GENE EFFECT ON YIELD AND YIELD COMPONENTS FOR THREE BREAD WHEAT CROSSES (*TRITICUM AESTIVUM* L.)

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Abstract

Three experiments were carried out using three bread wheat crosses namely Gemmiza 9 x Sids 1, Giza 168 x Dovin-2 and Giza 168 x Sakha 93. Six populations (P_1, P_2, F_1, F_2, BC_1 and BC_2) for each cross were used in this investigation.

Significant positive heterotic effects were obtained for plant height, grain yield/plant and biological yield/plant in the first cross, for plant height, kernel weight and biological yield/plant in the second cross, while, heterotic increase in No. of spikes/plant, kernel weight, grain yield/plant and biological yield/plant seemed to be accounted for the heterotic yield response observed in the third cross. On the other hand, significant negative heterotic effects were found for No. of spikes/plant and No. of kernels/spike in the second cross and No. of kernels/spike in the third one.

Inbreeding depression estimates were found to be significant for all studied attributes except for No. of spikes/plant in the first cross, as well as No. of kernels/spike and grain yield/plant in the second one.

Over dominance towards the higher parent for kernel weight, grain yield/plant and biological yield/plant was observed in the three crosses, for plant height in the first and second crosses, and No. of spikes/plant in the first and third ones. Meanwhile, over or partial dominance towards the lower parent was obtained for No. of kernels/spike in the three crosses and for No. of spikes/plant in. the second cross. On the other side, partial dominance was observed for plant height in the third one.

F_2 Deviations (E_1) were significant for No. of kernels/spike in the three crosses, and for grain yield/plant in the first and second crosses, Moreover, backcrosses deviations (E_2) were significant for plant height in the first and second crosses, for No. of spikes/plant in the second cross, for No. of kernels/spike and grain yield/plant in the second and third crosses and for biological yield/plant in the three ones.

The additive gene effect was significant for all characters in the second and third crosses except for No. of spikes/plant, No. of kernels/spike in the third cross and kernel weight in the second one. These results suggest the potential for obtaining further improvement in most studied characters. In addition, dominance and epistasis were significant for most of the studied attributes.

High to medium values of heritability estimates were found to associated with high and moderate genetic advance as percentage of F_2 means in most characters. These obtained results indicate that selection for the studied characters could be useful in the early generations.

INTRODUCTION

Wheat is the most important cereal crop in Egypt. Increasing wheat production to narrow the gap between production and consumption is considered the main goal in Egypt as well as in most countries all over the world (Shehab El-Din, 1993).

For effectiveness of any breeding program especially with diverse germplasm, it is necessary to measure the behavior and relative magnitude of different gene actions governing the various quantitative characters. This information would be helpful to wheat breeders to identify types of genetic variation in the characters for which selection is intended and to carry out rapid evaluation of the yielding ability of the breeding materials by identifying crosses of superior genotypes having higher yielding ability.

Crumpack and Allard (1962) reported that efficiency in breeding for self-pollinating crop plant depends, first on accurate identification hybrid combinations that have the potentiality of producing maximum improvements and second, on identifying in early segregating generations, superior lines among the progeny of the most promising hybrids. Therefore, information on the genetics and gene effect of breeding materials could ensure long-term election gains and better genetic improvements.

Mosaad *et al.* (1990) found that additive genetic variance was the prevalent type controlling days to heading, plant height and spike length. Moreover, Abul-Naas *et al.* (1991) and Al Kaddoussi *et al.* (1994), reported that dominance component played an important role in genetic control for number of spikes/plant, number of kernels/spike, kernel weight and grain yield/plant. On the other hand, El-Hosary *et al.* (2000), found that grain yield and its components in an eight durum wheat parent-diallel cross, were controlled by both additive and non-additive gene effects. In addition, concerning the heritability estimates, Gouda *et al.* (1993) indicated that heritability values ranged from 14 % to 71% for grain yield. Meanwhile, Moustafa (2002) and Hendawy (2003) reported that hereitability estimates for plant height, heading date and yield components were medium to high (more. than 50%), and El-Sayed *et al.* (2004) and Abdel Nour *et al.* (2005) reported that hertiability estimates for yield and its components were medium to high.

The present work was conducted to investigate the genetic variance and its components, gene action, heritablity values and expected genetic advance under selection for plant height, No. of spikes/plant, No. of kernels/spike, kernel weight, as well as biological and grain yields/plant.

MATERIALS AND METHODS

This investigation was carried out at El-Giza Research Station during the two successive seasons 2002/2003 and 2003/2004. The final experiment was conducted at Etay El-Barod Station, El-Behira governorate, Agriculture Research Center (ARC) in 2004/2005 season. Five bread wheat cultivars namely, Gemmiza 9, Sids 1, Giza 168, Dovin-2 and Sakha 93 were chosen to represent a wide range of variability in most studied characters. These cultivars were used as parental materials in the present study. However, the name, origin and the pedigree of these cultivars are presented in Table (1).

In the first season, the parental genotypes were evaluated in a randomized complete block design with three replications at El-Giza Research Station. Simultaneously, pair crosses were performed to obtain F_1, seeds. In the second season, the hybrid seeds were sown and the F_1 plants of each cross were back crossed to their respective parents to produce the two back crosses (BC_1) and (BC_2). At the same time, pair crosses were made to produce new F_1 seeds. Meanwhile, F_1 plants were self-pollinated to produce F_2 seeds. In the third season, the obtained seeds of the six populations P_1, P_2, F_1, F_2, BC_1 and BC_2 of the three crosses were evaluated at Etay El-Barod using a randomized complete block design with three replications. Rows were 4m. long and 20 cm apart, and the space between plants was 10 cm. Each plot consisted of two rows for each of P_1, P_2, F_1, BC_1 and BC_2 as well as five rows for F_2 genotypes.

Data were recorded on individual guarded plants for plant height, No. of spikes/plant, No. of kernels/spike, 100-kernel weight, as well as grain and biological yields/plant.

Various biometerical parameters were calculated for all studied characters. Heterosis (%) was expressed as percentage increase in F_1 value over better parent. Inbreeding depression (%) was also estimated as the average percentage decrease of the F_2 from the F_1. In addition, F_2 deviation (E_1) and backcross deviation (E_2) were measured as suggested by Mather and Jinks(1971). Likewise, potence ratio (P) was also calculated according to Peter and Frey (1966). Genectic analysis of generation means to give estimates of mean effect parameter (m), additive (a) dominance (d), additive x additive (aa), additive x dominance (ad) and dominance x dominance (dd) were obtained using the method illustrated by Gamble (1962).

Heritability in both broad and narrow senses were calculated according to Mather's procedure (1949) Furthermore, the predicted genetic advance (Δg) was computed according to Jahanson *et al.* (1955). Likewise, the genetic gain represented as percentage of the F_2 mean performance (Δg %) was estimated using the method of Miller *et al.* (1958).

Table 1. The name, pedigree and origin of the five parental bread wheat cultivars.

Genotype	Pedigree	Origin
Gemmiza 9	Ald "S"/Huac "S"//CMH74A.630/ SX CGM4583 - 5GM - 1 GM - 0 GM.	Egypt
Sids 1	HD21/Pavon "S"// 1158.57/MAYA74 "S".	Egypt
Giza 168	MRL/BUC// SERI CM93046-8M-0Y-0M-2Y-0B.	Egypt
Dovin-2	CM84655 - 02Ap - 300AP - 300L - 3Ap -300L - 3AP-0L-0AP	ICARDA
Sakha 93	Sakha 92 / TR810326 S8871-1S-2S-1S-OS	Egypt

RESULTS AND DISCUSSION

Varietal differences in response to their genetic background were found to be significant in most characters under investigation. Moreover, the genetic variance within F2 population was also significant for all studied characters. Hence, the different biometrical parameters used in this investigation were estimated. Means and variances of the six population P1, P2, F1, F2, BC1 and BC2 for the studied characters in the three crosses are shown in Table (2).

The values of better parent heterosis, inbreeding depression percentage, potance ratio and different gene action, parameters in the three crosses for the six studied characters are presented in Table (3). Significant positive heterotic effects were obtained for plant height, grain yield/plant and biological yield/plant in the first cross, plant height, kernel weight and biological yield/plant in the second cross and No. of spikes/plant, kernel weight, grain yield/plant and biological yield/plant in the third one. However, significant negative heterotic effects were found for No. of spikes/plant and No. of kernels/spike in the second cross and for No. of kernels/spike only in the third one. Similar results were reported by El-Hosary *et al.* (2000), Moustafa (2002) and Hendawy (2003).

Number of spike/plant, number of kernels/spike and 100-kernel weight being main components for grain yield/plant, heterotic increase if found in one or two or three of the yield components, may lead to favourable yield increase in hybrids. The lack for heterosis for No. of grain/spike which may be due to the lower magnitude of the non-additive gene action, would indicated that the increases in No. of spike/plant and 100-kernel weight of the third cross were the major contributing factors to heterosis in yield. These results are in agreement with those obtained by (Ketata *et al.*., (1976) and El-Rassas and Mitkess (1985).

The pronounced heterotic effects detected for number of spikes/plant and kernel weight in the third cross indicate that the cross (Giza 168 x Sakha 93) showed that it would be of interest in a breeding program for high yielding ability throught selecting for higher number of spikes/plant and kernels.

Table 2. Means and variances of P_1, P_2, F_1, F_2, BC_1 and BC_2 population of cross I (Gemmiza 9 x Sids 1), cross II (Giza 168 x Dovin-2) and cross III (Giza 168 x Sakha 93) in season 2004 / 2005 .

Characters	parameters	Cross I						Cross II						Cross III					
		P_1	P_2	F_1	F_2	BC_1	BC_2	P_1	P_2	F_1	F_2	BC_1	BC_2	P_1	P_2	F_1	F_2	BC_1	BC_2
Plant height (cm)	X	108.3	116.7	120.9	117.8	117.7	119.3	108.7	106.4	111.9	108.5	102.6	107.08	110	104.6	109.1	106.9	108.6	107.1
	S^2	3.12	7.34	1.88	24.07	13.45	15.6	7.75	17.52	5.61	69.14	26.08	29.36	4.67	4.27	2.10	11.41	9.18	2.99
No. of spikes/plant	X	17.7	20.4	21.3	19.67	21.43	20.79	21.44	26.22	23.67	21.39	17.67	16.83	21.33	17.78	25.56	20.88	22.23	24
	S^2	4.9	9.15	4.46	37.71	23.34	19.72	22.03	21.44	15.0	31.73	10.79	15.24	6.5	7.44	4.78	41.44	14.52	18.5
No. of kernels/spike	X	70	80.6	70.9	63.19	69.25	71.92	78.33	81.44	75	72.14	70.5	63.92	76.3	82	72.2	64.76	66.67	63.75
	S^2	20.44	24.04	19.88	115.52	111.48	77.9	58.5	74.03	55	180.23	49.18	72.81	20.68	26.22	21.29	114.52	59.7	26.75
100-kernel weight (g)	X	5.16	3.81	5.19	4.5	4.73	4.86	4.43	4.43	4.88	4.66	4.7	4.73	4.39	4.4	5.09	4.62	4.72	5.11
	S^2	0.077	0.125	0.035	0.557	0.292	0.172	0.043	0.153	0.07	0.292	0.081	0.142	0.041	0.024	0.067	0.211	0.129	0.189
Grain yield /plant (g)	X	50.2	43.4	78.3	45.43	62.64	61.43	56	64.56	67.44	55.37	55.42	47.5	59.43	69.57	80.86	74.54	62.62	70.8
	S^2	16.62	21.56	17.79	341.85	215.94	229.03	78.5	86.78	119.53	286.51	70.27	22.091	42.62	58.62	29.48	157.77	96.42	79.07
Biological yield /plant (g)	X	182	175	219	193.81	210	220.7	161.11	190	205.56	194.62	188.33	168.33	162.22	220	245.55	223.08	189.17	211
	S^2	84.44	94.44	54.44	574.76	353.85	268.68	86.11	100	77.78	281.81	196.97	160.61	69.45	100	69.14	356.41	208.33	143.33

The potance ratio indicated the over-dominance towards the higher parent for all characters except for number of kernels/spike and kernel weight in the first cross, for number of spikes/plant and number of kernels/spike in the second cross and for plant height and number of kernels/spike in the third one. Meanwhile, there was over-dominanc towards the lower parent for number of kernels/spike in the second and the third crosses. On the other hand, complete dominance was found for kernel weight towards the higher parent in the first cross, while partial dominance towards the higher parent for plant height in the third cross was detected. On the other side, partial dominance towards the lower parent for number of spikes/plant in the second cross and for number of kernels/spike in the first cross reflected the existence of over dominance in grain yield/plant and for number of kernels/spike. These results are in harmony with those obtained by Moustafa (2002) and Hendawy (2003).

Over dominance was obtained for plant height by Ketata *et al.*., (1976), Mosaad *et al.*., (1990), number of spikes/plant by Abul-Nas *et al.*., (1991), number of kernels/spike by Al-Kaddoussi *et al.*, (1994), for grain yield/plant by Al-Kaddoussi *et al.*, (1994), Mostafa and Hendawy (2003).

Significant positive values of inbreeding depression estimates are illustrated in Table (3) for all characters except for plant height and number of spikes/plant in the first cross, plant height, number of grains /spike, kernel weight and grain yield/plant in the second cross, and also for grain yield/plant and biological yield/plant in the third one. Both heterosis and inbreeding depression are coincided to the same phenomenon. Therefore, it is convenient to expect that heterosis in the F_1 would be followed by substantial reduction in the F_2 performance, as found in this present study. Significant heterosis and insignificant inbreeding depression were obtained for plant height in the first and the second crosses, kernel weight in the second cross, and for grain yield/plant in the third cross and biological yield/plant in the third one. These results suggest that the major portion of the genetic effect was of additive nature. The contradiction between heterosis and inbreeding depression estimates could also be due to the presence of linkage between genes in these materials (Van der Veen, 1959).

Table 3. Heterosis, potance ratio, inbreeding depression and gene action parameters for the three wheat crosses.

Character	cross	Heterosis % over B.P	Inbreeding depression	Potance Raito (P)	Gene action parameters							
					m	*a*	*d*	*aa*	*ad*	*dd*	E_1	E_2
Plant height	I	3.6^{**}	1.34	2.0	117.778^{**}	-1.576	11.28^{*}	2.88	2.63	- 10.72	1.078	3.596^{*}
	II	2.96^{*}	3.07	3.9	108.46^{**}	$- 4.15^{*}$	$- 10.185^{*}$	-14.52	$- 5.615^{*}$	-189.69^{**}	- 1.26	$- 9.79^{**}$
	III	-0.82	2.04^{*}	0.667	106.87^{**}	1.5	5.64	3.84	- 1.2	-2.76	-1.33	- 0.74
No. of Spikes/plant	I	4.41	7.65	1.667	19.67^{**}	0.645	8.0	5.75	1.995	- 5.22	- 0.505	1.865
	II	$- 9.74^{**}$	9.625^{**}	- 0.069	21.389^{**}	0.834	$- 19.00^{**}$	$- 74.86^{**}$	3.223	42.556^{**}	- 2.361	$- 13.0^{**}$
	III	19.83^{**}	18.31^{**}	3.383	20.88^{**}	-1.77	14.945^{*}	8.94	$- 3.545^{*}$	- 11.17	- 1.68	1.115
No. Of kernels/spike	I	-11.99	10.87^{*}	- 0.83	63.192^{**}	- 2.667	-25.166^{*}	-29.566^{*}	2.633	-19.5	-9.91^{**}	- 5.033
	II	-7.91^{*}	3.82	- 3.144	72.135^{**}	$- 23.629^{**}$	-24.595^{*}	-476.938^{**}	8.138^{*}	60.649^{**}	$- 5.309^{*}$	$- 20.472^{**}$
	III	-11.95^{**}	10.3^{*}	- 2.439	64.76^{**}	2.92	-5.15	1.8	5.77^{*}	10.06	$- 10.92^{**}$	$- 20.93^{**}$
100-kernel weight	I	0.54	13.34^{**}	1.042	4.496^{**}	- 0.131	1.884^{*}	1.182	$- 0.806^{**}$	- 1.001	-0.341	- 0.091
	II	10.16^{**}	4.51	∞	4.66^{**}	-0.03	0.67	0.22	-0.03	- 0.46	0.005	0.12
	III	15.65^{**}	9.23^{**}	139	4.62^{**}	-0.39^{*}	1.875^{**}	1.18^{*}	$- 0.385^{*}$	$- 1.89^{*}$	- 0.12	0.345
Grain yield/plant	I	55.97^{**}	41.98^{**}	9.26	45.428^{**}	1.212	79.924^{**}	66.424^{**}	- 2.188	$- 64.38^{*}$	$- 17.12^{**}$	- 1.032
	II	4.48	17.91	1.675	5.368^{**}	7.917^{**}	- 8.472	-15.638	12.195^{**}	65.248^{**}	$- 8.493^{**}$	$- 24.805^{**}$
	III	16.23^{**}	7.82	3.227	74.54^{**}	8.18^{*}	- 14.96	-31.32^{*}	- 3.11	55.2^{*}	1.86	-11.84^{*}
Biological yield/plant	I	20.33^{**}	11.503^{**}	11.571	193.809^{**}	- 10.71	126.684^{**}	86.184^{**}	-14.21^{*}	-152.604^{**}	- 4.941	33.21^{**}
	II	8.19^{**}	5.32^{*}	2.08	194.62^{**}	20.00^{**}	$- 35.16^{*}$	-65.16^{**}	34.445^{**}	114.07^{**}	4.06	$- 24.46^{**}$
	III	11.61^{**}	9.15	1.88	223.08^{**}	$- 21.83^{**}$	- 37.54	91.98^{**}	7.06	164.96^{**}	4.75	$- 36.49^{**}$

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

Significant negative F_2 deviations (E_1) were indicated for number of kernels/spike in all crosses and for grain yield/plant in the first two crosses (Table 3). These may refer to the contribution of epistatic gene effects in the performance of these characters. On the other hand, insignificant F_2 deviation were detected for plant height, number of spikes /plant, kernel weight and biological yield/plant in all crosses, and for grain yield/plant in the third one. This may indicate that the epistatic gene effects have minor contribution in the inheritance of these traits.

Backcross deviation (E_2) was significant for plant height and biological yield/plant in the first cross, for all characters except for kernel weight in the second cross, and for number of kernels/spike, grain yield/plant and biological yield/plant in the third one. These results could indicate the presence of epistasis in such large magnitude as to warrant great deal of attention in breeding programs.

Nature of gene action was investigated according to the relationships illustrated by Gamble (1962). The estimated mean effect parameters (m), which reflects the contribution due to over all mean plus the loci effects and interactions of the fixed loci, were highly significant for all characters in all crosses. The additive gene effects were significant and positive for grain yield/plant and biological yield/plant in the second cross and for grain yield/plant in the third one, suggesting the potential for obtaining further improvements of these characters by using pedigree selection program. Similar results were obtained by El-Hosary (2000), Moustafa (2002), Hendawy (2003) El-Sayed *et al.* (2004) and Nadya Abdel Nour *et al.* (2005).

Significant negative additive effect was indicated for plant height and number of kernels/spike in the second cross and for kernel weight and biological yield/plant in the third one, reflecting that the additive effects was of less importance in the inheritance of these characters. Positive effects were recorded for grain and biological yield in the second cross and grain yield only in the third one.

Dominance gene effects were significant for all studied characters, except for plant height in the first cross, for kernel weight and grain yield/plant in the second cross, for plant height, number of kernels/spike, grain yield/plant and biological yield/plant in the third one, pointing out the importance of dominance gene effects in the inheritance of all characters. Significant (a) and (d) components indicated that both additive and dominance gene effects were important in the inheritance of these characters. Therefore, selecting desired characters could be practiced in the early generation but would be more effective in late ones.

Additive x additive types of espistasis were significant for all studied characters except for plant height, number/of spikes/plant and kernel weight in the first cross, plant height, kernel weight and grain yield/plant in the second cross, plant height, number of spikes/plant and number of grain/spike in the third cross. Significant additive x dominance types of epistasis was found for kernel weight and biological yield/plant in the first cross, for all traits studied characters except for number of spikes/plant and grain weight in the second cross, for all studied traits except for plant height, grain yield/plant and biological yield/plant in the third cross. Dominance x dominance types of gene action were found to be significant for grain and biological yield/plant in the first cross, for all traits studied except for grain yield/plant in the second cross and for all characters except for plant height, number of spikes/plant and number of kernels/spike in the third cross.

The presence of both additive and non additive gene action for number of spikes/plant in the first cross, for kernel weight in the second cross, for plant height and number of kernels/spike in the third cross would indicate that selection procedures based on the accumulation of additive effects could be very successful in improving these characters. However, to maximize selection advance procedures both additive and non-additive genetic variation are important and would be preferred. Similar results were concluded by Mosaad *et al.* (1990), Abul-Naas *et al.* (1991), Gouda *et al.* (1993), Al-Kaddoussi *et al.* (1994), El-Hosary *et al.* (2000), Moustafa (2002), Hendawy (2003), El-Sayed *et al.* (2004) and Abdel Nour *et al.* (2005).

Heritablity in both broad and narrow senses and genetic advance under selection are presented in Table (4). High heritability values in broad sense were detected for all characters studied except for number of spike/plant, number of kernels/spike and grain yield/plant in the second cross for which moderate values were calculated.

High narrow sense heritability values were estimated for number of spikes/plant, kernel weight and biological yield/plant in the first cross, for plant height in the second cross and for number of spikes/plant, number of kernels/spike, grain yield/plant and biological yield/plant in the third one. Moreover, moderate narrow sense heritabilify estimates were detected for plant height and grain yield/plant in the first cross, number of kernels/spike, kernel weight, grain yield/plant and for biological yield/plant in the second cross, as well as for plant height in the third one. Meanwhile, low heritabilitvy values for the remaining characters were detected.

Table 4. Heritability in broad and narrow sense, genetic advance upon selection and genetic advance as percentage for the studied characters in three crosses of bread wheat.

Crosse	*Parameters*	*Plant height (cm)*	*No. of spikes/plant*	*No. of kernels/spike*	*100-kernel weight (g)*	*Grain yield/plant (g)*	*Biological yield/plant (g)*
I	h. broad	92.20	88.17	82.79	93.93	94.54	90.53
	h. narrow	70.00	81.82	34.70	86.31	69.58	86.47
	Δg	7.074	10.28	7.68	1.35	26.5	42.70
	Δg %	6.01	52.27	12.16	30.40	58.33	22.03
II	h. broad	91.37	52.73	69.48	76.03	66.86	72.4
	h. narrow	85.11	38.57	65.32	69.52	58.28	68.79
	Δg	14.58	4.48	18.06	0.77	20.32	23.79
	Δg %	13.44	20.93	25.04	16.61	36.70	12.22
III	h. broad	81.6	88.47	81.41	79.15	81.31	80.6
	h. narrow	67.75	84.94	80.15	49.29	72.38	77.69
	Δg	4.71	11.263	17.67	0.466	18.73	30.21
	Δg %	4.41	53.94	27.28	10.10	25.13	13.54

The differences in magnitude of both broad and narrow sense heritability estimates for all studied characters proved the presence of both additive and non-additive gene action in the inheritance of all characters in all crosses. Same results were previously obtained by Jatasra and Paroda (1980), Mosaad *et al.* (1990), and Gouda *et al.* (1993) Moustafa (2002), Hendawy (2003), El-Sayed *et al.* (2004) and Abdel Nour *et al.* (2005).

Genetic advance under selection (Δg%) was high in magnitude for number of spikes/plant, kernel weight, grain and biological yield/plant in the first cross, for number of spikes/plant, number of kernels/spike and grain yield/plant in the second cross as well as for number of spikes/plant, number of kernels/spike and grain yield/plant.

Moderate genetic gain was detected for number of kernels/spike in the first cross, plant height, for kernel weight and biological yield/plant in the second cross, and for kernel weight and biological yield/plant in the third cress. Relatively low genetic gain was estimated for plant height in the first and third crosses, respectively. Dixit *et al.*., (1970) pointed out that high heritability is not always associated with high genetic advance, but in order to make effective selection, high heritability should be associated with high genetic gain. In this study, high to moderate genetic advance (Δg%) were associated with high to moderate narrow sense heritability estimates for number of spikes/plant, kernel weight, grain and biological yield/plant in the first cross, for number of kernels/spike, kernel weight and grain yield/plant in the second cross, as well as for number of spikes/plant, number of kernels/spike and grain yield/plant in the thirdone. Consequently, selection for these characters would be effective. Relatively low genetic gain was associated with low heritability values for number of kernels/spike in the first cross and kernel weight in the third one. Hence, selection for these traits may be less effective. These results were in accordance with those of Moustafa (2002) and Hendawy (2003). As it is well known, expected that improvement in selection is directly proportional to thy heritabilit values. The except response to selection, varies with the phenotypic standard deviation of population means. This figures is measure of the total vartability in the characters an dottier therefor reflect the total response that could be found realized by breeding techniques.

Concerning to the first cross (Gemmiza 9 x Sids 1) it may have good potential to improve number of spikes/plant, kernel weight and grain yield/plant and the second cross (Giza 168 x Dovin-2) may be promising for number of spikes/plant, number of kernels /spike and grain yield/plant and in the thrid cross for number of spikes/plant, number of kernels/spike and grain yield/spike.

Generally, most biometreical parameters estimated for the second and third crosses were higher in magnitude than those estimated for the first cross. Consequently, it could be concluded that the crosses (Giza 168 x Dovin-2) and (Giza 168 x Sakha 93) would be interest in a breeding program for bringing about the maximum genetic improvement in the attributes studied.

REFERENCES

1. Abdel Nour, Nadya A. R., H. A. Ashoush and Sabah H. Abo Elela. 2005. Diallel crosses analysis for yield and its components in bread wheat. J. Agric. Sci. Mansoura Univ., 30 (1): 5725 – 5738.
2. Abul-Naas, A. A., A. A. El-Hosary and M. Asakr. 1991. Genetical studies on durum wheat (*Triticum aestivum* L.) Egypt J. Agron., 16 (1 – 2) : 81 – 94.
3. Al – Kaddaussi, A. R., M. M. Eissa and S. M. Salama. 1994. Estimates of genetic variance for yield and its components in wheat (*Triticum aestivum* L.) Zagaizig J. Agic Res., 21 (2) 355 – 366 .
4. Crumpacker, D. W., and R. W. Allerd. 1962. Adiallel cross analysis of heading date in wheat . Hilgasdi, 32 : 275 – 277 .
5. Dixit, P. K., saxena, P. D and Bhalia, L. K. 1970. Estimatian of genotypic Variability of some qualitative characters of groundnut. Indian J. Agric Sci., 40 – 197.
6. El–Hosary,A. A., M. E. Riad, Nagwa. R. A. and Manal, A. H. 2000. Heterosis and combining ability in durum wheat. Proc 9th cantf. Agron Minufiya Univ., Sep. 2000:101 – 117.
7. El – Rassas, H. N. and R. A. Mitkess. 1985. Heterosis and combining ability in bread wheat (*Triticum aestivum* L.) Annals of Agric. Sci, Moshtohor. 23 (2) 695 – 711 .
8. El-Sayed, E. A. M. 2004. A diallel crosses analysis for some quantitative characters in bread wheat (*Triticum aestivum* L.). Egypt J. Agric. Res., 82(4): 1665 – 1679.
9. Gamble, E. E. 1962. Gene effect in corn (Zea Mays l.) L. Separation and relative importance of gene effects for yield. Canadian J. of Plant Sci., 42 : 339 – 348 .
10. Gauda, M. A., M. M. El–Shami and T. M. Shehab El–Din. 1993. inheritance of grain yield and some related morphophysiological traits in Wheat T. Agric. Res. Tanta Univ . 19 (3) : 537 – 546 .
11. Hendawy, H. I. 2003. Genetic architecture of yield and its components and some other agronomic traits in bread Wheat. Minufiya J. Agic. Res. Vol. 28 no. 1: 71–86
12. Jatasra, D. S. and R. S. Paroda. 1980. Genetics of yield and yield components in bread wheat. Indian J. of Agric. Sci., 50 (5): 379 – 382.

13. Johanson, H. W., H. F. Robinson and R. E. Comstock. 1955. Estimation of genetic and environmental Variability in soybeans. Agron. J., 47 : 314 .

14. Ketata, H., E. L. Smith, L. H. Edwards and R. W. Mc New. 1976. Detection of epistatic, additive amd dominance variation in winter wheat (*Triticum aestivum* L. em. Thell) Crop Sci., 16 (1) 1 – 4.

15. Mather, K. 1949. Biometerical genetics. Dover publication Inc. London.

16. Mather, K. and J. L. Jinks. 1971. Biometerical genetics. 3rd Ed Chapman and Hall, London.

17. Miller, P. A., J. C. Williams, H. F. Robinson and R. E. Comstock. 1958. Estimation of genotypes and environmental Variances in upland cotton and their implication in selection. Agron. Tour. 50 : 126 – 131 .

18. Mosaad. M. G., M. A. El – Morshidy, B. R. Bakheit and A. M. Tamam. 1990. Genetical studies of some Morphophysiological traits in durum wheat crosses. Assiut J. Agric. Sci., 21 (1) 79 – 94.

19. Moustafa. M. A. 2002. Gene effect for yield and yield components in four durum wheat crosses, J. Agric. Sci., Mansoura Univ. 27 (1) : 151 – 164 .

20. Peter, F. C. and Frey. 1966. Genotypic correlation Dominance and heritability of quantitative characters in oats. Crop. Sci., 6 : 259 – 262 .

21. Shehab El-Din, T. M. 1993. Response of two spring wheat cultivars (*Triticum aestivum* L. em. Thell) to ten seeding rates in sandy soil . J. Agric. Sci. Mansoura Univ., 18: 2235-2240.

22. Van drs Veen, J. H. 1959. Test of non – allelic interaction and linkage for quantitative characters in generation derived from two diploid pure lines. Genetica, 30 : 201 .

التأثير الجيني للمحصول ومكوناته في ثلاثة هجن من قمح الخبز

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أجري هذا البحث في محطة بحوث الجيزة في موسمي ٢٠٠٢/٢٠٠٣ و٢٠٠٣ / ٢٠٠٤ ثم أجريت تجربة التقييم النهائي في محطة البحوث الزراعية بإيتاي البارود – بمحافظة البحيرة في موسم ٢٠٠٤ / ٢٠٠٥ م على ثلاثة هجن من قمح الخبز ، بتحليل العشائر الست (كل من الأبوين والجيلين الأول والثاني والجيلين الرجعيين) لكل من الهجن الثلاثة (جميزة ٩ × سدس ١ ، جيزة١٦٨× دوفن ٢ و جيزة ١٦٨ × سخا ٩٣) وكانت أهم النتائج المتحصل عليها من هذه الدراسة كما يلي :

١. كانت قوة الهجين معنوية وموجبه لطول النبات ومحصول الحبوب للنبات الفردي ووزن النبات الكامل في الهجين الأول / وطول النبات ووزن مائة حبة ووزن المحصول البيولوجى بالنسبة للهجين الثاني أما الهجين الثالث كانت قوة الهجين معنوية وموجبة بالنسبة لعدد السنابل / نبات ، ووزن الحبوب ، محصول الحبوب للنبات والمحصول البيولوجي للنبات .

٢. تأثير التربية الداخلية كان موجباً ومعنوياً في نقص متوسط الجيل الثاني عن الجيل الأول لكل الصفات المدروسة ماعدا طول النبات وعدد السنابل /نبات بالنسبة للهجين الأول – أما بالنسبة للهجين الثاني فكان تأثير التربية الداخلية موجباً ومعنوياً بالنسبة لعدد السنابل /نبات والمحصول البيولوجي – أما بالنسبة للهجين الثالث فكان معنوياً وموجباً لكل الصفات المدروسة ماعدا صفة محصول الحبوب والمحصول البيولوجي .

٣. أوضحت دراسة طبيعة التوارث أن درجة السيادة كانت كاملة لصفه وزن الحبوب بالهجين الأول بينما ظهرت السيادة الفائقة تجاه الأب الأعلي لصفه وزن الحبوب في الهجين الثاني والثالث وكذلك بالنسبة لصفة محصول الحبوب والمحصول البيولوجي للثلاثة هجن وكذلك طول النبات في الهجين الأول والثاني ، عدد السنابل/النبات للهجين الأول والثالث وعلى العكس من ذلك فقد كانت السيادة فائقة تجاه الأب الأقل لصفة عدد الحبوب/السنبلة في كل من الهجين الثاني والثالث . كما أمكن تحديد سيادة جزئية تجاه الأب الأقل لصفة عدد السنابل / نبات في الهجين الثاني وكذلك عدد الحبوب/سنبلة في الهجين الأول .

٤. كانت انحرافات الجيل الثاني E_1 وانحرافات الأجيال الرجعية E_2 معنوية لمعظم الصفات في الهجن تحت الدراسة مما يوضح أهمية الفعل الجينى التفوقى في وراثة هذه الصفات .

٥. أظهرت التأثيرات الوراثية المضيفة وكذلك الفعل الجيني غير المضيف (السيادة والتفوق) دوراً هاماً في وراثة معظم الصفات المدروسة .

٦. أظهرت الكفاءة الوراثية بمعناها الواسع قيماً عالية لمعظم الصفات كما أظهرت الكفاءة الوراثية بمعناها الضيق قيما عالية إلى متوسطة لمعظم الصفات ، كما وجد أن قيم الكفاءة الوراثية بمعناها

الضيق العالية والمتوسطة مرتبطة بنسبة تحسين وراثي مرتفع ومتوسط فـــي معظـــم الصـــفات المدروسة.

٧. يمكن الاستفادة من الهجينين الثاني والثالث في برامج تربية القمح للحصول على سلالات جديـــدة متفوقة في المحصول .

٨. النتائج المتحصل عليها تدل على أن الانتخاب في الأجيال الانعزالية المبكرة قد يكون مفيداً ولكن سوف يكون أكثر كفاءة إذا تم تأجيله إلى الأجيال الانعزالية المتأخرة .