J. Agric. Sci. Mansoura Univ., 31 (6): 3273 - 3283, 2006

STUDIES OF GENE EFFECT ON YIELD AND YIELD COMPONENTS FOR SOME BREAD WHEAT CROSSES

Moshref, M. Kh.
National Wheat Res. Program, Field Crops Res.Inst., Agric. Res. Center

ABSTRACT

Three experiments were carried out at El-Giza Agricultural Research Station using two wheat crosses namely, Gemmeiza 7 x Sids 1 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 while, heterotic increase in number of spikes/plant,100-kernel weight, grain yield/plant and biological yield/plant seemed to be accounted for the heterotic response observed in the second cross. On the other hand, significant negative heterotic effect was found for number of grains/spike in the second one .

Inbreeding depression estimates were found to be significant for all studied attributes except for number of spikes/plant in the first cross.

Over dominance towards the higher parent for 100-kernel weight, grain yield/plant and biological yield/plant, no. of spikes/plant, were observed in both crosses. Meanwhile, over or partial dominance towards the lower parent was obtained for number of kernels/spike in the two crosses. On the other side partial dominance was observed for plant height in the second one.

F_2 deviation (E_1) were significant for number of kernels/spike in the two crosses, and for grain yield/plant in the first cross. Moreover, backcross deviations (E_2) were significant for plant height in the first cross, number of kernels/spike, grain and biological yield/plant in the second one.

The additive gene effect was significant for all studied characters in Gemmeiza 7 x Sids 1 cross except for number of spikes/plant. These results suggest the potential for obtaining further improvement in most studied characters. In addition, dominance and epistasis were found to be significant for some of the studied attributes.

High to medium values of heritability estimates were found to be associated with high and moderate genetic advance as percentage of F_2 mean in most characters. These results indicated 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 the 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. These informations may be helpful for wheat breeders to identify types of genetic variation in the characters which the selection is intended and to carry out rapid evaluation of yielding ability of the breeding materials by identifying crosses of superior genotypes which have higher yielding ability.

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

The basis of progress in improving quantitative traits in plant breeding is the relative importance of type of gene action involved. After dividing the genotypic variance to additive, dominance and epistatic variances by Fisher (1918). Many genetic models were introduced to estimate the different genetic effects (Griffing,1956 and Hayman and Mather,1955).

Estimates of genetic variance are very essential among the basic information required for plant breeders. If most of the genes controlling character proved to be mainly of the additive nature in the crosses, the improvement of these characters could be achieved and selection may be effective (Abul-Nass *et al.*1993).

Mosaad *et al.* (1990) found that, additive genetic variance was the prevalent type controlling of number of days to heading, plant height and spike length. Moreover, Abul-Naas *et al.* (1991) and Al Kaddoussi *et al.* (1994) reported that, dominance component was played an important role in genetic control for number of spikes/plant, number of kernels/spike, 100-kernel weight and grain yield/plant. On the other hand, El-Hosary *et al.* (2000), found that grain yield and its components in eight durum wheat parent-diallel cross mating system 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 (2004) and Abdel Nour, Nadya *et al.* (2005) reported that, hertiability estimates for yield and its components were medium to high.

The present work was conducted to study the genetic variance and its components, gene action, heritablity and expected genetic advance under selection for plant height, number of spikes/plant, number of kernels/ spike, 100-kernel weight, as well as biological and grain yield/plant.

MATERIALS AND METHODS

This investigation was carried out during three successive seasons 2002/2003, 2003/2004 and 2004/2005 at El-Giza Research Station, Agricultural Research Center. In 2002/2003 season, four bread wheat cultivars namely; Gemmeiza 7, Sids 1, Giza 168 and Sakha 93 were chosen which represent a wide range of variability in most studied characters. These cultivars were used as parental materials in the present study.

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. 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 backcrossed 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"s seeds. Meanwhile, F_1 plants were self-pollinated to produce F_2 seeds. In the third season, the obtained seeds of the these populations i.e. P_l, P_2, F_1, F_2, BC_1 and BC_2 for the two crosses were evaluated 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_l, P_2, F_1, BC_1 and BC_2 as well as five rows of F_2 genotypes.

Data were recorded on 20 individual guarded plants in P_1,P_2 and F_1 and 40 plants in Bc_1 and Bc_2 and 100 plants in the F_2 for plant height, number of spikes/plant, number 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 Johanson *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 four parental bread wheat cultivars.

Genotype	Pedigree	Origin
Giza 168	MRL/BUC// SER! CM93046-8M-0Y-0M-2Y-0B- 0 Gz.	Egypt
Sakha 93	Sakha 92 / TR810328 S8871-1S-2S-1S-OS	Egypt
Gemmeiza 7	CM74A.630/SX//SERI82/3/AGENT GM.4611 – 2GM – 3GM – 1GM – 0GM	Egypt
Sids 1	HD2172/Pavon "S"// 1158.57/MAYA74 "S". SD46 – 4 SD – 2SD – 1SD – 0 SD	Egypt

RESULTS AND DISCUSSION

Varietal differences in response to their genetic background were found to be significant for most characters under investigation. Moreover, the genetic variance within F_2 populations were also significant for all studied characters. Hence, the different biometrical parameters used in this investigation were estimated. Means and variances of the six population P_1, P_2, F_1, F_2, BC_1 and BC_2 for the studied characters are shown in Table (2).

Table (2): Means and variances of the six populations for the studied characters of the two wheat crosses .

Characters	parameters	Cross I Gemmeiza 7 x Sids 1						Cross II Giza 168 x Sakha 93					
		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)	$\bar{X}$	108.80	116.80	120.20	117.50	117.50	118.90	111.00	105.10	109.20	106.80	108.70	107.20
	S^2	3.14	7.36	1.83	24.03	13.41	15.40	4.70	4.80	2.20	11.45	9.25	3.90
No.of spikes/plant	$\bar{X}$	17.90	20.50	21.25	19.70	21.49	20.92	21.41	17.81	25.60	20.90	22.42	24.00
	S^2	4.92	9.21	4.48	37.79	24.39	19.78	6.80	7.61	4.85	41.60	14.55	18.50
No. of kernels/spike	$\bar{X}$	72.00	80.20	70.80	62.19	68.25	71.81	76.00	81.00	72.3	65.10	66.60	63.80
	S^2	20.92	24.01	19.79	113.92	110.95	76.80	20.60	25.3	21.30	115.40	59.80	27.10
100-grain weight (gm)	$\bar{X}$	5.10	3.82	5.18	4.45	4.72	4.85	4.41	4.45	5.08	4.61	4.71	5.09
	S^2	0.07	0.13	0.03	0.55	0.29	0.17	0.04	0.03	0.07	0.20	0.13	0.19
Grain yield /plant (gm)	$\bar{X}$	50.30	43.30	78.10	45.54	62.69	61.34	59.20	69.49	80.75	74.60	62.45	70.90
	S^2	16.70	21.58	17.69	344.95	215.99	229.01	4.42	58.52	29.21	158.90	95.90	79.29
Biological yield /plant (gm)	$\bar{X}$	182.50	176.00	218.80	192.68	210.50	222.70	164.50	220.00	245.90	221.50	188.90	210.50
	S^2	85.44	95.60	53.54	573.60	354.90	272.80	67.50	90.90	69.80	352.50	206.55	145.40

Heterosis or hybrid vigor has been observed for nearly two centuries in plant breeding and for, perhaps,2000 years by animal hybridizations (East and Hayes,1912). Recently, many plant breeders have been interest to getting the possibility of developing hybrid cultivars in self pollinated crops especially wheat and barley. The feasibility of using hybrid cultivars depends on the economic production of large quantities of hybrid seeds. Therefore, one of the most important factors in determining the possibility of hybrids is the nature and amount of heterosis present.

The values of heterosis related to the better parent, inbreeding depression percentage, potence ratio and different gene action parameters in the two studied crosses 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 and number of spikes/plant, 100-kernel weight, grain yield/plant and biological yield/plant in the second one. However, significant negative heterotic effects were found for number of kernels/spike only in the second one. Similar results were reported by El-Hosary *et al.* (2000), Moustafa (2002) and Hendawy (2003).

The expression of heterosis for a complx character i.e., high yielding ability, could be explained on the basis of components interactions, as the numerical value recorded for this complex trait which is always a function of its components. However, the expression of heterosis for this complex trait may or may not be due to the interaction of its components. Heterosis may be occur without individual components exhibiting heterosis Williams (1959). The possibility of heterosis for a complex trait, however, is increased if the individual components passes heterosis.

Table (3): Heterosis, inbreeding depression, gene action and potence ratio parameters for the two wheat crosses.

Character	cross	Heterosis % over B.P	Inbreeding depression	Gene action parameters								otance Raito (P)
				m	a	d	aa	ad	dd	E_1	E_2	
Plant height	1	2.91**	2.25	117.50	1.40	10.20	2.80	2.60	-9.60	1.00	3.40	1.85
	2	-1.62**	2.20*	106.80	1.50	5.75	4.60	-1.45	-1.90	-1.83	-1.35	0.39
No. of Spikes/plant	1	3.66	7.29	19.70	0.57	8.07	6.02	1.87	-9.94	0.53	1.96	1.58
	2	19.57**	18.36**	20.90	-1.58	15.23	9.24	-3.38	-11.66	-1.71	1.21	3.33
No. Of kernels/spik	1	-11.72	12.16	62.90	-3.56	27.06	31.36	0.54	17.68	11.26	-6.84	-1.29
	2	-10.74**	9.96	65.10	2.80	-5.80	0.40	5.30	40.40	10.30	20.40	-2.48
100-kernel weight	1	1.57	14.09**	4.45	-0.13	2.06	1.34	-0.77	-1.20	-0.37	-0.07	1.13
	2	14.16**	9.25**	4.61	-0.38	1.81	1.16	-0.36	-1.74	-0.15	0.29	3.25
Grain yield/plant	1	55.26**	41.69**	45.54	1.35	97.20	65.90	-2.15	-64.16	16.91	-0.87	8.94
	2	16.20**	7.62	74.60	-8.45	-15.30	-31.70	-3.31	55.19	2.05	11.75	3.19
Biological yield/plant	1	19.89**	11.97**	192.68	-12.20	35.23	95.68	-15.45	-165.98	-6.35	85.15	12.17
	2	11.77**	9.92	221.50	21.66	-33.55	87.20	6.15	64.70	2.43	38.75	1.93

***, ** significant at 5% and 1% probability levels, respectively.**

Number of spikes/plant, number of kernels/spike and 100-kernel weight being the main components for grain yield/plant, heterosis is increase if it found in one or two or three of these main yield components, thus it may lead to favourable yield increase in hybrids. The lack for heterosis for number of grains/spike which may be due to the lower magnitude of the non-additive gene action, may be indicated that, the increasing in number of spikes/plant and 100-kernel weight of the second 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 were detected for number of spikes/plant and 100-kernel weight in the second cross indicated that, the cross (Giza 168 x Sakha 93) may be take in consideration in a breeding program for high yielding ability through selecting for higher number of spikes/plant and 100-kernel weight.

Potence ratio indicated over-dominance towards the higher parent for all characters except for number of kernels/spike and 100-kernel weight in the first cross and both plant height and number of kernels/spike in the second one. Meanwhile, there was over-dominanc towards the lower parent for number of kernels/spike in the second cross. On the other hand, complete dominance was found for 100-kernel weight towards the higher parent in the first cross, while partial dominance towards the hight was detected for plant height in the second cross. On the other side, partial dominance towards the lower parent for number of kernels/spike in the first cross was detected. Over dominance was detected for both grain yield/plant and number of kernels/spike. These results are in harmony with those obtained by Moustafa (2002) and Hendawy (2003) .Over dominance was also obtained by Ketata *et al.* (1976) Mosaad *et al.* (1990), for plant height,for number of spikes/plant by Abul-Nas *et al.* (1991), for number of kernels/spike by Al-Kaddoussi *et al* (1994) and for grain yield/plant by Al-Kaddoussi *et al.* (1994.

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

Significant negative F_2 deviations (E_1) were shown for number of kernels/spike in the two crosses and for grain yield/plant in the first cross (Table 3). These may be 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, 100-kernel weight and biological yield/plant in the two crosses, and for grain yield/plant in the second one. These results may be indicate that the epistatic gene effects have a minor contribution in the inheritance of these traits.

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

The choice of the most effect breeding procedures depends to a large extent on the knowledge of the genetic system contributing the characters to be selected. Therefore, the nature of gene action was also computed according to Gamble (1962). The estimates of various types of gene effects contributing to the genetic variability are presented in Table (3).

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 found to be highly significant for all studied characters in the two crosses.

Significant negative additive gene effect was reported for 100-kernel weight, grain and biological yield/plant in Giza 168 x Sakha 93 cross, reflecting that the additive gene effects was of less importance in the inheritance of these characters. Similar results were obtained by El-Hosary

(2000), Moustafa (2002) , Hendawy (2003) El-Sayed (2004) and Abdel Nour, Nadya *et al.* (2005).

Dominance gene effects were found to be significant for all studied characters, except for number of spikes/plant in the first cross and for number of kernels/spike, grain yield/plant and biological yield/plant in the second one, pointing out the importance of dominance gene effects in the inheritance of these 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.

In autogamous crops i.e., wheat and barley, the breeder is normally aiming at isolating parental combination that are likely to produce desirable homozygous segregants. The utility of attempts at identifying such pure lines is facilitated by the preponderance of additive genetic effects in self pollinating crops (Joshi and Dhawan, 1966).

Additive x additive types of epistatic gene effects were significant for all studied characters except for plant height, number of spikes/plant and 100-kernel weight in the first cross, plant height, number of spikes/plant and number of kernels/spike in the second one. Significant additive x dominance type of epistasis was found for 100-kernel weight and biological yield/plant in the first cross, and for all studied traits except for plant height, grain and biological yield/plant in the second one. Dominance x dominance types of gene action was found to be significant for grain and biological yield/plant in the first cross; and for all traits except, plant height and number of spikes/plant in the second one.

The presence of both additive and non additive gene action for number of spikes/plant in the first cross, and for plant height and number of kernels/spike in the second cross would indicate that selection procedures based on the accumulation of additive gene effects could be very successful in improving these traits. However, to maximize selection advance, both additive and non-additive genetic variations are important and would be preferred. Similar conclusion was reported 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 (2004) and Abdel Nour, Nadya *et al.* (2005).

Heritability values indicates whether progress from selection for a plant character is relatively easy or difficult to make a breeding program. A plant breeder, through experience, can perhaps rate a series of characters on their response to selection. Heritability gives a numerical description of this concept.

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 studied characters.

Table (4): Heritability % in broad and narrow sense, genetic advance upon selection and genetic advance% for the studied characters of the two crosses.

Cross	Parameters	Plant height (cm)	No. of spikes/ plant	No. of kernels/ spike	100-grain weight (gm)	Grain yield/plant (gm)	Biological yield/plant (gm)
Cross 1:	Heritability (b)	92.38	88.15	82.63	93.85	94.87	90.67
Gemmeiza 7	Heritability (n)	70.66	78.57	33.63	63.29	70.72	86.27
x	Δg	7.14	9.95	7.39	0.97	27.05	42.56
Sids 1	Δg %	6.07	50.51	11.88	21.78	59.41	22.09
Cross 2:	Heritability (b)	80.78	88.34	81.54	67.16	81.62	80.20
Giza 168	Heritability (n)	65.93	84.57	80.59	54.23	72.7	78.42
x	Δg	4.60	11.24	17.83	0.5	18.88	30.33
Sakha 93	Δg %	4.30	53.76	27.39	10.86	25.31	13.69

High narrow sense heritability values were recorded for number of spikes/plant, and biological yield/plant in both crosses. Moreover, moderate narrow sense heritability were detected for plant height and grain yield/plant. Meanwhile, low heritabilitvy value was obtained for number of spikes/plant in Gemmeiza 7xSids 1 cross. 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 the characters under study. 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 (2004) and Abdel Nour, Nadya et al (2005).

Genetic advance under selection (Δg%) was high in magnitude for number of spikes/plant, 100-kernel weight, grain and biological yield/plant in the first cross; as well as for number of spikes/plant, number of kernels/spike and grain yield/plant in the second one.

Moderate genetic gain was detected for number of kernels/spike in the first cross; and 100-kernel weight and biological yield/plant in the second cress. Relatively low values of genetic gain were estimated for plant height in the first and second cross. 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 found to be associated with high to moderate narrow sense heritability estimates for number of spikes/plant, 100-kernel weight, grain and biological yields/plant in the first cross, as well as for number of spikes/plant, number of kernels/spike and grain yield/plant in the second one. Consequently, selection for these characters would be effective and satisfy. Relatively low genetic gain was associated with low heritability values for number of kernels/spike in the first cross and 100-kernel weight in the second one. Hence, selection for these traits may be less effective. These results were in accordance with those obtained by Moustafa (2002) and Hendawy (2003). As it is well known, improvement in selection is directly proportional to their heritable values.

The expected response to selection, varies with the phenotypic standard deviation of population means, this figure is a measure of the total vartability for the characters and therefore reflect the total response that could be realized by breeding techniques.

According to the results mentioned above, the first cross, (Gemmeiza 7 x Sids 1) may be have a good potentialty to improve number of spikes/plant, 100-kernel weight and grain yield/plant and the second cross for number of spikes/plant, number of kernels/spike and grain yield/plant.

Generally, most biometreical parameters estimated for the second cross were found to be higher in magnitude than those estimated for the first one. Consequently, it could be concluded that the (Giza 168 x Sakha 93) cross would be of interest in a breeding program for bringing out the maximum genetic improvement in the attributes studied.

REFERENCES

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 .

Abul-Naas, A. A., A. A. El-Hosary and M.A.Sakr (1991). Genetical studies on durum wheat (*Triticum aestivum* L.) Egypt J. Agron., 16 (1 – 2) : 81 – 94.

Abul-Nass, A.A; M.A. Mahrous and A.A. El-Hosary. (1993). Genetical studies on grain yield and some of its components in barley (*Hordeum vulgar* L.). Egypt. J. Agron.,18, No. 1-2 pp. 33-46.

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.) Zagazig J. Agic Res., 21 (2) 355 – 366 .

Crumpacker, D. W., and R. W. Allard (1962) . A diallel cross analysis of heading date in wheat . Hilgasdi, 32 : 275 – 277 .

Dixit, P. K., P. D Saxena, and L. K. Bhalia, (1970). Estimatian of genotypic variability of some quantitative characters of groundnut. Indian J. Agric Sci., 40 – 197 .

El–Hosary,A. A., M. E. Riad, Nagwa. R. A. and Manal, A. H. (2000). Heterosis and combining ability in durum wheat. Proc 9th Conf. Agron, Minufiya Univ., Sep. 2000:101 – 117 .

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 .

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.

East,E.M. and H.K. Hays (1912). Heterozygosis in evaluation and in plant breeding. USDA-Bur.PL Ind.Bul.243.

Fisher,R.A. (1918). The correlation between relatives and supposition of Mendelian inheritance. Trans. Royal Soci., Edinburgh, 52:339(C.F. Gamble, 1962).

Gamble, E. E. (1962). Gene effect in corn (*Zea Mays* L.) Separation and relative importance of gene effects for yield. Canadian J. of Plant Sci., 42 : 339 – 348 .

Gouda, M. A., M. M. El–Shami and T. M. Shehab El–Din (1993). Inheritance of grain yield and some related morphophysiological traits in wheat. Tanta Agric. Res., Tanta Univ ., 19 (3) : 537 – 546

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

Hayman, B.I. and Mather,K. (1955). The description of gene interaction in continuous variation. Biometrics,10:69.

Hendawy, H. I. (2003). Genetic architecture of yield and its components and some other agronomic traits in bread wheat . Minufiya J. Agic. Res. 28 (1): 71–86

Jastara, 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.

Johanson, H. W.; H.F Robinson and R. E Comstock(1955). Estimation of genetic and environmental variability in soybeans. Agron. J., 47 : 314 .

Joshi, A.B. and N.L. Dhawan (1966). Genetic improvement in yield and special reference to self-fertilized crop. India J. Genet., 26A:101.

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

Mather, K. and J. L. Jinks (1971). Biometerical genetics 3re Ed, Chapman and Hall, London.

Mather, K. (1949). Biometerical genetics. Dover publication Inc. London.

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. J. 50 : 126 – 131 .

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 .

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 .

Peter, F. C. and Frey (1966). Genotypic correlation, dominance and heritability of quantative characters in Oats . Crop. Sci., 6 : 259 – 262 .

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.

Van der 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 .

Williams,W.(1959). Heterosis and genetic of complex characters. Nature, 184:527.

J. Agric. Sci. Mansoura Univ., 31 (6), June, 2006

دراسة التأثير الجيني على المحصول ومكوناته في بعض هجن قمح الخبز

محمد خلف مشرف
البرنامج القومي لبحوث القمح- معهد بحوث المحاصيل الحقلية - مركز البحوث الزراعية

أجري هذا البحث في المواسم ٢٠٠٢/٢٠٠٣ ، ٢٠٠٣ / ٢٠٠٤ و٢٠٠٤/ ٢٠٠٥ في محطة البحوث الزراعية بالجيزة بمركز البحوث الزراعية على هجينين من قمح الخبز ، بتحليل العشائر الست (كلا من الأبوين والجيلين الأول والثاني والجيلين الرجعيين) لكل من الهجينين (جميزة ٧×سدس ١ وجيزة 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 أما الهجين الثاني فكانت قوة الهجين معنوية وموجبة بالنسبة لعدد السنابل / نبات ، ووزن مائة حبة ، 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 معنوياً وموجباً لكل الصفات المدروسة ماعدا صفة محصول الحبوب والمحصول البيولوجي .
٣. أوضحت دراسة طبيعة التوارث أن درجة السيادة كانت كاملة لصفه وزن ١٠٠حبة بالهجين الأول بينما ظهرت السيادة الفائقة تجاه الأب الأعلى لصفه وزن ١٠٠ حبه في الهجين الثاني وكذلك بالنسبة لصفة محصول الحبوب والمحصول البيولوجي لكلا الهجينين وكذلك طول النبات في الهجين الأول ، عدد السنابل/النبات للهجين الأول والثاني وعلى العكس من ذلك فقد كانت السيادة الفائقة تجاه الأب الأقل لصفة عدد الحبوب/ السنبلة في الهجين الثاني . كما أمكن تحديد سيادة جزئية تجاه الأب الأقل لصفة عدد الحبوب/سنبلة في الهجين الأول .
٤. كانت انحرافات الجيل الثاني E_1 وانحرافات الأجيال الرجعية E_2 معنوية لمعظم الصفات في الهجينين 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 في معظم الصفات المدروسة.
٧. يمكن الاستفادة من الهجينين في برامج تربية القمح للحصول على سلالات جديدة متفوقة في المحصول .
٨. النتائج المتحصل عليها تدل على أن الانتخاب في الأجيال الانعزالية المبكرة قد يكون مفيداً ولكن ذلك سوف يكون أكثر فاعلية إذا ما تم تأجيله إلى الأجيال الانعزالية المتأخرة .