kgN/fed) and the combined analysis. As observed by many workers *i. e.,* Al-Gazar (1999), Kashif and Khaliq (2003), Awan *et. al*., (2005), Hasnain *et. al.,* (2006), Mahpara *et. al.,* (2008), Arab (2012) and Adel and Ali (2013).

As for number of spikelets per spike, highly significant effects were detected for Gemmeiza 9, Sakha 94 and Giza 168 under two nitrogen fertilizer levels and their combined data, while, Sham 6 under normal nitrogen fertilizer level (70 kgN/fed) and the combined analysis. As observed by many workers *i. e.,* Seleem (2001), Esmail (2002), Kashif and Khaliq (2003), Hasnain *et. al.,* (2006) and Adel and Ali (2013).

Concerning spike length, highly significant effects were detected for Gemmeiza 9 and Sham 6 under two nitrogen fertilizer levels and their combined data, while, Giza 168 showed highly significant under low nitrogen fertilizer level (35 kgN/fed) and the combined analysis and Yacora under normal nitrogen fertilizer level (70 kgN/fed). As observed by many workers *i. e.,* Al-Gazar (1999), Esmail (2002), Awan *et. al*., (2005), Hasnain *et. al.,* (2006), Mahpara *et. al.,* (2008), Arab (2012) and Adel and Ali (2013).

As for no. of grains/spikelet, highly significant effects were detected for Ug 2, Giza 168 and Ug 4 under two nitrogen fertilizer levels and their combined data, and Sham 6 showed highly significant under normal nitrogen fertilizer level (70 kgN/fed) and the combined analysis.

Concerning 1000-grain weight, highly significant effects were detected for Gemmeiza 9 and Ug 4 under two nitrogen fertilizer levels and their combined data, while, Sakha 94 showed highly significant under low nitrogen fertilizer level (35 kgN/fed) and the combined analysis and Sham 6 under low nitrogen fertilizer level (35 kgN/fed) only. As observed by many workers *i. e.,* Al-Gazar (1999), Esmail (2002), Kashif and Khaliq (2003), Abd-El Aty (2004), Awan *et. al*., (2005), Hasnain *et. al.,* (2006), Mahpara *et. al.,* (2008), Arab (2012) and Adel and Ali (2013),

Table (4): Estimates of general combining effects for parents evaluated under the two nitrogen levels and their combined data for yield and yield components traits.

Parents		No. of spikes/plant			No. of spikelets/spike			Spike length (cm)		
		Low (N)	Normal (N)	Comb (N)	Low (N)	Normal (N)	Comb (N)	Low (N)	Normal (N)	Comb (N)
Gemmeiza 9		-0.89	-2.44	-1.64	1.16**	0.90**	1.03**	0.49**	0.61**	0.55**
Sakha 94		-0.58	-0.73	-0.66	0.34**	0.10*	0.23**	-0.33	-0.15	-0.24
Giza 168		-0.55	-1.69	-1.13	0.62**	0.40**	0.51**	0.34**	0.02	0.18**
Misr 1		0.26**	1.43**	0.84**	-0.19	-0.27	-0.23	-0.01	-0.05	-0.03
Sham 6		042**	1.40**	0.91**	0.09	0.32**	0.20**	0.63**	0.73**	0.68**
Yacora		0.56**	0.41**	0.48**	-0.51	-0.36	-0.43	-0.23	0.17**	-0.03
Ug 2		0.84**	0.88**	0.86**	-0.72	-0.39	-0.56	-1.02	-1.25	-1.13
Ug4		-0.06	0.74**	0.34**	-0.80	-0.69	-0.75	0.13	-0.08	0.02
L.S.D ĝi	0.05	0.18	0.15	0.06	0.11	0.09	0.04	0.13	0.12	0.05
	0.01	0.24	0.19	0.08	0.15	0.12	0.05	0.17	0.15	0.06
L.S.D ĝi – ĝj	0.05	0.27	0.11	0.06	0.17	0.07	0.04	0.20	0.09	0.05
	0.01	0.36	0.11	0.06	0.23	0.07	0.04	0.26	0.09	0.05

Table (4): Cont.

Parents		No. of grains/spike			No. of grains/spikelet			1000-grain weight (g)		
		Low (N)	Normal (N)	Comb. (N)	Low (N)	Normal (N)	Comb. (N)	Low (N)	Normal (N)	Comb. (N)
Gemmeiza 9		0.54**	-1.82	-0.64	-0.14**	-0.20**	-0.17**	0.86**	1.44**	1.15**
Sakha 94		-2.32	-1.74	-2.04	-0.14**	-0.08**	-0.11**	0.19**	0.09	0.14**
Giza 168		5.16**	3.74**	4.46**	0.13**	0.09**	0.11**	-1.20	-1.40	-1.29
Misr 1		-1.63	-3.72	-2.67	-0.05*	-0.12**	-0.08**	-0.37	-0.32	-0.35
Sham 6		0.00	3.22**	1.61**	-0.02*	0.08**	0.03**	0.38**	-0.38	0.00
Yacora		-4.65	-1.94	-3.29	-0.13**	-0.03**	-0.08**	-0.68	-1.07	-0.88
Ug 2		4.85**	4.09**	4.47**	0.32**	0.23**	0.27**	-1.99	-1.40	-1.70
Ug4		-1.95	-1.85	-1.90	0.03**	0.03**	0.03**	2.81**	3.04**	2.93**
L.S.D ĝi	0.05	0.37	0.37	0.14	0.02	0.02	0.01	0.10	0.10	0.04
	0.01	0.49	0.49	0.19	0.03	0.03	0.01	0.14	0.13	0.05
L.S.D ĝi - ĝj	0.05	0.56	0.28	0.14	0.04	0.01	0.01	0.15	0.08	0.04
	0.01	0.74	0.28	0.14	0.05	0.01	0.01	0.20	0.08	0.04

Table (4): Cont.

Parents		Straw yield/plant (g)			Grain yield/plant (g)			Biological yield/plant (g)			Harvest index (%)		
		Low (N)	Normal (N)	Comb. (N)	Low (N)	Normal (N)	Comb. (N)	Low (N)	Normal (N)	Comb. (N)	Low (N)	Normal (N)	Comb. (N)
Gemmeiza 9		3.69**	3.77**	3.73**	-4.74	-8.03	-6.39	-1.05	-4.26	-2.66	-4.53	-4.85	-4.69
Sakha 94		1.55**	2.75**	2.15**	-3.52	-3.94	-3.73	-1.96	-1.20	-1.58	-2.83	-2.70	-2.76
Giza 168		0.08	-2.07	-1.00	-1.86	-6.02	-3.94	-1.79	-8.08	-4.93	-0.74	-1.12	-0.93
Misr 1		1.32**	3.59**	2.46**	1.34**	2.39**	1.87**	2.66**	5.99**	4.32**	-0.08	-0.66	-0.37
Sham 6		4.80**	5.36**	5.08**	2.91**	8.30**	5.61**	7.72**	13.67**	10.69**	-1.13	0.15	-0.49
Yacora		-6.78	-6.78	-6.78	-2.38	-2.09	-2.24	-9.16	-8.87	-9.01	3.41**	3.22**	3.31**
Ug 2		-2.53	-3.02	-2.78	4.11**	3.99**	4.05**	1.57**	0.95**	1.26**	3.17**	2.78**	2.98**
Ug4		-2.13	-3.60	-2.86	4.14**	5.40**	4.77**	2.01**	1.80**	1.91**	2.73**	3.18**	2.95**
L.S.D ĝi	0.05	0.32	0.30	0.12	0.33	0.29	0.12	0.11	0.10	0.04	0.36	0.27	0.12
	0.01	0.42	0.39	0.16	0.43	0.38	0.16	0.14	0.13	0.05	0.48	0.36	0.16
L.S.D ĝi - ĝj	0.05	0.48	0.22	0.12	0.49	0.22	0.12	0.16	0.07	0.04	0.55	0.20	0.12
	0.01	0.64	0.22	0.12	0.66	0.22	0.12	0.22	0.07	0.04	0.73	0.20	0.12

As for number of grains per spike, highly significant effects were detected for Giza 168 and Ug 2 under two nitrogen fertilizer levels and their combined data, while, Sham 6 showed highly significant under normal nitrogen fertilizer level (70 kgN/fed) and the combined analysis and Gemmeiza 9 under low nitrogen fertilizer level (35 kgN/fed) only. As observed by many workers *i. e.,* Al-Gazar (1999), Esmail (2002), Kashif and Khaliq (2003), Abd-El Aty (2004), Awan *et. al*., (2005), Hasnain *et. al.,* (2006), Arab (2012) and Adel and Ali (2013).

Concerning straw yield per plant, highly significant effects were detected for Gemmeiza 9, Sakha 94, Misr 1 and Sham 6 under two nitrogen fertilizer levels and their combined data.

As for grain yield per plant, highly significant effects were detected for Misr 1, Sham 6, Ug 2 and Ug 4 under two nitrogen fertilizer levels and their combined data. However, it is appear that, the parent which possesses high GCA effects for grain yield/plant might be also do for one or more traits contributing to yield, while the parent which had high GCA effects for one or more of yield components not necessarily had high GCA effects for yield it self. As observed by many workers *i. e.,* Al-Gazar (1999), Seleem (2001), Esmail (2002), Kashif and Khaliq (2003), Abd-El Aty (2004), Awan *et. al*., (2005), Hasnain *et. al.,* (2006), Mahpara *et. al.,* (2008) and Arab (2012).

Concerning biological yield per plant, highly significant effects were detected for Misr 1, Sham 6, Ug 2 and Ug 4 under two nitrogen fertilizer levels and their combined data. As observed by many workers *i. e.,* Khan *et. al.,* (2007) and Seboka *et. al.,* (2009).

As for harvest index, highly significant effects were detected for Yacora, Ug 2 and Ug 4 under two nitrogen fertilizer levels and their combined data.

3-B. Specific combining ability effects:

Estimates of the specific combining ability effects (Ŝi) for the twenty eight hybrid combinations at the two different nitrogen fertilizer levels and their combined data are presented in Table (5).

As for number of spikes per plant, seven, nine and nine hybrid combinations under the two nitrogen fertilizer levels (35, 70 kgN./fed) and their combined data, respectively showed highly significant and/or significant positive specific combining ability effects. However, five crosses showed highly significant specific combining ability effect under the two nitrogen fertilizer levels and their combined data. The cross Ug 2 x Ug 4 gave the highest desirable (Ŝij) value for this trait, followed by Sham 6 x Yacora. As observed by many workers *i.e.,* Kashif and Khaliq (2003), Awan *et. al*., (2005), Hasnain *et. al.,* (2006), Mahpara *et. al.,* (2008), Arab (2012) and Adel and Ali (2013).

Concerning number of spikelets per spike, nine, eight and twelve hybrid combinations under the two nitrogen fertilizer levels (35, 70 kgN./fed) and their combined data, respectively showed highly significant and/or significant positive specific combining ability effects. However, five crosses showed highly significant specific combining ability effects under the low nitrogen fertilizer levels and their combined data. The cross Misr 1 x Sham 6 gave the highest desirable (Ŝij) value for this trait followed by Gemmeiza 9 x Ug 4. As observed by many workers *i. e.,* Hasnain *et.al.,* (2006), Seboka *et.al.,* (2009) and Adel and Ali (2013)

With regard to spike length, eight, seven and ten hybrid combinations under the two nitrogen fertilizer levels (35, 70 kgN./fed) and their combined data, respectively showed highly significant and/or significant positive specific combining ability effects. However, the crosses Ug 2 x Ug 4, Yacora x Ug 2 and Giza 168 x Sham 6 showed highly significant specific combining ability effects under the two nitrogen fertilizer levels and their combined data. The best cross for this trait was Ug2 x Ug4. As observed by many workers *i. e.,* Comber (2001), Chowdhary *et. al*., (2007), Mahpara *et. al.,* (2008) and El-Shamarka *et. al*., (2009)

Table (5): Estimates of specific combining ability effects for the twenty eight crosses studied under two nitrogen fertilizer levels and their combined data for yield and yield component traits.

Crosses	No. of spikes /plant			No. of spikelets/spike			Spike length (cm)		
	Low (N)	Normal (N)	Comb (N).	Low (N)	Normal (N)	Comb (N).	Low (N)	Normal (N)	Comb (N).
Gemmeiza 9x Sakha 94	-0.59	1.29**	0.35*	-0.32	-0.16	-0.24	0.54**	-0.06	0.24
Gemmeiza 9x Giza 168	1.13**	2.98**	2.05**	-0.44	-0.40	-0.42	-0.07	0.81**	0.37**
Gemmeiza 9x Misr 1	-0.08	0.85**	0.39*	-0.29	-0.22	-0.26	0.12	0.90**	0.51**
Gemmeiza 9x Sham 6	0.69*	-1.92	-0.61	0.26	0.58**	0.42**	0.00	-0.78	-0.39
Gemmeiza 9x Yacora	-2.12	-3.11	-2.61	0.26	-0.01	0.12	0.77**	-0.28	0.25
Gemmeiza 9x Ug 2	-1.46	-2.82	-2.14	0.43*	0.06	0.24*	-0.89	-0.39	-0.64
Gemmeiza 9x Ug 4	-3.13	-2.87	-3.00	0.61**	0.89**	0.75**	-0.04	-0.26	-0.15
Sakha 94x Giza 168	-0.10	-1.33	-0.72	-0.10	-0.01	-0.06	-0.49	-0.39	-0.44
Sakha 94x Misr 1	1.53**	0.18	0.85**	-0.43	-0.09	-0.26	0.44*	-0.13	0.16
Sakha 94x Sham 6	-2.32	-3.48	-2.90	-0.01	-0.23	-0.12	0.23	-0.49	-0.13
Sakha 94x Yacora	0.46	-0.84	-0.19	0.56**	0.44**	0.50**	0.73**	-0.16	0.29*
Sakha 94x Ug 2	-1.15	0.14	-0.50	-0.05	-0.24	-0.15	0.43*	0.22	0.32*
Sakha 94x Ug 4	-3.90	-4.14	-4.02	-0.23	-0.70	-0.47	-1.39	-0.74	-1.06
Giza 168x Misr 1	-1.47	0.20	-0.64	0.09	0.41**	0.25*	0.18	0.05	0.12
Giza 168x Sham 6	-1.02	-0.98	-1.00	0.21	0.01	0.11	0.73**	0.41*	0.57**
Giza 168x Yacora	-0.68	-0.92	-0.80	0.69**	0.28	0.49**	0.22	-0.47	-0.13
Giza 168x Ug 2	2.16**	1.92**	2.04**	-0.35	-0.35	-0.35	-0.52	0.06	-0.23
Giza 168x Ug 4	-0.98	-3.24	-2.11	-0.29	0.16	-0.06	0.09	-0.40	-0.15
Misr 1x Sham 6	-1.44	0.78**	-0.33	0.85**	0.74**	0.79**	0.00	0.08	0.04
Misr 1x Yacora	-0.44	-0.94	-0.69	0.53**	0.69**	0.61**	-0.19	0.00	-0.10
Misr 1x Ug 2	-0.88	-0.99	-0.94	0.25	0.44**	0.35**	-0.38	-0.20	-0.29
Misr 1x Ug 4	-0.33	1.94**	0.80**	-0.22	-0.13	-0.17	-0.64	-0.72	-0.68
Sham 6x Yacora	1.27**	5.28**	3.27**	0.06	-0.26	-0.10	0.18	0.73**	0.45**
Sham 6x Ug 2	-1.90	-4.49	-3.20	0.18	-0.15	0.01	0.58**	0.01	0.29*
Sham 6x Ug 4	-2.71	-3.57	-3.14	-0.59	-0.38	-0.48	0.47*	0.17	0.32*
Yacora x Ug 2	-1.63	-2.46	-2.05	0.46*	0.66**	0.56**	1.31**	0.71**	1.01**
Yacora x Ug 4	0.63*	3.39**	2.01**	0.73**	0.11	0.42**	0.08	-0.17	-0.04
Ug 2x Ug 4	2.92**	4.69**	3.81**	1.01**	0.28	0.64**	1.27**	1.33**	1.30**
LSD (s_{ij})1%	0.55	0.45	0.35	0.35	0.29	0.22	0.40	0.36	0.26
5%	0.73	0.59	0.46	0.46	0.38	0.29	0.53	0.47	0.34
LSD (s_{ij}-s_{ik})1%	0.82	0.66	0.51	0.51	0.43	0.33	0.59	0.53	0.39
5%	1.09	0.88	0.67	0.68	0.57	0.43	0.79	0.70	0.51
LSD (s_{ij}-s_{ki})1%	0.77	0.62	0.17	0.48	0.40	0.11	0.56	0.50	0.13
5%	1.02	0.83	0.22	0.64	0.53	0.14	0.74	0.66	0.17

Table (5): Cont.

Crosses	No. of grains / spike			No. of grains/spikelet			1000-grain weight (g)		
	Low (N)	Normal (N)	Comb (N).	Low (N)	Normal (N)	Comb (N).	Low (N)	Normal (N)	Comb (N).
Gemmeiza 9x Sakha 94	-3.81	-6.94	-5.37	-0.10*	-0.25**	-0.18**	3.44**	5.25**	4.34**
Gemmeiza 9x Giza 168	1.45*	6.62**	4.03**	0.12*	0.32**	0.22**	-2.03	-1.41	-1.72
Gemmeiza 9x Misr 1	-3.68	-4.53	-4.11	-0.11*	-0.15**	-0.13**	-0.70	-2.67	-1.69
Gemmeiza 9x Sham 6	2.35**	-1.57	0.39	0.07*	-0.13**	-0.03	0.30	1.22**	0.76**
Gemmeiza 9x Yacora	1.56**	-0.18	0.69	0.04	0.00	0.02	2.40**	2.18**	2.29**
Gemmeiza 9x Ug 2	-4.32	-4.62	-4.47	-0.26**	-0.20**	-0.23**	1.64**	1.31**	1.48**
Gemmeiza 9x Ug 4	-15.53	-18.48	-17.01	-0.72**	-0.84**	-0.78**	7.05**	4.99**	6.02**
Sakha 94x Giza 168	2.11**	0.49	1.30**	0.10*	0.02	0.06*	1.62**	1.82**	1.72**
Sakha 94x Misr 1	2.77**	1.18*	1.97**	0.17**	0.06*	0.12**	-0.37	1.75**	0.69**
Sakha 94x Sham 6	6.30**	-3.33	1.48**	0.26**	-0.10*	0.08*	1.91	1.15**	1.53**
Sakha 94x Yacora	3.62**	4.79**	4.20**	0.08*	0.13**	0.10**	0.00	-4.48	-2.24
Sakha 94x Ug 2	7.58**	6.47**	7.03**	0.31**	0.30**	0.30**	-3.60	-3.20	-3.40
Sakha 94x Ug 4	2.44**	-0.84	0.80*	0.12*	0.05	0.09**	-3.62	-4.65	-4.14
Giza 168x Misr 1	-1.16	-3.08	-2.12	-0.06	-0.17**	-0.11**	0.08	1.52**	0.80**
Giza 168x Sham 6	1.14*	1.22*	1.18**	0.02	0.05	0.03	1.45**	-1.89	-0.22
Giza 168x Yacora	0.75	-4.02	-1.64	-0.05	-0.19**	-0.12**	3.59**	0.05	1.82**
Giza 168x Ug 2	0.06	-1.29	-0.62	0.05	0.00	0.03	-0.24	-1.73	-0.98
Giza 168x Ug 4	-1.19	-4.41	-2.80	-0.01	-0.21**	-0.11**	-2.72	-0.12	-1.42
Misr 1x Sham 6	3.86**	-1.35	1.26**	0.05	-0.15**	-0.05	-0.50	-1.70	-1.10
Misr 1x Yacora	1.13	10.82**	5.97**	-0.02	0.34**	0.16**	-0.27	0.89**	0.31**
Misr 1x Ug 2	-5.60	-1.31	-3.45	-0.29**	-0.12**	-0.20**	-0.96	-0.79	-0.87
Misr 1x Ug 4	-0.91	-1.23	-1.07	-0.01	-0.04	-0.03	4.08**	-0.02	2.03**
Sham 6x Yacora	-5.36	-3.70	-4.53	-0.23**	-0.11*	-0.17**	1.92**	-0.73	0.59**
Sham 6x Ug 2	-3.16	-3.62	-3.39	-0.17**	-0.13**	-0.15**	1.31**	3.40**	2.36**
Sham 6x Ug 4	-3.68	-0.35	-2.01	-0.08*	0.04	-0.02	2.26**	4.02**	3.14**
Yacora x Ug 2	1.72**	-4.15	-1.21	0.00	-0.27**	-0.13**	4.01**	7.13**	5.57**
Yacora x Ug 4	5.06**	6.62**	5.84**	0.11*	0.25**	0.18**	-1.57	-0.43	-1.00
Ug 2x Ug 4	9.40**	9.90**	9.65**	0.24**	0.36**	0.30**	-1.19	-0.84	-1.01
LS.D (s_{ij})1%	1.14	1.13	0.78	0.07	0.06	0.05	0.31	0.31	0.21
5%	1.51	1.50	1.03	0.10	0.08	0.06	0.42	0.41	0.28
LS.D (s_{ij}-s_{ik})1%	1.68	1.67	1.16	0.11	0.09	0.07	0.46	0.45	0.32
5%	2.23	2.22	1.52	0.14	0.12	0.09	0.61	0.60	0.42
LS.D (s_{ij}-s_{ki})1%	1.58	1.57	0.39	0.10	0.08	0.02	0.44	0.43	0.11
5%	2.11	2.09	0.51	0.13	0.11	0.03	0.58	0.57	0.14

Table (5): Cont.

Crosses	Straw yield/plant (g)			Grain yield/plant (g)			Biological yield/plant (g)			Harvest index (%)		
	Low (N)	Normal (N)	Comb (N).	Low (N)	Normal (N)	Comb (N).	Low (N)	Normal (N)	Comb (N).	Low (N)	Normal (N)	Comb (N).
Gemmeiza 9x Sakha 94	-6.72	11.75**	2.52**	-7.35	3.54**	-1.91	-14.06	15.28**	0.61**	-1.87	-3.70	-2.78
Gemmeiza 9x Giza 168	5.38**	6.27**	5.82**	4.37**	12.84**	8.61**	9.75**	19.10**	14.43**	-0.70	1.89**	0.59
Gemmeiza 9x Misr 1	5.69**	2.30**	4.00**	0.49	-3.15	-1.33	6.18**	-0.85	2.67**	-2.45	-2.61	-2.53
Gemmeiza 9x Sham 6	12.95**	10.42**	11.68**	-1.90	-9.09	-5.49	11.05**	1.33**	6.19**	-6.18	-7.17	-6.67
Gemmeiza 9x Yacora	-10.36	-15.22	-12.79	-2.65	-5.26	-3.96	-13.01	-20.48	-16.74	4.22**	5.52**	4.87**
Gemmeiza 9x Ug 2	-0.15	-2.47	-1.31	-7.68	-9.68	-8.68	-7.83	-12.15	-9.99	-4.14	-3.28	-3.71
Gemmeiza 9x Ug 4	-0.14	-1.29	-0.72	-10.09	-13.41	-11.75	-10.23	-14.70	-12.46	-5.47	-5.22	-5.35
Sakha 94x Giza 168	-4.51	-9.21	-6.86	5.25**	2.96**	4.10**	0.74**	-6.26	-2.76	5.08**	5.42**	5.25**
Sakha 94x Misr 1	2.03**	8.53**	5.28**	-1.86	7.43**	2.79**	0.17	15.97**	8.07**	-2.03	-0.73	-1.38
Sakha 94x Sham 6	-8.24	-16.13	-12.19	-5.74	-12.59	-9.17	-13.98	-28.73	-21.35	1.35*	3.29**	2.32**
Sakha 94x Yacora	0.23	-2.30	-1.04	-3.01	-9.19	-6.10	-2.78	-11.49	-7.14	-2.92	-4.21	-3.56
Sakha 94x Ug 2	-2.35	3.34**	0.50	-4.27	1.38**	-1.45	-6.62	4.72**	-0.95	-0.53	-0.93	-0.73
Sakha 94x Ug 4	-6.72	-10.82	-8.77	-10.20	-20.23	-15.21	-16.92	-31.05	-23.98	-1.17	-2.95	-2.06
Giza 168x Misr 1	-4.07	-6.46	-5.27	4.11**	1.12*	2.61**	0.04	-5.34	-2.65	4.09**	3.31**	3.70**
Giza 168x Sham 6	-1.30	0.22	-0.54	-4.69	-5.13	-4.91	-5.99	-4.91	-5.45	-2.16	-1.84	-2.00
Giza 168x Yacora	-6.69	-6.35	-6.52	-1.67	-5.05	-3.36	-8.36	-11.41	-9.88	2.81**	0.77	1.79**
Giza 168x Ug 2	-5.01	-7.08	-6.05	4.00**	4.12**	4.06**	-1.01	-2.96	-1.99	5.07**	5.80**	5.44**
Giza 168x Ug 4	-8.88	-9.78	-9.33	-11.44	-18.10	-14.77	-20.32	-27.88	-24.10	-0.42	-1.99	-1.21
Misr 1x Sham 6	-2.37	1.50**	-0.43	-1.37	-4.01	-2.69	-3.74	-2.51	-3.12	0.58	-1.56	-0.49
Misr 1x Yacora	5.23**	13.57**	9.40**	-3.86	4.02**	0.08	1.37**	17.59**	9.48**	-6.03	-5.47	-5.75
Misr 1x Ug 2	-5.99	-0.06	-3.03	-4.24	-5.16	-4.70	-10.23	-5.22	-7.73	1.83**	-1.85	-0.01
Misr 1x Ug 4	4.27**	2.75**	3.51**	-0.78	7.98**	3.60**	3.49**	10.73**	7.11**	-2.24	1.78**	-0.23
Sham 6x Yacora	15.23**	13.92**	14.58**	14.96**	19.08**	17.02**	30.19**	33.00**	31.60**	-1.79	-0.32	-1.05
Sham 6x Ug 2	3.97**	1.28**	2.63**	-3.45	-14.19	-8.82	0.53**	-12.91	-6.19	-3.59	-5.38	-4.48
Sham 6x Ug 4	1.55**	-0.12	0.71*	-7.49	-13.79	-10.64	-5.94	-13.91	-9.93	-4.18	-4.12	-4.15
Yacora x Ug 2	3.27**	0.63	1.95**	-6.78	-11.08	-8.93	-3.51	-10.45	-6.98	-5.86	-5.02	-5.44
Yacora x Ug 4	9.96**	18.43**	14.20**	4.00**	15.38**	9.69**	13.96**	33.81**	23.89**	-3.94	-3.49	-3.72
Ug 2x Ug 4	10.16**	11.08**	10.62**	19.62**	21.90**	20.76**	29.77**	32.98**	31.38**	2.56**	1.94**	2.25**
LSD (s_{ij})1%	0.97	0.91	0.65	1.00	0.88	0.65	0.33	0.30	0.22	1.11	0.83	0.68
5%	1.29	1.21	0.85	1.33	1.16	0.85	0.44	0.39	0.28	1.47	1.10	0.89
LSD (s_{ij}-s_{ik})1%	1.44	1.34	0.96	1.48	1.30	0.96	0.49	0.44	0.32	1.64	1.22	1.00
5%	1.91	1.78	1.26	1.97	1.72	1.26	0.65	0.58	0.42	2.18	1.63	1.31
LSD (s_{ij}-s_{kl})1%	1.36	1.27	0.32	1.40	1.22	0.32	0.46	0.41	0.11	1.54	1.15	0.33
5%	1.80	1.68	0.42	1.86	1.62	0.42	0.61	0.55	0.14	2.05	1.54	0.44

As for number of grains per spike, thirteen, eight and twelve hybrid combinations under the two nitrogen fertilizer levels (35, 70 kgN./fed) and their combined data, respectively showed highly significant and/or significant positive specific combining ability effects. However, seven crosses showed highly significant specific combining ability effects under the two nitrogen fertilizer levels and their combined data. The cross Ug 2 x Ug 4 gave the highest desirable (Ŝij) value for this trait followed by Sakha 94 x Ug 2. As observed by many workers *i. e.,* Subhaschandra (2007) and Seleem and Koumber (2011).

Concerning no. of grains/spikelet, ten, seven and ten hybrid combinations under the two nitrogen fertilizer levels (35, 70 kgN./fed) and their combined data respectively showed highly significant and/or significant positive specific combining ability effects. The best crosses were Sakha 94 x Ug 2 and Ug 2 x Ug 4 which gave the highest desirable (Ŝij) values for this trait.

With regard to 1000-grain weight, thirteen, thirteen and fifteen hybrid combinations under the two nitrogen fertilizer levels (35, 70 kgN./fed) and their combined data, respectively, showed highly significant positive specific combining ability effects. However, nine crosses showed highly significant specific combining ability effects under the two nitrogen fertilizer levels and their combined data. The best crosses for this trait were Gemmeiza 9 x Ug 4 followed by Yacora x Ug 2. As observed by many workers *i. e.,* Rady *et.al.,* (2011) and Seleem and Koumber (2011)

Concerning straw yield per plant, twelve, thirteen and eleven hybrid combinations under the two nitrogen fertilizer levels (35, 70 kgN./fed) and their combined data, respectively showed highly significant and/or significant positive specific combining ability effects. However, ten crosses showed highly significant specific combining ability effects under the two nitrogen fertilizer levels and their combined data. The best crosses were Yacora x Ug 4, Gemmeiza 9 x Sham 6 and Ug 2 x Ug 4 which gave the highest desirable (Ŝij) values for this trait.

As for grain yield per plant, seven, twelve and nine hybrid combinations under the two nitrogen fertilizer levels (35, 70 kgN./fed) and their combined data respectively showed highly significant positive specific combining ability effects. However, seven crosses showed highly significant specific combining ability effects under the two nitrogen fertilizer levels and their combined data. The best crosses were Ug 2 x Ug 4, Sham 6 x Yacora followed by Yacora x Ug 4 which gave the highest desirable (Ŝij) values for this trait. The crosses, which had useful heterosis over their better parent and these heterosis effects were due to over-dominance and considered at the same time as the most desirable inter-intra genetic interactions according to their SCA effects, which mean the ability to detected transgressive segregates during segregrates generation *via* selection programme. These crosses could be successfully need for breeding to input in wheat. As observed by many workers *i. e.,* Taleei and Beigi (1996), Khan and Rizwan (2000), Awan *et.al.,* (2005) and Seleem and Koumber (2011).

Concerning biological yield per plant, nine, ten and ten hybrid combinations under the two nitrogen fertilizer levels (35, 70 kgN./fed) and their combined data, respectively showed highly significant positive specific combining ability effects. However, seven crosses showed highly significant specific combining ability effects under the two nitrogen fertilizer levels and their combined data. The best crosses were Ug 2 x Ug 4, Sham 6 x Yacora followed by Yacora x Ug 4 which gave the highest desirable (Ŝij) values for this trait.

With regard to harvest index, eight, eight and seven hybrid combinations under the two nitrogen fertilizer levels (35, 70 N./fed) and their combined data, respectively showed highly significant positive specific combining ability effects. However, six crosses showed highly significant specific combining ability effects under the two nitrogen fertilizer levels and their combined data. The best crosses were Giza 168 x Ug 2, Sakha 94 x Giza 168 followed by Gemmeiza 9 x Yacora which gave the highest desirable (Ŝij) values for this trait. Both general and specific combining abilities were previously detected by; Sharma *et. al.,* (1991) and Seboka *et. al.,* (2009).

REFERENCES

Abd El-Aty, M. S. M. (2004). Genetic diversity, heterosis and combining ability in some bread wheat crosses J. Agric. Res. Tanta Univ. 30 (4): 847-862.

Adel M.M. and E. A. Ali (2013). Gene action and combining ability in a six parent diallel cross of wheat. Asian J. Crop Sci. 5(1): 14-23 Egypt.

Akbar, M., J. Anwar, M. Hussain, M. M. Iqbal and W. Sabir (2010). Heterosis and heteobeltiosis for grain yield and improvement in bread wheat. J. Agric. Res., 48(1): 15-23.

Akram, Z., S. U. Ajmal, K. S. Khan, R. Qureshi and M. Zubair (2011). Combining ability estimates of some yield and quality related traits in spring wheat (*Triticum aestivum* L.). Pak. J. Bot., 43(1): 221-231.

Al-Gazar, A. A. (1999). Diallel cross analysis of some bread wheat varieties. M.Sc. Thesis, Minufiya, Univ., Egypt.

Al-Kaddoussi, A. R. and E. E. Hassan (1991). Heterosis in relation to general and specific combining ability in durum (*T. durum*) Zagazeg. J. Agric. Res., 15(1): 1-9.

Arab, S. A. A. (2012). Characterization and evaluation of some wheat genotypes under different environmental conditions. D. Ph. Thesis, Minufiya, Univ. Egypt.

Ashoush, H. A. H. (1996). Analysis of diallel cross of some quantitative characters in common wheat (*Triticum aestivum L.*). Ph. D. Thesis, Faculty of Agric, Moshtohor Zagazig Univ. (Banha Branch), Egypt.

Awan, S. I,. M. F. A. Anwar and M. Siddique (2005). Combining ability analysis in inter varietal crosses for components traits in Hexapoid wheat. J. Agric. and Social Sci. 1 (4):316-317.

Bayoumi, T. Y. (2004). Diallel cross analysis for bread wheat under stress and normal irrigation treatments. Zagazig J. Agric. Res., 31 (2): 435 – 455.

Chowdhary, M. A., M. Saiad and M. I. Ashraf (2007). Analysis on combining ability of metric traits in bread wheat, (*Triticum aestivam*) .Pak. J . Agric. Res. 45(1): 11-17.

Comber, R. M. (2001). Estimation of the different components of genetic variance of some quantitative traits in bread wheat. Ph.D. Thesis, Faculty of Agric., Minufiya Univ., Egypt.

Darwish, I. H. and H. A. Ashoush (2003). Heterosis, gene effect, heritability and genetic advance in bread wheat. Minufiya J. Agric. Res., 28 (2): 433 – 444.

Dawwam, H. A., F. A. Hendawy and Mona M. Serage El-Din (2007). Heterosis and combining ability analysis of some Quantitative characters in bread wheat. (*T.aestivum.L.*) - Minufiya j. Agric. Res. 32 (4): 1087-1108

El-Borhamy, H.S., M.A. El-Maghraby and A.M. Gadallah (2008). Genetic behavior of yield and its components in three bread wheat crosses. Egypt. J. Agric. Res., 86 (3): 973-984.

El-Hosary, A. A., M. E. Raid, N. A. Abd El-Fattah and M. A. Hassan (2000). Heterosis and combining ability in durum wheat. Proc. 9th Conf. Agron., Minufiya Univ., Sep. 2000, pp. 101 – 117.

El-Marakby. A. M., N. A. A. Mohamed, Afaf M. 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. Egypt. J. plant Breed. 11(1): 75-100

El-Sayed, R. M. A. (1997). Quantitative inheritance of yield and some of its contributory characters in common wheat. M. Sc. Thesis, Faculty of Agric., Minufiya Univ., Egypt.

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

El-Seidy, E. H. and A. A. Hamada (2000). Interaction of wheat genotypes × water sources. Proc. 9th Conf. Agron., Minufiya Univ. Sept. 2000, pp. 17– 34.

EL-Shal, M. H. A. (2005). Studies on yield and its components in some wheat crosses. M. Sc., Thesis, Fac. of Agric. Al-Azhar Univ.

EL-Shamarka, Sh. A., M. A. Abo- shereif, I. H Darwish, N. A. Gaafar and Hend H. EL-Fiki (2009). Combining ability for earliness, yield and yield components traits in wheat. Minufiya J. Agric. Res 34(1): 57-76.

EL-Shamarka, S. A. (1980). Studies on heterosis and combining ability in common wheat. M. Sc.Thesis. Minufiya Univ., Egypt.

Esmail, R. M. (2002). Estimation of genetic parameters in the F1 and F2 generations of diallel crosses of bread wheat (*Triticum aestivum L.*). Bulletin – of – the National – Research – Centre – Cairo. (2002), 27:1, 85–106;35.

Griffing, B. (1956 a). A Generalized treatment of the use of diallel cross to quantitative in heritance. Heredity. (10): 31-50.

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

Hasnain, Z., G. A. Abbas, A. A. Saeed, Muhammed and M. A. Rahim (2006). Combining ability for plant height and yield related traits in wheat (*T. aestivum*) J- Agric. Res. 44(3): 167-175. Pakistan.

Hendawy, F. A. (1994). General and specific combining ability estimates in a diallel cross of seven bread wheat varieties. Minufiya J. Agric. Res., 19 (1): 75 – 93.

Hendawy, F. A., H. A. Dawwam and Marwa M. El-Nahas (2007). Triple test cross analysis of some quantitative characters in bread what (*Triticum aestivum* L.). Minufiya J. Agric. Res., 34 (2): 1055 – 1069.

Hendawy, H. I. (1990). Breeding for yield and its components in wheat. M. Sc. Thesis, Faculty of Agric., Minufiya Univ., Egypt.

Hendawy, H. I. (1998). Combining ability and genetics of specific characters in certain diallel wheat crosses. Ph. D. Thesis. Fac. Of Agric Minufiya Univ., Egypt.

Hendawy, H. I., A. S. Seleem and H. S. El-Borhamy (2005). Estimates of combining ability and correlation coefficient for yield and its components in bread wheat, Minufiya. Agric. Res., 30 (1): 251 – 271.

Hewezi, T. A. (1996). Graphical analyses of diallel cross of some bread wheat varieties.M. Sc. Thesis, Faculty of Agric. Minufiya Univ., Egypt.

Kashif, M. and I. Khaliq (2003). Determination of general and specific combining ability effects in a diallel cross of spring wheat. Pak. J. Bio .Sci. 6(18): 1616-1620.

Khan, M.A., N. Ahmed, M. Akbar, Aziz-ur-Rehman and Iqbal Muhummed Muzaffar (2007). Combining ability analysis in wheat. Pak. J. Agric. Sci. 44(1): 1-5, Pakistan.

Khan, A. S. and A. Rizwan (2000). Combining ability analysis of physio-morphological traits in wheat (*Triticum aestivum L.*).International J. of Agric. and Bio. 2 (1-2): 77-79.

Kumar, A., V. K. Mishra, R. P. Uyas and V. Singh (2011). Heterosis and combining ability analysis in bread wheat (*Triticum aestivum L.*) J. P. B. and Crop Sci. 3 (10): 209- 217. India.

Mahpara, S., Z. Ali and M. Ahsan (2008). Combining ability analysis for yield and yield related traits among wheat varieties and their f1 hybrids. International J. Agric. Bio. 10(6): 599-604, Pakistan.

Mekhamer, K. I. S. (2009). Inheritance of some important agronomic traits in common
wheat. Ph.D.Thesis, Faculty of Agric. Moshtohor Benha Univ., Egypt.

Rady, M. S., M. A. A. Abo. Sherief, A. M. El-Zanaty and Marwa F. Hendawy (2011). Estimation of Genotypic variability of some quantitative characters in bread wheat (*T.aestivum*) Minufiya J. Agric. Res. 36(5): 1227-1262.

Saad, F. F. (1999). Heterosis parameters and combining ability for crosses among Egyptian and Austrian durum wheat entries. Assiut J. of Agric. Sci., 30 (1): 31 – 42.

Seboka, H., A. Ayana and H. Zelleke (2009). Combining ability analysis for bread wheat (*Triticum aestivum L.*). E.A.J.S. 3(1):87-94 Ethiopia.

Seleem, S. A. (1993). Heterosis and combining ability in common wheat. M. Sc. Thesis, Minufiya Univ., Egypt.

Seleem, S. A. (2001). Breeding studies of some characters in common wheat. Ph. D. Thesis, Minufiya Univ., Egypt.

Seleem, S. A. and R. M. A. Koumber (2011). Estimation of combining ability and Gene action in the F1and F2 generations in some bread wheat crosses. Minufiya J. Agric. Res. 36(6): 1627.

Sharief, A. E., M. H. El-Hinidi, M. S. Sultan, A. H. Abdel El-Latif and M. N. El-Hawary (2006). Heterosis in some bread wheat crosses under normal and water stress conditions. Egypt J. Plant Breed. 10 (2): 1 – 14.

Sharma, R. C., E. L. Smith and R. W. McNew (1991). Combining ability analysis for harvest index in winter wheat. Euphytica 55: 229-234 USA.

Subhaschandra, B. (2007). Genetic analysis in teraploid wheat. M. Sc. Thesis, Dahawrd Univ.,

Taleei, A. R. and A. H. Beigi (1996). Study of combining ability and heterosis in bread wheat diallel cross. Indian J. of Agric. Sci., 27 (2): 67 – 75.

التربية لمحصول القمح ومكوناته تحت مستويين من التسميد الأزوتى

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الملخص العربي

أجرى هذا البحث فى مزرعة محطة البحوث الزراعية إيتاي البارود محافظة البحيرة– مصر.الهدف من هذا البحث هو دراسة النظام الوراثي المتحكم في بعض صفات المحصول ومكوناته وهي:– عدد السنابل بالنبات ، عدد السُنيبلات بالسنبلة، طول السنبلة، عدد الحبوب بالسنيبلة، وزن 1000 حبة، عدد الحبوب بالسنبلة، محصول النبات الفردي من الحبوب، محصول النبات الفردي من القش ،المحصول البيولوجي و دليل الحصاد حيث أجرى التهجين بين الآباء بدون الهجن العكسية في الموسم الزراعي 2011/2010 للحصول علي حبوب الجيل الأول وفى موسم 2012/2011 تم تقييم هذه التراكيب الوراثية الثمانية وثمانية وعشرون هجينا الناتجة منها وذلك تحت مستويين من مستويات التسميد الآزوتى(منخفض) 35 كجم آزوت للفدان و(عادي) 70 كجم آزوت للفدان وذلك في تجربة مصممة في قطاعات كاملة العشوائية ذات ثلاثة مكررات.

1- كان التباين الراجع إلى التسميد الآزوتى معنوياً لجميع الصفات المدروسة وكانت القيم الناتجة من مستوى التسميد العادي 70 كجم آزوت للفدان أعلى من مثيلتها فى مستوى التسميد المنخفض 35 كجم آزوت للفدان.

2- كانت قيم التباين الوراثى الراجع إلى التراكيب الوراثية والآباء والهجن عالية المعنوية وذلك فى كل الصفات المدروسة تحت مستويي التسميد الآزوتى و التحليل المشترك. كانت قيم التفاعل بين التراكيب الوراثية, الآباء و الهجن مع التسميد الآزوتى عالية المعنوية عدا طول فترة امتلاء الحبوب حيث كانت معنوية فقط.

3- كانت قيم التباين الراجع إلى متوسط قوة الهجين عالية المعنوية لمعظم الصفات أما لصفات طول فترة امتلاء الحبوب والمحتوي المائي للأوراق كانت معنوية فقط وذلك تحت مستوي التسميد الآزوتى 35 كجم آزوت للفدان.

4- كانت قيم التفاعل بين متوسط قوة الهجين مع مستويي التسميد الآزوتى عالية المعنوية لكل الصفات المدروسة عدا صفات تاريخ التزهير ، تاريخ النضج و المحصول البيولوجي حيث كانت معنوية فقط وصفات طول فترة الامتلاء، معدل امتلاء الحبوب، ارتفاع النبات ، المحتوي المائي للأوراق و الضغط الأسموزي ودليل الحصاد حيث كانت غير معنوية.

5- أظهرت الهجن شام 6 × ياكورا, ياكورا × Ug4, جيزة 168 × Ug2 و Ug2 ×Ug4 تفوقها في محصول الحبوب بالنبات بالإضافة إلي تفوقها في معظم الصفات المدروسة.

6- كان التباين الراجع لكلٍ من القدرتين العامة والخاصة على التآلف عالى المعنوية لجميع الصفات تحت الدراسة فى مستويي التسميد الآزوتى والتحليل المشترك فيما عدا صفة طول فترة الامتلاء تحت مستوي التسميد الآزوتى 70 كجم آزوت للفدان. أظهرت النسبة بين تباين القدرتين العامة والخاصة على التآلف أن التباين الوراثى المُضيف والفعل الجيني المضيف × المضيف هما الأكثر أهمية فى وراثة جميع الصفات المدروسة.

7- أظهرت الآباء مصر 1, شام 6, Ug2 و Ug4 قدرة عامة تآلفية عالية لصفة المحصول وكذلك أثبتت أنها تملك قدرة تآلفية عامة عالية لمعظم صفات المحصول.

8- أظهر الهجينان Ug2 xUg4 و Sham 6 x Yacora قدرة خاصة على التآلف عالية المعنوية وذلك لصفة محصول النبات من الحبوب تحت مستوى التسميد العادي, أثبتت الهجن Ug2 x Ug4, Sham6 x Yacora, Yacora x Ug4 و Gemmieza 9 x Giza 168 أهميتها العملية في برامج إنتاج الهُجن وذلك بسبب تفوقها في صفات المحصول ومكوناته.

Table (2): Mean square estimates of ordinary analysis for yield and yield components traits studied under the two different levels of nitrogen fertilization and their combined analysis.

S.O.V.	d.f.		Spike length (cm)			No. of spikelets/spike			No. of spikes / plant		
	s	comb	Low	normal	Comb.	Low	normal	Comb.	Low	normal	Comb.
Nitrogen(N)		1			931.85**			70.33**			89.67**
Rep x N	2	4	0.38	0.43	0.41	0.29	0.36*	0.32**	1.80**	0.07	0.93**
Genotypes	35	35	13.42**	33.9**	40.41**	3.70**	2.23**	5.59**	2.96**	2.96**	5.20**
Parent	7	7	7.49**	30.3**	32.81**	9.95**	4.75**	13.71**	5.51**	6.58**	10.51**
Crosses	27	27	9.96**	32.3**	34.72**	1.96**	1.56**	3.34**	2.16**	2.13**	3.90**
Par.vs.cr.	1	1	148.2**	101**	247.16**	7.10**	2.83**	9.45**	6.73**	0.01	3.09**
G x N		35			6.90**			0.34**			0.72**
Par x N		7			5.05**			0.99**			1.58**
Cr. x N		27			7.55**			0.17**			0.39**
ar.vs.cr.xN		1			2.24**			0.48**			3.66**
Error	70	140	0.277	0.18	0.23	0.29	0.36	0.09**	0.147	0.11	0.13**
GCA	7	7	3.86**	21.25**	20.31**	4.73**	2.74**	7.19*	2.82**	3.64**	6.16**
SCA	28	28	4.63**	8.81**	11.76**	0.36**	0.25**	0.53*	0.53**	0.32**	0.63**
G.xN.		35			6.90**			0.34*			0.72**
GCA x N		7			4.81**			0.28*			0.30**
SCA x N		28			1.67**			0.07*			0.23**
Error	70	140	0.092	0.0606	0.08	0.036	0.025	0.03	0.049	0.039	0.04
GCA /SCA			0.83	2.41	1.73	13.1	11.2	13.6	5.34	11.2	9.82

Table (2): Cont.

S.O.V.	d.f.		No. of grains / spike			No. of Grains/spikelet			1000-grain weight (g)		
	s	comb	Low	normal	Comb.	Low	normal	Comb.	Low	normal	Comb.
Nitrogen(N)		1			4495.6**			2.47**			449.8**
Rep x N	2	4	5.97**	0.36	3.17*	0.02*	0.01	0.02**	0.20	0.21	0.21
Genotypes	35	35	150.58**	163.71**	275.8**4	0.29**	0.30**	0.53**	35.43**	37.93**	66.70**
Parent	7	7	293.64**	233.52**	466.43**	0.52**	0.24**	0.67**	30.46**	32.93**	61.97**
Crosses	27	27	118.64**	143.86**	234.35**	0.24**	0.30**	0.49**	31.39**	38.06**	61.65**
Par.vs.cr.	1	1	11.42**	211.02**	62.13**	0.06**	0.65**	0.56**	179.27**	69.56**	236.1**
G x N		35			38.44**			0.06**			6.66**
Par x N		7			60.72**			0.09**			1.43**
Cr. x N		27			28.15**			0.05**			7.79**
ar.vs.cr.xN		1			160.32**			0.15**			12.74**
Error	70	140	1.1757	1.1588	1.17	0.0048	0.0033	0.002	0.0888	0.085	0.09
GCA	7	7	120**	97.77**	195**	0.26**	0.18**	0.41**	21.22**	23.76**	43.89**
SCA	28	28	32.7**	43.77**	65.9**	0.06**	0.08**	0.12**	9.46**	9.87**	16.82**
G.xN.		35			38.4**			0.06**			6.66**
GCA x N		7			21.8**			0.03**			1.08**
SCA x N		28			10.6**			0.02**			2.50**
Error	70	140	0.39	0.3863	0.39	0.0016	0.0011	0.00	0.02963	0.0286	0.03
GCA /SCA			3.7	2.23	2.97	4.49	2.33	3.45	2.24	2.41	2.61

Table (2): Cont.

S.O.V.			Straw yield/plant (g)			Grain yield/plant (g)			Biological Yield/plant (g)			Harvest index (%)		
Nitrogen(N)		1			2266**			1171**			2330**			572**
Rep/N	2	4	4.3*	0.21	2.26*	1.8	0.27	1.03	0.57**	0.00	0.29*	3.84*	0.2	1.99
Genotypes	35	35	238**	359**	550**	234.1**	575**	721**	578**	1226**	1587**	106**	110**	212**
Parent	7	7	453**	503**	939**	159**	747**	737**	603**	1330**	1652**	191**	208**	396**
Crosses	27	27	191**	329**	464**	227**	493**	652**	568**	1218**	1578**	71.8**	70**	137**
Par.vs.cr.	1	1	20**	168**	152.**	921**	1586**	2463**	670**	722**	1391**	435**	497**	932**
G/N		35			47.3**			88.4**			217**			4.57**
Par./N		7			17.2**			170**			281**			3.60**
Cr./N		27			55.6**			68.8**			208**			4.95**
Par.vs.cr./N		1			36.1**			44.8**			0.47*			1.05
Error	70	140	0.86	0.75	0.81	0.9	0.69	0.81	0.09	0.08	0.09	1.12	0.6	0.87
GCA	7	7	139**	194**	323**	126**	343**	426**	236**	557**	724**	85.1**	86**	169**
SCA	28	28	64**	101**	148.**	66**	154**	193**	182**	372**	481**	22.9**	24**	45.9**
G.xN.	35				47.4**			88.5**			217**			4.57**
GCAxN	7				9.97**			42.9**			69.6**			1.89**
SCAxN	28				17.2**			26.1**			73.1**			1.43**
Error	140	70	0.3	0.25	0.27	0.3	0.23	0.27	0.03	0.02	0.03	0.37	0.2	0.29
GCA /SCA			2.2	1.9	2.18	1.9	2.2	2.20	1.3	1.5	1.51	3.7	3.6	3.7