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GENE ACTION AND HERITABILITY ESTIMATES OF F3 WHEAT FAMILIES UNDER SALINE CONDITION AT RAS SUDR

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ABSTRACT: The F3 generation of fifthwheat crosses were used to estimate the type of gene action and heritability in broad and narrow sense for the growth characters , i.e plant height , number of tillers/plant, leaves dry weight and leaf area as well as leaves chemical contents i.e proline, K, Mg and SO4 in dry weight and yield and its components i.e number of spikes/plant , number of grains/spike, 1000 grain weight and grain yield/plant. The results indicated that, the dominance components played the major role in the inheritance of all growth characters except plant height, the additive was controlled one. The heritability in broad sense was ranged from 38.11 to 85.5% however, in narrow sense was ranged from 21.57 to 56.0% for all the studied growth characters. The $(H/D)^{05}$ was more than one for number of tillers/plant and leaves area meter. The dominance genetic variance accounted for proline in fresh leaves contents and the crosses second, third and fifth of Mg in dry leaves contents while, the additive genetic variance was played major controlling in K and SO_4 as well as the crosses number first and fourth in Mg Leaves dry contents. The heritability in broad sense was more than 53.1% for all the Leaves chemical contents while, narrow sense heritability was more 20.5% up to 51.1% The $(H_1/D)^{05}$ was more than one for proline and Mg content. Whereas, the ratio was less than unity for K and SO4 in Leaves contents. Dominance genetic variance estimated for all the studied characters of yield i.e number of grains /spike and grain yield as well as the first, second and fifth crosses for number of spikes/plant and 1000-grain weight except the third and fourth crosses the additive was controlled inheritance ones . The heritability in broad sense was

more than 50% for the all studied yield characters whereas , narrow sense heritability was ranged from 21.7 to 50.7% in this respect . The $(H_1/D)^{05}$ was more than unity for number of grains/spike, grain yield/plant and the first, second and fifth crosses for number of spikes/plant and 1000-grain weight the ratio was less than unity.

Keyword : Additive – dominance – variance – heritability – narrow - broad – selection – hybrid- saline – generation.

INTRODUTION

In the initial stages of breeding program breeders need general knowledge about gene action and genetic system controlling of studied characters. Estimation of additive(D) and dominance (H) genetic components depending on one generation does not allow testing their significance, thus leading to unambiguous tests for these components. To overcome this problem Mather and Jinks (1982) proposed a method called a multigenerational technique (Joint scaling test) which includes any combination of the parameters of mode gene action and tests the goodness fit of the controlled model. Many researchers used diallel technique to obtain genetical information about yield and its attributes characters. In this respect, additive gene effect was great importance to dominance controlled the genetic system for number of spikes/plant was noticed by Eissa (1989), AL-Kaddoussi (1996) and Awaad (1996). The importance of dominace gene effects for grains/spike was also reported by Eissa (1989) . But, Eissa and Alkaddoussi (1996) and Awaad (1996) found that additive gene effects accounted for the large part of the total variation for number of grains spike, In this respect, additive gene effects played a great role in the inheritance of 1000-grain weight Hassaballa *etal* (1984) and; AL-Kaddoussi *etal* , (1994)

For grain yield/plant, the additive gene effects were found to be the predominant type controlling this character. This result contradicted with those of Chatreath and Gupta (1986), Al-Kaddoussi (1996) and Hendawy *etal* (1998). However, information on heritability estimates are useful to formulate the exacted genetic gain from selection through segregating generation in wheat improvement program. Further , high heritability values, especially those estimated in narrow sense, indicate the effective of selection for characters improvement. Previous studies indicated that heritability values estimated for yield and its contributors are variable from low to high either in broad or narrow sense using different materials and methods. For, instance, high heritability values (over 50%) for grain yield /plant were reported by Ismail and El-Haddad (1978) and Kheiralla and Sherif (1992).While, moderate to low values were reported by Hassan (1993) .

The present investigation was under taken to obtain information about gene action of genetic system and heritability for growth and leaves chemical contents were measured at 90 days after sowing as well as grain yield / plant and its related characters in the segregating generations of fifth wheat crosses made among seven local and introduced wheat varieties were grown and irrigated by water salinity levels from 8000 up to 10000 ppm .

MATERIALS AND METHODS

This study was carried out at the Experimental Farm of Ras Sudr Station, South of Sinai Governorate, D.R.C. Egypt, during four successive seasons started in 1997/1998. Seven Parental genotypes of bread wheat *(Triticum aestivum.L)* with genetic variation and differences between of them . One parent is local cultivar, Sakha-8, the other parents genotypes are introduces from ICARDA. Namely ,code number and pedigree are presented in Table (1) .

Table (1): Pedigree and origin of the studied wheat genotypes

Parent	Pedigree	Origin
$S._8$	Indus 66 X Norteno (s) pk 3418-6_{s}-ISW.	Egypt
$IC._2$	SWMi2008-2AP .IAP-3AP-IAP-OAP.	Syria
$IC._4$	SWM1162515A-6AP-IAP-IAP-OAP .	Syria
$IC._5$	CM64335-3AP-IAP-4AP-OAP.	Mexico
$IC._7$	CM58924-IAP-4 AP-IAP-IAP-OAP .	Mexico
$IC._8$	CM58804-6AP-2 AP-IAP-IAP-IAP-OAP	Mexico

In 1997/1998 , the parents were grown in calcareous soil and irrigated by water salinity level 8000 ppm, fifth crosses were made among parents and designated as follows: cross 1(Sakha.8 × ICARDA-2), cross 2 (ICARDA – 4 × ICARDA-5), cross 3 (Sakha – 8 × ICARDA-7), cross 4

(ICARDA – 4 × ICARDA –2), and cross 5 (Sakha –8 × ICARDA-8). In 1998 / 1999, some F_1s heads were selfed to produce F2 grain. Thirty F3 families grains in each cross were handly sown in the first week of November 1999/2000.

A randomized complete block design with three replications was used. Each cross of F3 was allocated to each plot and consisted of 32 rows (30 rows for F3 families and one row of each parent). Row length was 3m long, row to row and plant to plant spacings were 15 and 5 cm, respectively.

In each season all the agricultural recommended practices were applied in the proper time and it was used in the new land and increasing levels of salinity in water irrigation from 8000 ppm with 1000 ppm every season and the selection for the plants under saline condition for the plant which of high yielding and some chemical contents were related to salinity tolerance.

Data recorded on 10 guarded plants in each family for the growth characters were measured at 90 days after sowing i.e plant height(cm), number of tillers/plant, leaves dry weight(gm)/plant and leaf area(cm^2) as well as analysis of leaves chemical contents in each of fresh and dry leaves i.e Proline(in fresh leaves), K, Mg and SO4 in leaves dry weight in the same age (90 DAS). At harvesting date, the data recorded on 10 guarded plants in each family for yield characters, i.e number of spikes / plant, number of grains / spike, 1000 – grain weight (gm) and grain yield / plant (gm).

Statistical procedure

1- Variance means of F3 families were estimated separately as outlined by Mather and Jinks (1982).
2- Partitioning of variance was calculated by solving the following equations (according to Mather and Jinks 1982):

$$\hat{\sigma}^2 F3 = \frac{1}{2} D + 1/16\ H + E$$

(genetic variance components for F3 means)

Where :

D=amount of Additive genetic variance
H=amount of dominance genetic variance
E=plant to plant environmental variance

3- Heritability in broad and narrow sense were calculated (according to Mather and Jinks 1982).

RESULTS AND DISCUSSION

Growth character

Separation out the total genetic variance to its mean items additive (D) and dominance (H) gene effects using diallel analysis method was performed for the most important growth character appeared to be more associated with yield and its attributes i.e plant height , number of tillers/ plant , leaves dry weight and leaf area were measured at 90 days after sowing . Also , estimate of leaves chemical content in the same age (90 DAS) and its content related and associated with salinity tolerance when it irrigated and grown under saline condition i.e proline , K ,Mg, and SO4 in leaves fresh or dry weight . As well as the genetic components of variance were computed for wheat yield and its attributes .

Partitioning of genetic variance into additive (D), dominance (H) and , environmental effects (E) as well as heritability in broad and narrow sense shown in tables (2,3and4) for F3 families . Since variances were estimated negative will be considered as zero .

The relative contribution of additive dominance gene effects and heritability in broad and narrow sense for wheat growth characters were measured at 90 days after sowing are shown in Table (2). The results revealed that , dominance genetic variance was significant and larger than the corresponding additive ones in all studied growth characters, except plant height for all the wheat crosses families , indicated that the dominance component played the major role in the inheritance of number of tillers/plant, leaves dry weight/plant and leaf area. While , the additive component played the major role in the inheritance of plant height. Thus, superior genotypes could be identified from its phenotypic expression in this character only and this was true in all crosses of wheat.

The environmental component (E) was insignificant in plant height only . However , the other wheat growth characters i.e number of tillers/plant , leaves dry weight and leaf area was larger and significantly influenced by the environment fluctuations , this result was appeared the effect of irrigation water salinity on the studied growth characters for all the wheat crosses families .

Heritability estimates for growth characters varied greatly from cross to another and from character to character and tended

Table (2) : Additive (D) , dominance (H) , Environmental and heritability in broad and narrow sense of F3families for some growth characters of wheat crosses measured at 90 days after sowing .

component	CROSSES				
	1	2	3	4	5
	ICARDA 2 X Sakha. 8	ICARDA 4 X ICARDA 5	Sakha 8 X ICARDA 7	ICARDA 4 X ICARDA 2	ICARDA 8 X Sakha 8
	Plant height / cm				
D ± S.E	15.67 * ± 6.27*	13.3* ± 5.32	-12.05 ± 4.82	7.06 ± 2.82	2.747 ± 1.11
H ± S.E	-28.94 ** ± 11.58	-27.00** ± 10.8	-25.53* ± 10.2	-14.13* ± 5.65	-13.81 ± 5.52
E ± S.E	7.53 ± 3.01	4.75 ± 109	6.81 ± 2.72	18.17 ± 7.27	16.16 ± 6.46
Hb + S.E	84.86** ± 33.9	73.5 ** ± 29.4	78.11 ** ± 31.24	57.11 * ± 22.84	53.15 ± 21.26
Hn + S.E	36.17 * ± 14.49	28.7 ± 11.48	35.8 * ± 14.32	28.7 ± 11.48	21.57 + 8.63
H / D	0.00	0.00	0.00	0.00	0.00
Number of tillers / Plant					
D ± S.E	4.44 ± 1.46	3.76 ± 1.68	1.18 ± 0.48	3.98 ± 1.59	0.98 ± 0.39
H ± S.E	7.63 ± 3.00	6.22 ± 3.10	10.27 ± 4.11	9.13 ± 3.65	-10.41 ± 4.16
E ± S.E	14.71* ± 5.88	16.88* ± 751	21.20** ± 8.48	11.75 * ± 4.70	8.91 ± 3.56
Hb ± S.E	54.4 * ± 21.71	51.71 * ± 12.45	67.0 ** ± 21.51	57.9 ** ± 21.16	67.1 ** ± 26.80
Hn ± S.E	24.6 ± 10.70	31.5 * ± 7.61	24.7 ± 9.88	28.8 * ± 11.52	36.7 * ± 14.68
H / D	1.72	1.65	10.05	2.29	0.00
Leaves dry weight					
D ± S.E	17.5 ± 6.31	32.5 ** ± 9.41	32.28** ± 14.44	44.8** ± 17.87	27.41 * ± 11.22
H ± S.E	76.4 ** ± 16.7	62.2 * ± 16.88	61.51 * ± 19.48	54.1 ± 20.81	62.41 * ± 18.81
E ± S.E	28.1 ** ± 7.81	20.9 * ± 7.46	17.17* ± 7.77	24.7 * ± 10.10	21.11 * ± 9.91
Hb ± S.E	77.8 * ± 22.4	68.81 ± 18.71	80.0 ** ± 30.51	65.8 ± 14.74	66.9 ± 16.16
Hn ± S.E	41.5 ± 11.45	45.51 ± 14.41	50.0 * ± 18.81	56.**0016.00	41.7 ± 11.51
H / D	4.36	2.65	1.91	1.21	2.27
Leaf area meter/ cm2					
D ± S.E	28.0 ± 11.35	34.0 ± 15.16	39.41* ± 16.17	48.41** ± 19.36	41.91* ± 16.76
H ± S.E	-32.1 ± 14.57	42.14* ± 20.7	53.41** ± 21.8	51.61 ** ± 20.64	50.94 ** ± 20.38
E ± S.E	8.41 ± 3.87	17.16 * ± 8.17	20.45 * ± 8.88	31.11 ** ± 12.44	14.81 ± 5.92
Hb ± S.E	76.7 * ± 31.50 .	80.7 * 40 .15	85.48 * 41.50	78.51 * ± 31.4	66.7 ± 26.68
Bn ± S.E	40.5 * ± 18.11	44.6 * ± 18.71	50.71 ** ± 25.01	30.81 ± 12.32	40.3 * ± 16.12
H1 / D	0.00	1.24	1.36	1.35	1.22

D= amount of additive genetic variance . H= amount of dominance genetic variance
E= plant to plant environmental variance . S.E= Standard Errore .
Hb and Hn = Heritability in broad narrow sense .

to be increased above from 50% and larger than in broad sense in all characters of growth and all crosses families . The values of heritability in broad sense were ranged from 53.15 to 84.84% for plant height , 51.71 to 67.1% for number of tillers/plant from 65.8 to 77.8% for leaves dry weight as well as 66.7 to 85.48% for leaf area in F3 wheat families. The values of heritability in narrow sense were ranged from 21.57 to 36.17% for plant height , 24.6 to 36.7 for number of tillers/plant ranged from 41.5 to 56.0% for leaves dry weight as well as 30.81 to 50.71% for leaf area in F3 generation . Thus, improving these growth characters measured at 90 DAS could be achieved through straight forward current hybridization in the following generation due to the accumulate the additive gene effect and could not depends on the phenotypice for selection in F3 generation under saline condition at 90 days after sowing .

The obtained results indicated that the $(H/D)^{05}$ degree was higher than the unity for all the studied growth characters and all the wheat crosses and this result stated that the dominance gene action was major effect and controlling these characters, except plant height. In the studied wheat crosses, over dominance gene effects played an important role in the genetic control of these growth characters. Hybrid breeding method would be an effective procedure for improving these characters.

Leaves chemical contents

Data presented in Table (3) show additive (D),dominance(H) enviro-nmental (E) components and heritability in broad and narrow sense, for leaves chemical contents each of fresh and dry weight measured at 90 days after sowing . The results indicated that the dominance genetic variance were significant for proline (ppm) in fresh leaves content and Mg (ppm) in dry leaves content , while the additive gene effect was significant for K (ppm) and SO4 (ppm) in dry leaves in age about 90 DAS. The results revealed that additive genetic variance was the main component controlled the leaves chemical contents from K and SO4 indicating that improving the wheat plants under saline condition (soil or water) could be achieved through straight forward phenotypic selection for content of leaves from K and SO4 which measured at 90 DAS for F3

Table (3) : Additive (D) , dominance (H) , Environmental and heritability in broad and narrow sense of F3families for leaves chemical contents of wheat crosses plant measured at 90 days after sowing .

Component	CROSSES				
	1	2	3	4	5
	ICARDA 2 X Sakha. 8	ICARDA 4 X ICARDA 5	Sakha 8 X ICARDA 7	ICARDA 4 X ICARDA 2	ICARDA 8 X Sakha 8
	Proline content in leaves fresh weight ppm				
D ± S.E	144.8* ± 57.64	148.9* ± 59.56	196.0 ** ± 78.1	204.0** ± 81.61	111.4 ± 44.4
H ± S.E	1211.4** ± 48.46	114.7.0** ± 45.88	894.0* ± 344.1	1061.0 ** ± 424.4	1118.1** ± 447.5
E ± S.E	115.1* ± 14.51	98.7 * ± 39.48	109.7 * ± 43.88	119.6 * ± 47.6	84.7 * ± 33.88
Hb + S.E	55.3 ± 22.01	54.3 ± 21.72	53.1 ± 21.24	61.4 * ± 24.56	64.4 * ± 25.6
Hn + S.E	32.4 ± 12.85	36.4 ± 14.56	39.7 * ± 15.88	46.4 * ± 18.56	28.8 ± 11.52
H / D	8.409	7.703	4.561	5.200	10.036
	Potassium (K) content in Leaves dry weight- ppm				
D ± S.E	444.8** ± 177.6	418.8** ± 167.5	376.8* ± 150.4	216.7 ± 86.4	230.4 ± 92.0
H ± S.E	177.6* ± 70.8	109.8 ± 43.6	140.4 ± 56.00	167.5 * ± 67.0	167.3* ± 66.9
E ± S.E	67.5 ± 26.8	81.1 * 32.44	110.0 * ± 44.00	58.7 ± 23.51	61.7 ± 24.68
Hb ± S.E	71.5 ** ± 28.6	66.6 * ± 26.4	61.4 * ± 24.4	75.1 ** ± 30.04	68.7 * ± 27.48
Hn ± S.E	50.1 * ± 20.0	41.4 * ± 16.56	45.7 * ± 18.28	48.1 * ± 19.24	40.1 * ± 16.04
H / D	0.411	0.262	0.373	0.733	0.684
	Magnesium (Mg) contents in leaves dry weight – ppm				
D ± S.E	104.5 ± 41.6	117.7 ± 46.85	130.6 * ± 52.24	167.7 ** ± 66.8	156.6** ± 62.4
H ± S.E	-445.9 ± 178.9	319.8 * ± 17.81	299.7 ** ± 119.88	-311.7 ± 1320	410.8 ** ± 164.32
E ± S.E	15.0 ± 6.00	9.8 ± 3.92	21.7 ** ± 8.68	7.6 ± 3.04	24.8 ** ± 9.92
Hb ± S.E	71.6 * ± 28.64	61.5* ± 24.6	66.5 * ± 26.60	67.1 * ± 26.84	71.3 * ± 28.52
Bn ± S.E	20.5 ± 8.2	49.7 ± 19.88	31.0 ± 12.4	51.1 ± 20.44	30.7 ± 12.28
D / H	0.00	2.717	2.295	0.00	1.998
	Sulfate (SO4) contents in leaves dry weight- ppm				
D ± S.E	1478.7* ± 591.2	1351.6 * ± 540.64	1211.7 * ± 484.4	917.6 ± 367.04	817.6 ± 326.0
H ± S.E	-448.7 ± 179.2	517.6 * ± 20.70	610.7 * ± 244.1	461.5 ± 184.6	555.1* ± 222.0
E ± S.E	74.8 * ± 29.92	56.7 * ± 21.70	41.5 * ± 16.6	11.7.5 ± 4.68	17.8 ± 712
Hb ± S.E	61.4 ± 24.56	57.1 ± 23.11	60.3 ± 24.12	63.1* ± 25.24	65.6 * ± 26.26
Bn ± S.E	50.7 * ± 20.28	45.7 ± 21.6	44.7 ± 17.60	50.7 * ± 20.28	49.5 * ± 19.80
H1 / D	0.00	0.383	0.504	0.503	0.678

D= amount of additive genetic variance . H= amount of dominance genetic variance
E= plant to plant environmental variance . S.E= Standard Errore .
Hb and Hn = Heritability in broad narrow sense .

generation. The result confirmed to the accumulation of additive gene effects in these characters under saline condition .

The environmental variances were significant for the studied characters of leaves chemical contents i.e proline , K, and SO4 in first, second and third crosses only. While, Mg content in leaves was not significant for the three crosse. The environmental variance for SO4 content was not significant for the fourth and fifth crosses.

In the F3 generation, heritability in broad sense were ranged from 53.1 to 64.4% for proline content, from 61.4 to75.1% for K content from 61.5 to71.6% for Mg content as wall as from 57.1 to 65.6% for SO4 content indicating the effectiveness of selection among families in these crosses. Heritability in narrow sense were ranged from 28.8 to 46.4% for proline content , from 40.1 to 50.1% for K, from 20.5 to 51.1% for Mg, from 44.7 to 50.7% for SO4. It is interesting to mention that heritability values in the studied crosses for leaves chemical contents under saline condition were significant and may indicate that the complex genetic model played a great role in the inheritance of leaves chemical contents condition .

Concerning the drive parameter $(H/D)^{05}$ were more than unit for proline content in fresh leaves of wheat plant and Mg (ppm) content in leaves dry weight. These results indicates that dominance gene effect was controlled and played an important role in the genetic of proline and Mg (ppm) in leaves. While, additive gene effects played an important role in the genetic control for K and SO4, which the ratio $(H/D)^{05}$ were less than unity. Thus, the breeder of wheat under saline condition could be using the selection in F3 generation for K^{+} and SO4 in leaves chemical contents after 90 DAS.

Generally, it could be concluded that the genetic variance and improving wheat plants under irrigation water salinity level more than 8000 (ppm) using the selection method in F3generation for K and SO4 in wheat leaves chemical contents measured at 90 DAS .

Yield and its Attributes

1- Number of spikes/plant

The relative contribution of additive (D), dominance (H), environmental (E) and heritability in broad and narrow sense were

Table (4) : Additive (D) , dominance (H) , Environmental (E) and Heritability in broad and narrow sense of F3families for yield and its attributes of wheat crosses at harvesting .

Components	CROSSES date				
	1	2	3	4	5
	ICARDA 2 × Sakha 8	ICARDA 4 × ICARDA 5	Sakha 8 × ICARDA 7	ICARDA 4 × ICARDA 2	ICARDA 8 × Sakha 8
	Number of spikes / plant				
D ± S.E	8.59 ± 3.44	11.81 ± 4.72	39.88* ± 15.95	28.81* ± 11.52	38.74 * ± 15.49
H ± S.E	14.88 ± 6.51	18.75 ± 7.50	36.88 ** ± 14.75	19.98 ± 7.99	47.61 ** ± 18.86
E ± S.E	2.31 ± 0.94	5.31 ± 2.41	12.51 * ± 5.00	10.57 * ± 4.28	11.66 * ± 4.66
Hb + S.E	50.1 * ± 20.61	48.7 * ± 19.48	57.1 * ± 22.84	53.1 * ± 21.24	60.00 * ± 24.0
Hn + S.E	39.6 ± 15.84	29.5 ± 11.8	50.7 * ± 20.0	33.4 ± 13.36	29.10 ± 11.64
H / D	1.732	1.58.7	0.925	0.694	1.217
Number of grains / spike					
D ± S.E	73.1 * ± 29.24	64.6 ± 25.84	45.7 ± 18.28	70.8 * ± 28.32	94.81 ** ± 37.94
H ± S.E	346.0 ** ± 144.0	171.1 ± 68.4	120.5 ± 48.2	311.6 ** ± 124.4	320.1 ** ± 123.00
E ± S.E	14.7 * ± 5.88	30.0** ± 12.0	13.5* ± 5.4	37.0 ± 14.8	30.5 ± 12.20
Hb ± S.E	61.5 ± 24.6	55.1 ± 22.55	54.7 ± 21.88	64.7 ± 25.88	71.1 * ± 28.44
Hn ± S.E	22.7 ± 9.08	36.7 * ± 14.68	38.1 * ± 15.24	28.8 ± 12.41	31.6 ± 12.64
H / D	4.733	2.655	2.05	4.401	3.376
1000 – grain weight / gm					
D ± S.E	111.7** ± 44.68	42.6 ± 17.04	66.5 * ± 26.6	39.8 ± 15.92	28.5 ± 11.4
H ± S.E	251.4** ± 100.4	340.7* ± 136.28	44.5 ± 17.8	31.6 ± 12.64	86.1 ± 11.4
E ± S.E	15.7 ± 6.28	10.4 ± 4.16	12.5 ± 5.0	10.6 ± 4.24	7.3 ± 2.92
Hb ± S.E	61.2 ± 24.48	63.4 ± 23.36	70.1 ± 28.08	63.3 ± 25.32	51.3 ± 20.52
Hn ± S.E	30.5 ± 12.2	29.8 ± 11.92	50.7 ± 20.28	40.5 ± 16.2	34.1 ± 13.64
H / D	2.251	7.997	0.669	0.794	3.021
Grain yield / plant – gm					
D ± S.E	19.7 ± 7.88	10.7 ± 4.28	16.7 ± 6.68	10.31 ± 4.12	15.7 ± 6.28
H ± S.E	38.1 * ± 15.24	17.7 ± 7.08	30.1* ± 12.04	63.4 ** ± 16.91	49.2 * ± 19.68
E ± S.E	8.3 ± 3.32	5.7 ± 2.28	8.4 ± 3.36	4.8 ± 1.92	5.3 ± 2.12
Hb ± S.E	59.4 * ± 23.76	51.3 ± 20.52	56.1 ± 22.44	60.3 * ± 24.12	48.1 ± 19.24
Bn ± S.E	31.3 * ± 12.52	26.3 ± 10.52	30.8 * ± 12.32	30.1 * ± 12.04	21.7 ± 8.68
D / H	1.949	1.654	1.802	6.149	3.144

D= amount of additive genetic variance . H= amount of dominance genetic variance .E= plant to plant environmental variance . S.E= Standard Errore .
Hb and Hn = Heritability in broad narrow sense .

shown in Table (4) . The results indicated that the dominance component (H) was significant and larger in magnitude than the corresponding additive one in the first, second and fifth crosses, resulting in an average degree $(H/D)^{05}$ of dominance more than unity , suggesting that non fixable genes could be exploited efficiently through hybrid breeding method for improving number of spikes/plant. While , the crosses number third (Sakha-8 × ICARDA-7) and cross fourth (ICARDA-4 × ICARDA-2) additive gene effect was controlled inheritance of number of spikes/plant under saline condition . Thus, it would be using the pedigree selection method in F3 generation to improving wheat in this respect. In this connection, overdominance accounted for the most part of the genetic variation in spikes number/plant AL-kaddoussi and Eissa (1990) and Iskandar (1999) .

The environmental component (E) was significant in the third, fourth and fifth crosses, suggesting that number of spikes/plant was greatly affected by environments. The environmental effect for the number of spikes/plant of the first and second crosses of wheat was not reached the significant level.

The heritabitity values in narrow and broad sense were nearly in all the crosses under this study. The heritability was ranged from48.7 to 60.0% for broad sense and from 29.1 to 50.7% for the narrow sense in F3 generation. Thus, improving these characters under saline condition could be reached by using both selection and hybridization in the follow generation. These results were confirmed those recorded by Eissa and Awaad (1993), El-Marakby *etal* (1994), Iskandar (1999) and Salama (2000).

2-Number of grains /spike

In the F3 generation, dominance variance was the main component controlling this character in the all studied crosses, and the dominance genetic component was greater than the corresponding additive one. Thus, data in Table (4) show the importance of overdominance gene effects in the genetic control of wheat grains number/spike. So, the drive prameter $(H/D)^{05}$ was more than the unity and this was indicated that number of grains /spike greater than by salinity as the environmental effects. The environmental component (E) was significant for the studied crosses. Similar results were reported by

Kheiralla and Sherif (1992), Eissa and Awaad (1993) El-Marakby *etal* (1994), Iskandar (1999).

The heritability values in broad sense were ranged from 54.7 to71.1%. While, the heritability values in narrow sense were ranged from 22.7 to 38.1% to these results indicating the accumulation of dominance gene effects from the F3 generation. Thus, improving this characters could be achieved through hybridization in the following generation and this was true in all the wheat studied crosses under water irrigation salinity. These results are opposite by those reported by Eissa and Awaad (1993).

3- Thousand grain weight

In the F3 generation, the genetic variance was due to dominance for the first and second as well as fifth crosses. While, the genetic variance was due to additive for the third and fourth crosses, resulting in $(H/D)^{05}$ was more than unity for the first, second and fifth crosses. Drived parameter $(H/D)^{05}$ was less than unity for the third and fourth crosses and this indicating the important role of overdominance gene effects. In the third and fourth crosses, the additive genetic component was the prevailed type in 1000-grain weight indicating that phenotypic selection could be effective to be used for improving 1000-grain weight. These results are in agreement with those reported by Kheiralla and Sherif (1992), Eissa and Awaad (1993).

The environmental component (E) was not reached the significant level and this was true in all the studied wheat crosses, indicating that 1000-grain weight was lowly affected by increasing water salinity as the environment at fluctuations. These results differed with those reported by Pawar *etal* (1988) and Eissa and Awaad (1993) as well as Iskander (1999).

Heritability estimates in broad sense (H_b) ranged from low (51.3%) for the fifth cross to (70.1%) for the third cross and this value for the third cross indicating accumulation of additive gene effects.While,heritability estimates in narrow sense (H_n) ranged from, low (29.8%) for the second cross to moderate (50.7%) for the third cross. These results showed the variance between the values of heritability in broad and narrow sense in the third and fourth crosses and this meaning the decrease of environmental effect on this character, so it could be using the selection method to improving 1000-grain weight under saline condition. These results are in harmony with those obtained by Kheiralla and Sherif (1992)and Eissa and Awaad (1993)

4- Grain yield/plant (gm)

Result of D,H and E for grain yield/plant are presented in Table(4) indicated that, the dominance components (H) was found to be significant and larger in magnitude than the corresponding additive one for all the wheat studied crosses and this indicated that overdominance gene effects was controlled in grain yield/plant of wheat under saline condition . Improving grain yield /plant by current hybrid method is considered effective under saline condition and the selection method was not succeeded.

The environmental component (E) was insignificant for all the studied crosses and this result showed clearly that grain yield is quantitatively inherited character and influenced by the environmental condition but not reached the level of significance. Opposite results were previous obtained by Iqbal Singh *etal* (1989) as well as Eissa and Awaad (1993).

In the F3 generation, the genetic variances were due to dominance in all the studied wheat crosses. Heritability in broad sense estimates were ranged from (48.1%) in the fifth cross to (60.3%) in the fourth cross. While, the heritability in narrow sense estimates were ranged from (21.7%) in the fifth cross to (31.3%) in the first cross. The differences between values of heritability in broad and narrow sense for grain yield/plant of wheat under saline condition was revealed that the selection method was not effective to improving this character. The dominance gene effects were controlled and larger than the additive ones, so it could be recommended for using the hybrid method in improving this character . These results are in agreement with those obtained by Afiah and Abdel-Sattar(1998), AL-Kaddoussi *etal* (1994), Eissa (1993), and EL-Marakby *etal* (1994).

Data in Table (4) indicated that the ratio of (H/D) mean degree of dominance is more than the unity in all the studied wheat crosses for grain yield and this confirmed the above mentioned before. The dominance gene effect was found and highly important and controlling inheritance of grain yield/plant. Thus, the continuous of hybrid for the following generation in wheat crosses was succeeded in improving the wheat plant under saline condition and it could be using some selection criteria for the salt tolerance i.e proline, K and SO_4 in leaves chemical contents as well as the plant height in growth stage as the indicator for selection Indices under saline condition and the program of selection was continuous in the following generations .

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تقدير الفعل الجينى ودرجة التوريث لبعض عائلات الجيل الثالث لقمح الخبز تحت ظروف الملوحة برأس سدر

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أجـريت هـذه الدراسـة بمحطـة بحـوث رأس سـدر جـنوب سـيناء خـلال الموسم الزراعى ١٩٩٨/٩٧، ١٩٩٩/٩٨، ٩٩/٢٠٠٠ وذلـك بهدف معرفة الفعل الجينى ودرجة التوريث لبعض صفات النمو والمحتوى الكيميائي للأوراق عند عمر ٩٠ يوم من الزراعة وكذلك محصول الحبوب وبعض مكوناته وذلك فى عائلات الجيل الثالث الإنعزالي لخمس هجن من قمح الخبز وكانت أهم النتائج ما يلي :-

١- *صفات النمو:* كان المكون الوراثي السيادى هو الأكثر تحكماً فى وراثة صفات النمو المدروسة ما عدا صفة إرتفاع النبات حيث كان المكون الوراثي المضيف هو الأكثر أهمية فى وراثة الصفة

- كانت درجة التوريث بالمعنى الواسع لصفات النمو تتراوح بين ٣٨,١١ إلى ٨٥,٥ % بينما كانت درجة الـتوريث بالمعـنى الضـيق لنفس الصفات وعند نفس العمر تتراوح من ٢١,٥٧ إلى ٥٦% لجميع الصفات تحت الدراسة .
- كـانت نسبة (H/D) عند مستوى ٠,٥ % للصفات عدد الأفرع للنبات ومساحة الورقة أكثر من الواحد الصحيح بالمقارنة بصفات إرتفاع النبات و الوزن الجاف للأوراق عند نفس العمر .

٢- *محـتوى الأوراق الكيمـاوى:* كـان المكون الوراثي السيادى هو الأكثر أهمية فى توريث صفة محتوى أوراق النبات الخضراء من البرولين وأيضاً محتوى الأوراق الجافة من الماغنسيوم للهجن الثاني والثالث والخامس فقط بينما كان المكون الوراثي المضيف هو الأكثر أهمية في توريث صفتي محتوى الأوراق من البوتاسيوم والكبريتات وأيضاً الهجين الأول والرابع لصفة محتوى الأوراق من الماغنسيوم .

- كانت درجة التوريث بالمعنى الواسع لصفات محتوى الأوراق الكيماوى سواء الخضراء أو الجافة أكثر من ٥٣,١ % بينما كانت درجة التوريث بالمعنى الضيق لنفس الصفات اكثر من ٢٠,٥ %وحتى ٥٤,١ %
- كانت نسبة (H/D) لصفتي البرولين والماغنسيوم أكثر من الواحد الصحيح بينما كانت أقل من الواحد لصفتي محتوى الأوراق من البوتاسيوم والكبريتات .

٣- *صـفات محصول الحبوب ومكوناته:-* كان المكون الوراثي السيادى هو المتحكم في توريث صفتي عدد حـبوب السنبلة ومحصول الحبوب / نبات وأيضاً الهجين الأول والثاني والخامس لصفة عدد السنابل / نـبات و وزن ١٠٠٠ حبة ما عدا الهجين الثالث والرابع كان المكون الوراثي المضيف هو المتحكم فى توريث هذه الصفات .

- كـانت درجة التوريث بالمعنى العريض أكثر من ٥٠ % لجميع صفات المحصول ومكوناته المدروسة بينما كانت درجة التوريث بالمعنى الضيق أكثر من ٢١,٧% حتى ٥٠,٧ % .
- كانت نسبة (H/D) أكثر من الواحد الصحيح للصفات عدد الحبوب / السنبلة ومحصول حبوب /نبات وكذلـك الهجين الأول والثاني والخامس لصفة عدد السنابل للنبات بينما صفة وزن الألف حبة مع باقي الهجن لصفة محصول الحبوب/ نبات كانت النسبة أقل من الواحد الصحيح .