ANALYSIS OF YIELD AND YIELD COMPONENTS IN TWO BREAD WHEAT CROSSES UNDER WATER STRESS CONDITIONS

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Abstract

This investigation was carried out from 2008/2009 to 2011/2012 .Two crosses namely; Sahel 1 x Gemmeiza 11 and Gemmeiza 10 x Sids 1 were grown in two experiments normal irrigation (N) and drought stress (D). Five populations (P_1, P_2, F_1, F_2 and F_3) for each cross were used. Significant either positive or negative heterotic effects were found for all characters, except for No. of spikes/ plant, No. of kernels/ spike and grain yield/plant in the first cross under drought stress. Inbreeding depression estimates were significant and positive for kernel weight and grain yield/ plant in both crosses under drought conditions. Also, significant and positive estimates for all characters, except for No. of spikes / plant in the second cross and kernel weight in the first cross under normal irrigation. Additive gene effects (d) and additive x additive (i) were significant either positive or negative for all characters under both irrigation regimes, except for No. of spikes /plant, kernel weight and grain yield/plant in the second cross under normal irrigation. Dominance gene effects(h) and dominance x dominance (I)were significant and positive for No. of spikes/plant in both crosses and grain yield /plant in the first cross under both irrigation regimes Significance of these components indicated that ,both additive and dominance gene effects are important in the inheritance of these characters. High to medium, heritability estimates were associated with low and moderate expected and actual gain in most characters under irrigation regimes .Results proved that selection for the studied characters could be used in early generation but would be more effective if postponed to late ones under both irrigation regimes in both crosses.

INTRODUCTION

In Egypt, wheat (*Triticum aestivum L*) is the most important food crop. However, the gap between the local production and consumption is continuously increasing due to increasing population with a limited cultivated area.

Wheat breeders are interested in estimating the relative magnitude of the genetic variance and types of gene action involved in expression of characters. Therefore, they need detailed information about the nature of gene action, heterosis, inbreeding depression, heritability and predicated genetic gain from yield and its components. These targets could be realized by breeding new high yielding, early maturing, drought, heat and salt tolerant wheat varieties. Drought tolerant wheat cultivars will be directed to solve the problem of drought under rainfed areas and could be used to expand wheat areas under marginal conditions. Many investigators studied the type of gene effect in wheat and reported that dominance effect was relatively more important than additive one for grain yield, while, additive genetic effect was predominated in the expression of plant height and days to hading.

Abul- Naas *et al* (1991) reported that dominance 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) reported that additive and non-additive gene effects were important. However, Abdel-Nour and Hassan (2009) reported the predominance of additive and additive x additive gene action in controlling the genetic system for yield and its components under normal and drought conditions. Also Kheiralla (1994) studied the effects of drought stress on the components of genetic variation for earliness in wheat. He found that additive and non-additive gene effects were controlling earliness under both normal and drought environments. Narrow sense heritability was estimated by 0.49 in the favorable environment and by 0.67 under stress. On the other hand, Hendawy (2003), El-Sayed (2004), Abdel-Nour and Moshref (2006), El –Sayed and El-Shaarawy (2006), Abd-Allah *et al* (2008) and Abdel-Nour and Hassan (2009), reported that narrow sense heritability estimates for yield and its components were medium to high.

The objective of the current research was to study the gene action, heritability as well as actual and predicated genetic gains from selection in two bread wheat crosses derived from four diverse wheat bread genotypes using five populations under normal and drought environments.

MATERIALS AND METHODS

Tow crosses were used in the present study. They were derived from four widely diverse bread wheat genotypes. Name and pedigree of parental genotypes are given in Table (1). These genotypes were used to obtain the following two crosses: (1) Sahel 1 x Gemmeiza 11 and (2) Gemmeiza 10 x Sids 1

Table 1. Name, pedigree and origin of four parental bread wheat genotypes.

No.	Name	Pedigree	Origin
P1	Sahel 1	NS 732/PIMA/ VEE"S"SD735-4SD-1SD-1SD-oSD.	Egypt
P_2	Gemmeiza 11	BOW"S"KVZ"S"//7C/SERI82/3/GIZA168/SAKH61. GM7982-2GM-1GM-2GM-1GM-0GM.	Egypt
P_3	Gemmeiza 10	MAYA 74 "S" /ON//160-147/3/BB / GLL/4/CHAT "S"/5/CROW"S". GM5820-3GM-1GM-2GM- 0GM.	Egypt
P_4	Sids 1	HD2172/PAVON "S"// 1158.57/ MAYA 74 "S". SD46-4SD-2SD-ISD-OSD.	Egypt

Cultivars Gemmeiza 10 and Sids 1 are characterized by high yield and high number of spikes/plant while, Gemmeiza 11 and Sahel 1 are good yielders and having good numbers of kernels/ spike and heavy kernels under drought.

The present study was carried out at El- Giza Research Station, Agricultural Research Center (A.R.C), Egypt, during the three successive seasons from 2008/2009 to 2010/2011.

The final experiment (the fourth season) was conducted at Bahteem Research Station, El-Qalubia Governorate, Agricultural Research Center ,A.R.C. in 2011/2012 season. In the first season (2008/2009), the parental genotypes were crossed to obtain F_1 seeds. In the second season (2009/2010), the hybrid seeds of the two crosses were sown to give the F_1 plants. These plants were selfed to produce F_2 seeds. Crossing was repeated to ensure enough and fresh hybrid seeds. The new hybrid seed and part of the F_2 were stored under refrigeration for further use. In the third season (2010/2011), F_1, F_2 and parent seeds of each cross were sown to produce more F_{2seeds}. Moreover, F2 plants were selfed to produce F_3 seeds.

In the fourth season (2011/2012) the five populations P_1, P_2, F_1, F_2 and F_3 of each of the two crosses were sown in two adjacent experiments. The first experiment (stress experiment) was irrigated once (70 days after planting irrigation). The second experiment (non- stress or normal experiment) was irrigated four times after planting irrigation. A boarder of fifteen meters was set between the two experiments. Each experiment was arranged in a randomized complete blocks design with four replications. Rows were 4m long spaced 20cm apart. The plants within rows were 10cm apart. Each plot consisted of two rows for each parent and F_1, five rows for F_2 generation and 20 rows for F_3 families selected from F_2 at season 2010/2011 from each cross. Data were collected from individual guarded plants from each plot (50 plants from F_2, 40 plants from F_3- bulks and 10 plants for parents and F_1). The characters studied were, No .of spikes /plant, No .of kernels/ spike, 100- kernel weight (g) and grain yield/ plant (g). The proper culture practices were applied as recommended for wheat production in both experiments. The amounts of total rainfall during the fourth growing season are shown in Table (2).

Table 2. Monthly total rainfall at Bahteem in the El-Qalubia during in 2011/2012 winter season.

Month	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012	Apr 2012	May 2012
Rainfall mm/month	-	0.3	2.6	0.4	6.2	-	-

Table contents were estimates over 150 mm

*Agro meteorological data climatic factor from Giza Station, (A.R.C).

The amount of heterosis was expressed as the percentage increase of F_1 above the better parent value. Inbreeding depression was calculated as the difference between the F_1 and F_2 means expressed as percentage of the F1 mean, and the difference between the F_2 and F_3 means expressed as percentage of the F_2 mean. The t-test was used to determine the significance of these deviations, where the standard error (S E) was calculated as follows S E for better parent heterosis, and S E for inbreeding depression. In addition, F2 deviation (E_1) and F_3 deviation (E2) were measured as suggested by Mather and Jinks (1971) .Potence ratio (P) was also calculated according to Peter and Frey (1966). Type of gene action was estimated according to Singh and Chaudhary (1985) using five parameter's model. The stander error of additive (d^*), dominance (h), dominance x dominance (I) and additive x additive (i)was obtained by taking the squares root of respective variation "T" test values were calculated upon dividing the effects of d^*, h, I and i by their respective standard error. Heritability in broad and narrow sense was calculated according to Mather (1949) and parent off- spring regression was performed according to Sakai (1960). Furthermore, the predicated and actual genetic advance (Δg) form selection was computed according to Johanson *et al*., (1955). The genetic gain from selection as percentage of the F_2 and F_3 mean performance (Δg %) was computed using the method of Miller *et al*. (1958).

RESULTS AND DISCUSSION

Differences between genotypes were significant in most characters under investigation. The F_2 genetic variances were also significant for all studied characters in the two crosses under the two environments. Therefore, the different biometrical parameters in this investigation were estimated. Means and variances of the five populations P_1, P_2, F_1, F_2 and F_3 for the characters studied in the two crosses under drought and normal conditions are presented in Table (3).

Heterosis relative to the better parent, inbreeding depression percentage, potence ratio (P), E_1, E_2 and gene action for the four studied characters under two environments are given in Table (4).

Table3. Means (x) and variances (S^2) for the studied characters of the five populations (P_1, P_2, F_1, F_2 and F_3 families) in two bread wheat cross

Characters	Parameters	Sahel I X Gemmeiza 11									
		Drought					Normal				
		P_1	P_2	F_1	F_2	F_3 Bulk	P_1	P_2	F_1	F_2	F_3 Bulk
No. of spikes/plant	X	12	12.75	14.11	12.7	12.4	15	12.79	15.17	14.4	14.1
	S^2	3.95	8.2	4.5	37.8	24.5	4.70	6.5	5.2	45.2	31.2
No. of kernels/spike	X	59.6	56.1	58.9	59.8	60.1	47.8	59.1	68.1	66.1	64.2
	S^2	20.8	23.1	18.9	12.03	85.7	23.7	24.2	15.6	163.9	118.7
100-kernel weight(g)	X	4.98	5.26	4.485	4.47	4.465	4.09	5.3	5.41	5.23	5.18
	S^2	0.06	0.10	0.04	0.57	0.39	0.05	0.09	0.05	0.61	0.43
Grain yield /plant(g)	X	23.7	23.71	28.1	26.82	25.73	21.3	27.56	32.52	30.15	29.20
	S^2	16.9	22.3	15.60	150.7	109.8	17.1	24.3	17.9	174.9	118.7
Gemmeiza 10 x Sids 1											
No. of spikes/plant	X	9.65	8.91	12.39	11.4	11.21	15.62	15.5	15.1	13.67	13.10
	S^2	5.7	6.9	5.12	42.6	28.2	6.30	7.50	5.90	51.8	34.9
No. of kernels/spike	X	54.2	56.1	55.1	55.42	55.59	57.1	63.58	59.10	57.9	56.2
	S^2	20.2	21.7	16.8	131.7	92.9	19.1	22.3	17.5	152.2	105.80
100-kernel weight(g)	X	4.55	5.24	4.54	4.254	4.242	4.6	5.06	4.75	4.705	4.7
	S^2	0.04	0.025	0.08	0.22	0.142	0.032	0.03	0.075	0.27	0.195
Grain yield /plant(g)	X	19.7	19.5	24.1	22.80	22.1	27.61	26.4	30.85	28.9	27.9
	S^2	14.9	18.7	22.9	145.9	113.7	15.2	19.9	25.4	162.7	120.6

Table 4. Heterosis, potence ratio, inbreeding depression and gene action parameters in the two bread wheat crosses (1) and (2).

Character			No. of spikes/plant		No. of kernels/spike		100-kernel		Grain yield/plant	
Cross			(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Heterosis% over B.P.		D	10.67	*28.39	-1.17	**-1.78	-14.63	*-13.35	18.52	**22.34
		N	*1.130	**-3.33	**15.23	**-7.05	**2.10	**-6.12	**18.00	**11.73
Potence ratio %		D	- 4.63	8.41	0.60	0.053	- 4.54	1.03	- 87.90	45.00
		N	-1.15	-7.67	-2.59	-0.38	1.18	-0.35	2.58	6.36
Inbreeding depression	Drou	F_2	9.99	7.99	*1.53	**-0.58	*0.33	**6.30	**4.56	*5.39
		F_3	2.36	*1.67	*2.21	*-0.31	0.112	0.24	**4.06	*3.07
	Norm	F_2	**5.08	9.47	**2.94	**2.03	*-3.33	**0.95	**7.29	**6.32
		F_3	2.08	4.16	*2.87	*2.94	*0.96	*0.21	*3.15	**3.46
Gene action parameter	Drought	m	**12.70	**11.40	**59.80	**55.42	**4.47	**4.25	**26.82	**22.8
		d	**- 0.38	**0.37	**1.75	*- 0.95	**-0.14	**-0.35	**-0.01	**0.10
		h	*1.74	**1.17	-1.40	-0. 67	-0.013	0.22	*3.76	2.73
		I	*2.16	*1.63	*-0.80	0.05	0.040	*0.70	-2.40	-0.27
		i	**-0.75	**-1.20	**1.05	**-2.52	**0.367	**-0.11	**-0.64	**-1.57
		E_1	**-0.54	**0.57	**1.43	**0.30	**-0.33	*-0.46	**0.92	0.95
		E_2	**-1.685	**0.75	**3.45	0.93	**-0.67	-0.951	**-0.345	**0.50
	Normal	m	**14.4	**13.67	**66.10	**57.90	**5.23	**4.71	**30.15	**28.9
		d	***1.1	**0.06	**-5.65	**-3.24	**-0.61	**-0.23	**-3.13	**0.61
		h	*1.32	*2.47	*6.40	*5.33	0.25	0.053	**4.11	**3.97
		I	*0.45	*0.77	-4.80	*-5.87	0.21	0.28	*1.25	-0.13
		i	*2.25	3.05	**-19.55	**0.09	-1.67	- 0.072	**-10.24	1.33
		E_1	*-0.13	-1.66	**-.013	**-1.82	0.18	-0.09	1.68	-0.3
		E_2	*-0.865	**- 4.46	*0.865	**-7.04	**0.255	-0.18	1.45	**-2.08

D = Drought ----- N= Normal irrigation; cross (1) SahelxGemmeiza11 and cross (2) Gemmeiza 10 xSids1.

Significant positive heterosis was detected for No. of spikes /plant and grain yield /plant in the second cross under drought stress and also No. of spikes /plant, No. of kernels /spike, kernel weight and grain yield in the first cross under normal irrigation. Besides, significant negative heterosis was evident for No. of kernels/spike and kernel weight in the second cross under drought and also No. of spikes/plant, No. of kernels /spike and kernel weight in the second cross under normal irrigation. Similar results were reported by Khalifa *et al* (1997), El-Hossary *et al.*, (2000), El-Sayed *et al* (2004) and Abdel-Nour and Hassan (2009).

Number of spikes/pant, number of kernels/spike and kernel weight are the main components of grain yield. Hence, heterotic increase if found in one or more of these attributes with other attributes being constant would lead to favorable yield increase in hybrids. The lack of significance in heterosis of No. of kernels/ spike and kernel weight in the first cross under drought and also No- of spikes/plant, No. of kernels/ spike and kernel weight in the second cross under normal conditions could be due to the lower magnitude of the non- additive gene action. These results are in agreement with those obtained by Amaya *et al.* (1972) and Ketata *et al* (1976). The pronounced heterotic effect detected for No. of spikes/ plant and No. of kernels / spike and kernel weight and grain yield / plant in the second cross and kernel weight in first one under drought stress and also No. of spikes/plant, No. of kernels/spike, kernel weight and grain yield/plant in the first cross under normal condition would be of interest in a breeding program for high yielding ability.

Potence ratio obtained indicated overdominance towards to the higher parent for all studied characters, except for No. of kernels/ spike in the both crosses and kernel weight in the second cross under drought and also No. of kernels/spike and kernel weight in the second cross under normal conditions. Complete dominance was calculated for No. of spikes/plant and kernel weight in the second cross under drought conditions and also for all studied characters in the first cross, except for No. of spikes/plant in the first cross and kernels / spike and kernel weight in the second one under normal irrigation. On the other hand, partial dominance towards to the lower parent was estimated for kernels/spike and kernel weight in the second cross under normal irrigation and kernel weight in the second cross under drought irrigation. These results are in agreement with those reported by Jatasra and Paroda (1980), Abul- Naas *et al*. (1991), Abdel-Nour and Mosharf (2006), Abd-Allah *et al*. (2008), and Abdel- Nour and Hassan (2009).

Significant inbreeding depression was found for No. of kernels/spike, kernel weight and grain yield/plant in the second cross and kernel weight and grain yield/plant in the first one under drought stress. Also, significant inbreeding depression was found for all studied characters, except for No. of spikes/ plant in the second cross under normal irrigation. Moreover, significant negative inbreeding depression was detected for No. of kernels/spike in second cross under drought stress and kernel weight in the first cross under normal irrigation. This is a valid result, since the expression of heterosis in F_1 may be followed by considerable reduction in F_2 performance .Similar results were obtained by Gautam and Jain (1985), Khalifa *et al*. (1997), Abdel – Nour and Moshref (2006) and Abdel- Nour and Hassan (2009).

Meanwhile, significant heterosis and insignificant inbreeding depression were obtained for No. of spikes/plant in the second cross under drought stress and No. of spikes/plant in the second cross under normal irrigation.

However, significant and positive heterosis and significant and negative inbreeding depression for kernel weight in the first cross under normal conditions were detected. The contradiction between heterosis and inbreeding depression estimates could be due to the presence of linkage between genes in these materials (Van der Veen 1959). These results may be refer to the contribution of epistatic gene effects in the performance of these characters. Similar results were reported by Kheiralla *et al*. (1993), Farshadfar *et al*. (2001) and Tammam (2005).

Nature of gene action was determined using the five parameter model (Table 4). The estimated F_2 mean which reflects the contribution due to the overall mean plus the locus effect and interaction of fixed loci, was highly significant for all studied characters in the two crosses under both drought stress and normal irrigation conditions.

The additive gene effect (d*) was significant and positive for No. of kernels/spike in the first cross ,No. of spikes/plant and grain yield/plant in the second one under drought stress and No. of spikes/plant and grain yield/plant in the second cross and No. of spikes /plant in the first cross under normal irrigation. Meanwhile, significant and negative additive value (d*) was detected in the two crosses for all characters, except for No. of Kernels/spike in the first cross and No. of spikes/ plant and grain yield / plant in the second one under drought stress and No. of spikes / plant in the first cross and No. of spikes/plant and grain yield/plant in the second cross under normal irrigation. These results suggest the potential for obtaining further improvements for these characters by using pedigree selection program. Similar results were obtained by Amaya *et al*. (1972), El-Hosary *et al*. (2000), El-Sayed (2006), Abd-Allah *et al* .(2008) and Abdel-Nour and Hassan (2009). In addition, Dominance gene effect (h) was significant and positive for spikes/plant in both crosses and grain yield/plant in the first cross under drought stress and No. of spikes/ plant, No. of kernels/spike and grain yield/plant in both crosses under normal irrigation. The significance of these components indicated that both additive and dominance gene effects are important in the inheritance of these characters. Therefore, selecting desired characters could be practiced in the early generations but would be more effective in late ones.

Dominance x dominance (I) type of gene action were positive and significant for No. of spikes/plant in both crosses and grain yield/plant in the first cross under drought stress and was also positive and significant for all characters, except for kernel weight in the two crosses under normal conditions. These results confirm the important role of dominance x dominance gene action in the genetic system controlling these characters. Additive x additive (i) type of epistasis was significant and positive for No. of spikes/plant, No. of kernels/spike and kernel weight in the first cross and significant and negative for No. spikes/plant, No. of kernels/spike, kernel weight and grain yield in the second one and grain yield in the first cross under drought conditions .It was also, significant and negative for No. of kernels/spike and grain yield /plant in the first cross under normal irrigation. Similar findings were reported by Hendawy (2003), Abdel- Nour and Mosharef (2006), Abd- Allah *et al* (2008) and Abdel-Nour and Hassan (2009).

Significant and positive F_2 deviation (E_1) was calculated for No. of kernels / spike, kernel weight and grain yield/plant in the first cross and kernel weight and grain yield /plant in the second cross and also significant negative was evident for kernels/spike in the second cross under drought stress .In addition significant and positive was detected for No of spikes/plant in the first cross and kernel weight in the second cross and kernels/spike and grain yield/plant in the two crosses and also significant and negative was detected for kernel weight in the first cross under normal conditions. This may indicate that epistatic gene effects had major contribution in the inheritance of these characters.

F_3deviation (E_2) was significant and positive for No. of spikes /plant in the second cross and grain yield/plant in the tow crosses under drought conditions. It was also significant and positive for kernels/spike, kernel weight and grain yield/plant in the two crosses under normal irrigation. On the hand, significant and negative (E_2) values were detected for No. of spikes/plant, kernel weight and grain yield /plant in the first cross under drought condition. Also, No. of spikes/plant in the two crosses and No. of kernels/spike and grain yield in the second cross under normal irrigation. These results would prove the presence of epistasis in such magnitude as to warrant great deal of attention in a breeding program.

Heritability in both broad and narrow senses and between generations (parent- offspring regression) are presented in Table (5).

High heritability values in broad sense were detected for all studied characters under both conditions and ranging from 94.53% to 78.17% (indicating that superior genotypes for these characters could be identified from the expression and illustrate the importance of straight forward phenotypic selection for the improvement of these traits) .However, these values for kernel weight in both crosses under drought conditions, where low broad sense heritabilities were detected and ranged from 13.44% to 49.09%.

Table 5 . Heritability and expected versus actual gain for from selection all studied characters in two crosses of bread wheat.

Character	Cross	Heritability				Parent offspring regression		Expected gain from selection							
		Broad sense		Narrow sense				GS		Ag% of F_2		GS		Ag% F_3	
		D	N	D	N	D	N	D	N	D	N	D	N	D	N
No. of spikes/plant	1	78.17	79.51	70.37	61.95	77.84	74.56	1.58	1.52	12.44	10.6	7.18	7.13	57.9	50.56
	2	80.63	90.87	67.61	65.25	76.87	76.29	1.61	1.72	14.12	12.54	7.4	7.94	66.01	60.6
No. of kernels/spike	1	93.14	87.08	57.52	55.16	70.1	72.12	23.04	25.78	38.14	39.00	10.97	12.38	18.25	19.28
	2	88.44	86.31	58.92	60.97	72.03	74.04	24.47	27.47	44.55	47.44	11.7	12.92	21.05	22.91
100-kernel weight (g)	1	13.44	80.82	63.16	59.02	73.73	74.32	1.74	1.68	38.95	32.12	0.81	0.80	18.12	15.44
	2	49.09	81.11	68.18	55.56	73.11	69.32	1.17	1.05	27.45	22.40	0.53	0.51	12.5	10.85
Grain yield/plant (g)	1	94.53	83.71	54.28	64.27	71.08	76.48	2.43	3.10	9.70	10.29	11.72	14.42	45.54	48.63
	2	88.99	86.14	44.14	51.75	65.62	69.68	19.47	24.10	85.38	86.14	9.70	11.71	43.90	41.90

Narrow-sense heritability estimates ranged from 44.14% for grain yield/plant in the second cross to 70.37% for No. of spikes/plant in the first one under drought and ranged from 51.75% for grain yield / plant in the second cross to 65.25% for No. of spikes/plant in the same cross under normal condition. The parent off-spring regression heritability was found to be moderate to high ranging from 65.62% to 77.84% under drought and from 67.32% to 76.48% under normal conditions.

The difference in magnitude of both broad and narrow sense and parent off-spring regression heritability estimates for all studied characters would ascertain the presence of both additive and non-additive gene effects in the inheritance of these characters. These results are in harmony with those obtained by Abdel-Nour and Moshref (2006), Tammam (2005), Abd-Allah *et al.* (2008) and Abdel-Nour and Hassan (2009).

Table (5) shows the predicted versus actual genetic gain from selection for all studied characters. The expected genetic advance (Ag% F_2) and actual genetic advance (Ag% F_3) ranged from low to moderate for all studied characters in both crosses under both drought and normal conditions ,except for kernel weight in all crosses where these values were low under both conditions. These results indicated the possibility of practicing selection in early segregation generations to enhance these characters and hence obtaining high yielding genotypes.

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 was associated with high genetic selection gain .

In General, most of the significant parameters resulted from all crosses were higher in magnitude under drought conditions, but results indicated that plants from (Sahal 1 x Gemmeiza 11) were the best to produce high yield under drought stress. Consequently, it could be concluded that both crosses would be of interest in a breeding program for genetic improvement of wheat under drought conditions.

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تحليل المحصول ومكوناته لهجينين من قمح الخبز تحت ظروف الاجهاد المائى

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أجرى هذا البحث فى محطة بحوث الجيزة فى ثلاثة مواسم من 2009/2008م إلى 2011/2010م ثم أجريت تجربة التقييم النهائي فى محطة البحوث الزراعية ببهتيم– محافظة القليوبية في الموسم الرابع 2012/2011 على هجينين من قمح الخبز، بتحليل العشائر الخمسة (الأبوان والأجيال الأول والثاني والثالث) لكل من الهجينين (ساحل × جميزة 11)، (جميزة 10× سدس 1) وكانت النتائج كما يلي : كانت قوة الهجين فى الجيل الأول بالنسبة للاب الافضل معنوية وموجبة لعدد السنابل في النبات ومحصول الحبوب في الهجين الثاني تحت ظروف الجفاف .وعدد السنابل فى النبات وعدد حبوب السنبلة ووزن الحبة ومحصول الحبوب للنبات في الهجين الأول وعدد حبوب السنبلة ومحصول الحبوب للنبات فى الهجين الثانى تحت ظروف الري العادي.
أوضحت الدراسة وجود سيادة فائقة تجاه الأب الأعلى في جميع الصفات ما عدا عدد السنابل في النبات ووزن مائة حبة في الهجين الاول تحت ظروف الجفاف .وعددالسنابل فى النبات وعدد حبوب السنبلة فى الهجين الثاني تحت ظروف الري العادي. كان تأثير التربية الداخلية موجباً ومعنوياً لصفتي وزن الحبة ومحصول الحبوب للهجينين تحت ظروف الجفاف والري العادي وكذلك عدد الحبوب فى السنبلة للهجينين في ظروف الرى العادي . أظهرت التأثيرات الوراثية المضيفة وكذلك الفعل الجيني غير المضيف دوراً هاماً في وراثة معظم الصفات المدروسة تحت ظروف الري العادي والجفاف . أظهرت كفاءة الوريث بمعناها الواسع قيماً عالية لمعظم الصفات فى كل من الهجينين ما عدا وزن الحبة فى كلا الهجينين تحت ظروف الجفاف وكذلك أعطت كفاءة التوريث بمعناها الضيق نفس القيم العالية ما عدا صفة محصول الحبوب فى النبات في الهجين الثاني تحت ظروف الجفاف وكذلك كانت قيم كفاءة التوريث بين الأجيال قيماً متوسطة فى معظم الصفات المدروسة(تحت الدراسة).

والخلاصة أنه يمكن الاستفادة من هذه الهجن فى برامج التربية للقمح للحصول على سلالات جيدة متفوقة عالية فى المحصول تحت ظروف الجفاف والري العادي. وكذلك الهجين (ساحل 1 × جميزة 11) يمكن الاستفادة به تحت ظروف الجفاف.