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EVALUATION OF SOME WHEAT CULTIVARS UNDER TWO LEVELS OF IRRIGATION WATER SALINITY IN CALCAREOUS SOILS, SOUTH SINAI

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ABSTRACT: Field experiments were carried out in Ras Sudr Research Station, Desert Research Center (South Sinai Governorate, Egypt) during 1998/1999 and 1999/2000 winter growing seasons to evaluate six bread wheat cultivars (Sakha 8, Sakha 69, Giza 155, Giza 157, Gemmeiza 1 and Gemmeiza 3) under two salinity levels of irrigation water (4000 and 8000 ppm) in calcareous soils.

Data of growth recorded at 90 days after sowing cleared that raising level of irrigation water salinity greatly decreased each of plant height, number of tillers /plant, number of leaves /plant and leaf area /plant but, increased leaves dry weight /plant. Also, at harvest, yield and its components were decreased due to raising level of irrigation water salinity.

Generally, results pointed to the relative growth vigor for Sakha 8 cv compared with the two Giza cvs. Also, under low level of irrigation water salinity, results showed the superiority of Sakha 8 in yield components except grain numbers /spike, where, Sakha 69 was at par with Sakha 8 in this character. However, there were great differences among the tested cvs in the magnitude decrease of each yield component due to raising irrigation water salinity level. Hence, with the raise in irrigation water salinity level, the two cvs of each of Gemmeiza and Sakha bore similar grain numbers /spike and both Sakha cultivars had similar grain weight/ spike.

Yet, under low level of irrigation water salinity, Sakha 8 secured the highest grain and straw yields followed by Sakha 69 whereas, the two Giza cvs recorded the lowest grain yields. While, under high level of irrigation water salinity, differences between the two Sakha cvs in grain yield was not significant but, Sakha 8 cv outyielded the other five ones.

Key words: irrigation water salinity, underground water, calcareous soils.

INTRODUCTION

The Egyptian policy aims to increase cultivated area under wheat as well as to increase the productivity per area unit for reducing the gap between wheat production and consumption. Therefore, wheat cultivation should be extended in more areas particularly in the newly reclaimed lands. The strategy seeks this expansion in Sinai where an area of about 0.6 million faddans is proposed to be cultivated with relatively low quality irrigation water through El-Salam canal (Gomaa, 1992).

Many of the reclaimed areas have poor productivity due to its irrigation with underground saline water. The total production of wheat for these areas can be improved by introducing high yielding varieties that show high adaptability to such stress conditions.

Salinity is one of the biotic stress factors that reduce the value and productivity of considerable area in many arid and semi-arid regions of the world, as well as is considered as the major limitation on growth and yield of many crop plants in these regions (Cheesman, 1988). Crop plants differ in salt tolerance exist not only among different genera and species, but even within a species which may be considered salt sensitive (Epstein *et. al.*, 1980). However, salinity has an inhibitory effect on growth, yield and yield attributes of many crops in differentially responses (Perez-Alfoced *et al.*, 1993). Also, adverse effects on yield and its components of wheat were observed in different wheat cultivars grown under saline soil conditions (Naire and Khuble, 1990). On the other hand, Ceccarelli et al. (1987) reported that a high yield potential under favorable conditions is not an efficient selection criterion to identify the higher yielding material for stress conditions. Under calcareous soil conditions in Ras Sudr, Sallam and Afiah (1998) showed that the genotypes of wheat were significantly affected by underground saline water in all their traits except 1000-grain weight and harvest index. Under high salinity level of irrigation water (8000 ppm), they found that some new lines and some Sakha and Gemmeiza cultivars had relatively the highest grain yield. However, significant differences in yield and yield components of Egyptian wheat cultivars were reported by Nigem and Eissa (1988), Bassiouny *et al.* (1993), Kishk *et al.* (1994), Hassan and Bassiouny (1995), Abo-Warda

(1997), Khattab (1998) and Hassan and Gaballah (1999).

The main objective of the present investigation is to evaluate yield and yield components of six bread wheat cultivars under two salinity levels of underground water at Wadi Sudr, south of Sinai.

MATERIALS AND METHODS

Four field experiments were carried out in Ras Sudr Research Station, Desert Research Center at South Sinai Governorate, Egypt during the two winter growing seasons of 1998/99 and 1999/2000. This study aimed to define the most productive bread wheat cultivar among the tested six ones (Sakha 8, Sakha 69, Giza 155, Giza 157, Gemmeiza 1 and Gemmeiza 3) when grown in calcareous soil under two salinity levels of underground water used in irrigation (4000 and 8000 ppm). The tested wheat cultivars were evaluated under each level of water salinity in separate experiment every season. Complete block design with three replicates was used. Soil and underground water chemical analyses are presented in Table 1 and 2, respectively. In both seasons, the soil was fallow during the summer season. The sowing date was November 15 in both seasons. Where, seeds at rate of 75 Kg / fed were drilled in rows distanced at 15 cm apart with 5 m length. Each plot included 20 rows i.e. the plot area was 15 m^2. Triple phosphate (37.5 % P_2O_5) and potassium sulphate (50 % K_2O) at rate of 50 Kg/ fed for each were added before sowing. Also, nitrogen as ammonium nitrate (33.5 % N) was added at the rate of 100 Kg /fed in four equal doses at sowing, tillering, elongation and boating stages. Harvest was made on April 25 in both seasons. Other cultural practices were applied as usual in wheat fields under calcareous soil conditions.

To show the effect of irrigation water salinity level on growth traits for the tested cultivars, vegetative sample of 10 competitive tagged plants were taken at 90 days after sowing from the 2nd pair rows for each plot. The individual plants were used to measure the following traits: 1) plant height, 2) number of leaves/ plant, 3) number of tillers/ plant, 4) leaf dry weight and 5) leaf area/ plant.

Also, at harvest, 10 competitive tagged plants were taken from the fourth inner row of each plot to count number of spikes/ plant and number of grains/

Table 1. Soil chemical analysis of the experimental fields in the 1998/99 and 1999/2000 seasons.

Season	EC^+ mmhos/cm	Ph	Ca CO_3 (%)	Available N, P, K, Ca and Mg (ppm)					Organic matter (%)	SAR* (%)
				N	P	K	Ca	Mg		
98/1999	7.8	7.31	22.0	3.01	1.81	6.09	18.5	1.0	0.5	13.9
99/2000	8.4	7.41	22.7	3.04	1.84	7.00	19.0	1.1	0.6	14.0

EC^+: electric conductivity measured as dS /m "decisiemens/ m i.e. m mhos/ cm/ 25 C°".
SAR*: sodium adsorption ratio.

Table 2. Average chemical analysis of underground irrigation water at Wadi Sudr averaged over the two growing seasons for two levels of salinity.

Salinity level	Ph	T.D.S (ppm)	Cations (mg/L)				Anions (mg/L)		
			Ca^{++}	Mg^{++}	Na^+	K^+	HCO_3^-	Cl^-	$SO_4^=$
Low	7.5	4128	7.4	7.8	18.9	0.51	34.7	1.7	1.9
High	7.8	8192	11.7	12.7	34.1	0.91	51.5	2.2	3.6

spike. Meantime, an area of 3 m^2 was harvested from the middle 10 rows of each plot to determine number of spikes/ m^2, 1000-grain weight, grain and straw yields per m^2 and per faddan.

The obtained data were subjected to standard analysis of variance for randomized complete block design (Snedecor and Cochran, 1967). Duncan multiple range test was used to compare means as described by Steel and Torrie, 1960.

RESULTS AND DISCUSSION

A. Growth:

Data in Table 3 show the effect of irrigation water salinity levels on some growth traits for the tested wheat cultivars, recorded at 90 days after sowing.

A.1. Effect of increasing level of irrigation water salinity (IWS):

Data of Table (3) show growth parameters went on decreasing due to increasing salinity level of irrigation water from 4000 to 8000 ppm except that of the dry weight of leaves. The magnitudes of reduction differed from trait to another. The highest reduction was observed with number of tillers/ plant, which accounted to 29.4 and 21.1 in the first and second season, respectively. The least reduction was occurred with plant height.

There was significant reduction in leaf area/ plant, but increasing the level of irrigation water salinity increased the leaf dry weight of plant. This means that subjecting the wheat plant to more stress by increasing irrigation water salinity level, the plant produced more thicked leaves. Wardlaw (1967) observed also more thicked leaves of wheat due to water stress. The reductions in these growth characters were resulted from the decreases in net photosynthesis, stomatal conductance and transpiration rate when wheat plants were subjected to water stress conditions. This was explained by Abd El-Raheem *et al* (1997).

A.2. Cultivars effect:

Under the low level of IWS, results of the two seasons indicated that Sakha 8 cv had the tallest plants followed by Sakha 69 one then Gemmeiza two cvs followed by Giza two cvs at par. This was also the same under high level of IWS but with one exception in each season. Where, there were no significant differences in plant height among Giza 157 and the

Table 3. Effect of irrigation water salinity level on growth traits for some wheat cultivars in 1998/99 and 1999/2000 growing seasons.

Main effects	Plant height (cm)		No. of tillers/plant		No. of leaves/plant		Leaf dry wt/ plant (gm)		Leaf area/ plant (dc^2)	
	1998/ 99	1999/ 2000	1998/ 99	1999/ 2000	1998/ 99	1999/ 2000	1998/ 99	1999/ 2000	1998/ 99	1999/ 2000
					Low level of IWS+ (4000 ppm)					
Sakha 8	76.4 a	84.1 a	2.5 a	2.7 a	12.9 a	13.4 a	5.07 a	5.26 a	16.7 a	16.9 a
Sakha 69	71.3 b	80.0 b	2.1 b	2.3 b	12.3 b	13.0 b	4.49 c	5.00 b	16.0 b	16.1 b
Giza 155	56.0 e	64.1 d	1.1 d	1.3 d	11.6 c	11.9 d	4.41 c	4.66 c	14.8 e	14.5 e
Giza 157	60.1 d	63.1 d	1.2 d	1.4 d	10.5 d	11.4 e	4.30 c	4.50 c	14.4 f	14.4 e
Gemmeiza 1	66.1 c	73.6 c	1.5 c	1.7 c	12.0 b	12.0cd	4.70 b	4.80 b	15.1 d	15.2 d
Gemmeiza 3	65.1 c	75.0 c	1.6 c	1.7 c	12.0 b	12.3 c	4.75 b	4.90 b	15.5 c	15.6 c
Mean	**65.8 A**	**73.3 A**	**1.7**	**1.9**	**11.9 A**	**12.3 A**	**4.62**	**4.85**	**15.4 A**	**15.5 A**
					High level of IWS (8000 ppm)					
Sakha 8	70.4 a	74.1 a	1.4 a	1.6 a	10.4 a	11.0 a	5.79 a	5.99 a	15.0 a	14.5 a
Sakha 69	65.5 b	78.1 a	1.1 ab	1.3 b	10.1ab	10.5 b	5.15bc	4.45 b	14.1 b	13.8 b
Giza 155	54.0 d	59.3 c	1.0 b	1.1 bc	9.4 bc	9.6 cd	4.60 c	4.75 c	12.0 d	11.0 d
Giza 157	57.1cd	59.9 c	1.0 b	1.0 c	9.0 c	9.1 d	4.75 c	5.00 c	12.2 d	11.4 d
Gemmeiza 1	61.4 c	63.1 b	1.3 ab	1.4 ab	10.0ab	9.9 c	5.00bc	5.10bc	13.0 c	12.5 c
Gemmeiza 3	60.9 c	64.2 b	1.2 ab	1.5 ab	9.8 b	9.9 c	5.25 b	5.50 b	13.2 c	12.4 c
Mean	**61.6 B**	**66.5 B**	**1.2**	**1.5**	**9.8 B**	**10.0 B**	**5.09**	**5.13**	**13.3 B**	**12.6 B**
Reduction %	**6.4**	**9.3**	**29.4**	**21.1**	**17.6**	**18.7**	**10.2 +**	**5.8 +**	**13.6**	**18.7**

IWS+ : *Irrigation water salinity.*

Values followed by the same letter are not different at < 0.05 by Duncan's multiple range test.

Capital letters: significant for means of irrigation water salinity levels at 0.05 level of probability.

two Gemmeiza cvs in the 1st season, as well as, between the two Sakha cvs in the 2nd season.

Similar to plant height when plants were irrigated by water of a low salinity level, data of the two seasons also cleared that Sakha 8 cv could produced the highest number of tillers/ plant flowed by Sakha 69 cv too. Whereas, the two cultivars of Giza group produced the lowest number of tillers/ plant. While, under high level of IWS, there were no significant differences in number of tillers/ plant among the four cvs of Giza and Gemmeiza groups in the 1st season, as well as, among Sakha 8 cv and the two cvs of Gemmeiza group in the 2nd season. Nevertheless, Sakha 8 cv had much tillers/ plant than the rest tested cvs in both seasons.

It is obvious, recorded data of low IWS level indicated that Sakha 8 cv bore the highest number of leaves/ plant followed by Sakha 69 in both seasons, as well as, the two cvs of Gemmeiza group in the 2nd season. While, Giza 157 cv attain the lowest number of leaves/ plant in the two seasons. Differences among the tested cvs in this trait under the tried two levels of IWS were nearly the same in the 2nd season. But, in the 1st season, there were no differences among the four cvs of Sakha and Gemmeiza groups under the high level of irrigation water salinity in this respect. However, Sakha 8 bore much plant leaves more than Giza group both cvs too. Here it is noticeable that the taller plants are the much numbers of tillers and leaf numbers per plant.

With the use of water having a low salinity level in irrigation, Sakha 8 cv followed by the two cvs of gemmeiza in the two seasons, as well as, Sakha 69 cv in the 2nd season had heavier leaves dry weight/ plant compared with the rest cvs. Also, under high level of IWS, Sakha 8 cv recorded the heaviest leaf dry weight/ plant in the two seasons. Whereas, the two cvs of Giza group were similar in attaining light leaf dry weight/ plant as compared with Gemmeiza 3 in the two seasons, as well as, Sakha 69 cv in the 2nd season. These results indicated that the higher number of leaves/ plant is the heavier leaves dry weight in most cases.

Also, the obtained data clearly show that Sakha 8 cv had the larger leaf area/plant followed by Sakha 69 then the two Gemmeiza cvs followed by the two Giza cvs. This was true under the two levels of IWS over both seasons. Yet, Gemmeiza 3 cv recorded larger leaf area/ plant than Gemmeiza 1 cv in the two seasons. While, Giza 157 cv attained smaller leaf area/ plant as compared with Giza 155 cv only in the 1st season. It worthy to note here that the heavier leaf dry weight is the bigger leaf area/ plant.

Regardless leaves dry weight/ plant, results showed a diversity among the tested wheat cultivars in the relative decreases of the other growth traits recorded here due to raising level of irrigation water salinity. This finding indicating to the importance of certain cultivar to be stock to improve specific growth trait for salt tolerance. For instance, the two Sakha group cvs recorded the highest relative reduction in number of tillers/ plant, but they recorded the lowest relative reduction in leaf area/ plant with the raise in level of IWS. Under the same conditions of this work, most of the obtained results were in harmony with those of Abd El-Gawad *et al.* (1990) and Sallam and Afiah (1998).

B. Yield and its components:

Data which pertaining the effect of irrigation water salinity level on yield and yield components for the tested wheat cultivars are presented in table 4.

B.1. Effect of increasing level of irrigation water salinity (IWS):

Like as in most growth traits (Table 3), results in Table 4 showed a great decreases in yield and yield components due to raising level of IWS. This was true in the two seasons. Increasing the level of IWS from 4000 to 8000 ppm decreased the grain yield by 37.1 and 46.1 % in the first and second seasons, respectively. Most of these reductions resulted from the reductions in spike number/ m^2 and number of grains per spike rather than the reduction in 1000-grain weight which seems to be more stable to the environmental changes. Straw yield showed also reductions amounted to more than one third in both seasons. This was also a function of the reduction in plant height in a minor magnitude due to tillering capacity of relatively major magnitude.

B.2. Cultivars effect:

It is evident from recorded data that Sakha 8 cv produced much number of spikes/ m^2 than the rest tested cultivars except Sakha 69 cv in the 2nd season under the low level of IWS.

Table 4. Effect of irrigation water salinity level on yield and yield components for some wheat cultivars in 1998/99 and 1999/2000 growing seasons.

Main effects	No. of spikes/ m^2		No. of grains/ spike		1000-grain weight (gm)		Grain yield (ardab /fed)		Straw yield (ton /fed)	
	1998/ 99	1999/ 2000	1998/ 99	1999/ 2000	1998/ 99	1999/ 2000	1998/ 99	1999/ 2000	1998/ 99	1999/ 2000
					Low level of IWS⁺ (4000 ppm)					
Sakha 8	230 a	240 a	26.8 a	30.1 a	34.4 a	35.1 a	13.9 a	14.3 a	3.7 a	3.9 a
Sakha 69	217 b	225ab	26.1 a	27.5ab	32.1 b	31.4 b	12.6 b	13.2 b	3.2 b	3.3 b
Giza 155	188 c	200 b	20.1 c	21.1 c	28.1 d	27.1 c	8.8 d	9.1 d	2.1 d	2.3 d
Giza 157	180 c	199 b	20.1 c	21.4 c	27.9 d	27.5 c	9.1 d	9.8 d	2.3 d	2.3 d
Gemmeiza 1	198bc	200 b	23.1 b	25.1 b	30.1 c	29.1bc	11.2 c	11.9 c	2.6 c	2.8 c
Gemmeiza 3	191bc	205 b	24.1 b	26.1 b	30.0 c	30.1bc	10.9 c	11.6 c	2.6 c	2.7 c
Mean	**200 A**	**211 A**	**23.3 A**	**25.2 A**	**30.4 A**	**30.1 A**	**9.7 A**	**11.7 A**	**2.8 A**	**2.9 A**
					High level of IWS (8000 ppm)					
Sakha 8	190 a	199 a	21.7 a	22.1 a	31.4 a	32.1 a	7.8 a	8.4 a	2.2 a	2.3 a
Sakha 69	180 b	181 b	20.1ab	21.1ab	30.1ab	30.0ab	6.9 ab	7.4 ab	2.0 ab	2.1 ab
Giza 155	151cd	141 d	18.1 b	17.1 b	26.1bc	25.1bc	5.0 c	4.8 c	1.5 c	1.6 c
Giza 157	145 d	141 d	17.1 b	18.1 b	25.7 c	24.6 c	5.2 c	4.9 c	1.6 c	1.5 c
Gemmeiza 1	180 b	165 c	20.7ab	20.9ab	28.1bc	27.1 b	5.7 bc	6.0 bc	1.7 bc	1.9 bc
Gemmeiza 3	161 c	175 c	19.1ab	20.1ab	29.1 b	29.6 b	6.0 b	6.3 b	1.9 b	2.0 b
Mean	**168 B**	**167 B**	**19.5 B**	**19.9 B**	**28.4 B**	**28.1 B**	**6.1 B**	**6.3 B**	**1.8 B**	**1.9 B**
Reduction%	**16.0**	**21.0**	**16.3**	**20.8**	**6.6**	**6.6**	**37.1**	**46.1**	**35.7**	**34.5**

IWS⁺ : *irrigation water salinity.*

Values followed by the same letter are not different at < 0.05 by Duncan's multiple range test.

Capital letters; significant for means of irrigation water salinity levels at 0.05 level of probability.

Where, differences between them in this trait did not reach to the level of significance. Meantime, the two cvs of Giza group recorded lower number of spikes as compared with the rest cultivars in most cases.

Meantime, results showed no differences between the two Sakha cvs in number of grains/ spike under the two levels of IWS over the two seasons. This was also the same in comparison among Sakha cvs group and Gemmeiza 3 cv in the 2nd season, as well as, in comparison among the four cvs of Sakha and Gemmeiza groups in the two seasons when low salinity water was used in irrigation. However, the two cvs of Giza were similar in having the lowest number of grains/ spike over the two seasons under the low level of IWS. Also, under high level of IWS, Sakha 8 had many grain numbers/ spikes than the two Giza cvs over both seasons. Here, it can be concluded that the competition between spike and grains of the spike on assimilates was not severe. Since, the cultivars that produced much spike numbers/ m^2 attained also higher grain numbers/ spike even with the raise in irrigation water salinity level. This may be due to the lower number of spikes/ m^2 under both conditions.

As in number of grains/ spike, results indicated that Sakha 8 cv had heavier grains than the other tested cvs except Sakha 69 one under high level of IWS during the two seasons. Where, there was no difference between both these cvs in this respect. Also, the differences among Sakha 69 and Gemmeiza cvs group under low level of IWS in the 2nd season, as well as, among theses cultivars and Giza 155 cv under high level of IWS over the two seasons did not reach to the level of significance. However, Sakha 69 cv attained heavier grains than the rest cvs in different cases. Under the conditions of the present study, the superiority of cvs having higher number of spikes/ m^2 and higher number of grains/ spike in grain weight too, point to the low competition among these components on assimilates during maturity.

Accordingly, under low level of IWS, results cleared that Sakha 8 cv could produce the highest grain and straw yields/ fed followed by Sakha 69 cv then gemmeiza cultivars, the two cvs of Giza were similar in giving the lowest values of both yields. This was true in the two seasons. While, under high level of IWS, the tested two cvs of Sakha group produced a

Table 5. Reduction % of yield and its components of the tested wheat cultivars caused in increasing salinity level of irrigation water.

Main effects	No. of spikes/ m^2		No. of grains/ spike		1000-grain weight (gm)		Grain yield (ardab /fed)		Straw yield (ton /fed)	
	1998/ 99	1999/ 2000	1998/ 99	1999/ 2000	1998/ 99	1999/ 2000	1998/ 99	1999/ 2000	1998/ 99	1999/ 2000
Sakha 8	17.4	17.1	19.0	26.6	8.7	8.5	43.9	41.3	40.5	41.0
Sakha 69	17.0	17.3	22.9	23.3	6.2	4.5	45.2	43.9	32.5	36.4
Giza 155	19.7	29.5	10.0	18.9	7.1	7.4	43.2	47.3	28.6	30.4
Giza 157	19.4	27.6	14.4	15.4	7.9	10.5	42.9	50.0	30.4	34.8
Gemmeiza 1	9.1	17.5	10.4	16.7	6.6	6.9	44.1	49.6	34.6	32.1
Gemmeiza 3	15.7	14.6	20.7	22.9	3.0	1.7	45.0	45.7	26.9	25.9

comparable grain and straw yields/ fed over the two seasons. However, Sakha 8 cv outyielded the rest cvs in both seasons. Meantime, Sakha 69 surpassed the two cvs of Giza group in this respect over the two seasons. These results could be ascribed to the superiority of two Sakha cultivars in yield components. Similar results were previously obtained under saline conditions by El-Haddad *et al.* (1993), Kishk et al. (1994), Afiah *et al.*(1997) and Sallam and Afiah (1998).

Finally, it is worthy to note that the relative decreases in different yield components due to raising the level of IWS reflected a great diversity among the tested cultivars in salt tolerance over the two seasons, as seen in Table (5). From the Table it is worth mentioning that all yield components were reduced due to increasing salinity level from 4000 to 8000 ppm. The grain yield was reduced by more than 40 % reaching 50 % in Giza 157 in the second season. Yield of Gemmeiza 1 went down by > 49 % in both seasons. Also using 4000 ppm salinity level of irrigation water is also considered low quality water. Back to Table (4), under this condition Sakha group gave lighter yield followed by Gemmeiza group and the lowest yield was of Giza two cultivars. These indicate that this order of tolerance can be read as Sakha more tolerant than Gemmeiza and the most sensitive ones were of Giza group. When the salinity level increased to be very saline water, all the six cultivars produced reduced yields and rate of reduction was 40 % and more. Also yield components went on reducing due to increasing the level of irrigation water salinity. Both spike number/ m^2 and grain number/ spike caused most of the reduction in grain yield rather than 1000 grain weight.

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تقييم بعض أصناف القمح تحت مستويين لملوحة ماء الرى بالأراضي الجيرية بجنوب سيناء

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أقيمت تجربتان حقليتان بمحطة بحوث رأس سدر (محافظة جنوب سيناء - مصر) التابعة لمركز بحوث الصحراء خلال موسمي شتاء ١٩٩٨/١٩٩٩ ، ١٩٩٩/٢٠٠٠ بغرض تقييم ستة أصناف من قمح الخبز (سخا ٨ ، سخا ٦٩ ، جيزة ١٥٥ ، جيزة ١٥٧ ، جميزة ١ ، جميزة ٣) تحت مستويين لملوحة ماء الرى (٤٠٠٠ ، ٨٠٠٠ جزء فى المليون) بالأراضى الجيرية . وفيما يلى أهم النتائج:

- أظهرت بيانات النمو المسجلة عند ٩٠ يوم من الزراعة أن رفع مستوى ملوحة ماء الرى إلى ٨٠٠٠ جزء فى المليون أدى إلى نقص كبير فى كل من ارتفاع النبات وعدد الأشطاء/ النبات وعدد الأوراق/ النبات وكذلك مساحة أوراق النبات ، ولكنه أدى إلى زيادة الوزن الجاف لأوراق النبات.
- أدى رفع مستوى ملوحة ماء الرى أيضاً إلى نقص المحصول ومكوناته عند الحصاد.
- أشارت النتائج إلى قوة نمو الصنف سخا ٨ وإلى ضعف نمو الصنفين جيزة ١٥٥ ، ١٥٧ نسبيا.
- أشارت النتائج المتحصل عليها تحت ظروف الرى بماء ذو مستوى الملوحة المنخفض إلى تفوق الصنف سخا ٨ فى المحصول ومكوناته عن بقية الأصناف فيما عدا صفة عدد الحبوب بالسنبلة.
- وجدت اختلافات معنوية بين الأصناف المختبرة فى مقدار النقص النسبى بكل مكون من مكونات المحصول والراجع إلى زيادة مستوى ملوحة الماء المستخدم فى الرى، ولذلك فإنه برفع مستوى ملوحة ماء الرى من ٤٠٠٠ إلى ٨٠٠٠ جزء فى المليون تساوت أصناف سخا وأصناف جميزة فى عدد حبوب السنبلة وتساوى الصنف سخا ٦٩ مع الصنف سخا ٨ فى وزن الحبة.
- أظهرت نتائج المحصول تحت ظروف الرى بالماء ذوى مستوى الملوحة المنخفض أن الصنف سخا ٨ قد حقق أعلى محصول من الحبوب والقش تلاه الصنف سخا ٦٩ . فى حين حقق الصنفين جيزة ١٥٥ ، ١٥٧ أقل قيم لمحصول الحبوب و القش . بينما تحت ظروف الرى بماء ذو مستوى ملوحة مرتفع لم تكن هناك فروق معنوية بين صنفى سخا ٨ وسخا ٦٩ فى محصول الحبوب ، ولكن الصنف سخا ٨ قد تفوق أيضاً على بقية الأصناف فى هذا الصدد.