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IMPACT OF IRRIGATION WATER SALINITY LEVELS ON SOIL CHEMICAL PROPERTIES AND SOME FABA BEAN VARIETIES

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ABSTRACT

Two experiments were conducted in a wire proof greenhouse at Sakha Agricultural Research Station during seasons of 2005/2006 and 2006/2007 to estimate the influence of water salinity on some soil chemical properties, yield and yield components of faba bean varieties. Four water salinity levels 0.5 dS/m (W1) 2.94 dS/m (W2), 4.82 dS/m (W3) and 7.0 dS/m (W4) were used. Ten faba bean varieties; Giza 461, Rina More, Giza 843, Giza 3, Sakha 1, Sakha 2, Sakha 3, Nobaria1, Misr 1 and Misr 2 were planted in pots which filled with 10 kg of non saline clay soil at the beginning of each season.

The obtained results could be summarized as follows :

Dramatic increase of soil salinity was shown after harvesting due to increasing irrigation water salinity i.e., from (1.9 , 2.0) to (5.93, 5.99) (12.53, 13.00) and (14.44, 14.20) dS/m with W1, W2, W3 and W4 the in two seasons, respectively. As well as SAR was increased from (4.64 , 4.48) before planting to (7.79, 7.63) (12.78, 12.14) and (14.42, 15.01) with W2, W3 and W4 in two seasons respectively. Also, HCO^-_3, Cl^-, and Na^+ were increased with increasing irrigation water salinity.

Irrigation water salinity significantly affected faba bean yield and yield components. Faba bean seed yield /plant had the following sequence With different irrigation waters: W1: Sakha 2 > Giza 461 = Misr 1 > Rina More = Misr 2 = Nobaria 1 Sakha 1 = Giza 3 = Sakha 3 > Giza 843. W2 : Sakha 2 > Misr1 = Misr 2 > Nobaria 1 = Sakha 3 = Sakha 1 = Giza 3 > Giza 843 = Giza 461 > Rina More. W3 : Sakha 2 = Misr1 = Misr 2 > Nobaria 1 = Giza 3 > Sakah 1 = Giza 843 = Sakha 3 = Rina More = Giza 461. W4 : Misr 2 = Misr 1 = Sakha 2 > Nobaria 1 = Sakha 1 = Sakah 3 > Giza 3 = Giza 843 > Rina More = Giza 461.

Number of pods/plant, straw yield/plant, number of branches / plant number of seeds / plant and 100-seed weight significantly decreased with increasing irrigation water salinity levels.

Faba bean : Misr 2, Misr 1 and Sakha 2 were the highest tolerant varieties to irrigation water salinity. While the varieties Giza 461, Rina More were the lowest ones according to FAO (1985).

INTRODUCTION

Under Egyptian conditions, the shortage of fresh water resources for Agricultural expansion in Arid and semiarid region are noticed. Thus, an urgent need for using low quality water for this purpose is a vital importance . However the use of saline waters for irrigation affects many soil properties such as these related to ion exchange equilibrium and salt concentration, (El Kouny 2002, and Jalali *et al*. 2008).

Soil properties are considered as important factors controlling most of soil conditions and soil plant relationships Wassif *et al*. (1997). Broad bean (*Vicia faba*) is the most important leguminous crops cultivated in Egypt, where its seeds are consumed as a cheap source of protein for human and livestock. Two of the most important factors affecting broad bean production are soil salinity and or irrigation water salinity.

Salt has three folds effects it reduced water potential, causes ion imbalance or disturbance and ion toxicity. This altered water status leads to initial growth reduction and limitation of plant productivity. Since salt stress involves both osmotic and ionic stress. (Benlloch-Gonzales *et al.* 2005). Salt stress affects all the major processes such as growth photosynthesis, protein synthesis and energy and lipid metabolism (Parida and Das 2005 and Albino *et al*. 2007).

Katerji-N *et al*., (1992) studied the effect of 3 salinity levels of water on beans by adding NaCl, $CaCl_2$ and $MgSO_4$ to fresh water (0.9 dS/m = control), to gave 2.1 dS/m and 4.0 dS/m). Data showed clear decrease in leaf area, dry matter production and yield with the increases of water salinity. Sharma (1991) showed that, in pot experiment irrigated with water salinity levels of 1.5, 4.5, 7.8 and 13.7 dS/m, decreasing shoot growth more than root growth. Pascale *et al*., 1997 found that the 5 dS/m soil salinity led to 50% of yield reduction compared to 4.7 dS/m in the Van Genuchthen model. The shortage of suitable water requires selection of genotypes with a species can there be expected to provide useful material for experimental comparisons with ordinary relatively salt sensitivity (Shannon *et al*.,1987). In general, beans are reported to be sensitive to salt but some species may be moderately tolerant. (Mass and Hoffman 1977).

MATERIALS AND METHODS

Two pot experiments were conducted in a wire proof greenhouse at Sakha Agricultural Research Station during winter seasons 2005/2006 and 2006/2007. This study amid at investigate the effect of four salinity levels of irrigation water on soil and ten faba bean varieties; Nobaria 1, Giza 3, Giza 461, Sakha 1, Sakh 2 , Sakha 3, Rina Mora, Misr 1, Misr 2 and Giza 843 yield and yield component.

In each season plastic pots 30 cm in width and 30 cm in deep were filled with 10 kg of disturbed non saline clay soil collected from the surface layer (0-30 cm) of Sakha Agricultural Research Station Farm. Some chemical and physical properties of experimental soil are shown in Table 1. Faba bean varieties were planted in 15^{th} Nov. 2005/2006 and 2006/2007. After two weeks of sowing the seedlings were thinned to 3 plants /pot.

The first irrigation for each pot was done with fresh water. After germination, constant volume of artificially salinezed water equivalent to field capacity was used for irrigation. Four levels of water salinity were 0.5(W1), 2.94 (W2), 4.82 (W3) and 7.0 (W4) dS/m were used for irrigation. The artificially water salinity were prepared using a base of tap with Na and Ca at SAR = 6 by using a mixture of $CaCl_2$ and NaCl Salts.

The traditional Agricultural practices for *Vicia faba* varieties were separately made and nitrogen and phosphorus were applied a the rate of 15 kg N/fed. and 30 kg P_2O_5/fed. Nitrogen was applied as urea (46.5% N) in one dose after thinning, phosphorus was applied as superphosphate (15.5% P_2O_5) in one dose before sowing and potassium fertilizer was added in the form of potassium sulphate (48% K_2O) at rate 24 K_2O kg /fed after one month of planting. The statistical analysis was done under the complete randomized block design with 3 replication. Plants were harvested at maturity stage and yields of faba bean were weighted g/pot. In each season soil samples after harvesting were analyzed for ECe, total N % , available P and K and soluble ions, according to standard methods of (Page *et al*. 1982). Statistical analysis was carried out according to (Gomes and Gomes 1984).

Table (1) : Some chemical and physical properties of soil used

Season	* pH 1:2.5	** ECe dS/m	Soluble cation, meq/L				Soluble anion, meq/L				SAR
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{--}	HCO_3^-	Cl^-	SO_4^{--}	
2005/2006	8.00	1.9	7.1	1.8	9.8	0.3	-	2.2	9.00	7.8	4.64
2006/2007	8.05	2.00	7.5	2.3	9.9	0.3	-	2.3	9.2	8.5	4.48

Table (1) : Cont.

Season	Total N%	Available ppm		F.C. %	O.M %	Particle size distribution			Text ure
		P	K			Clay	Silt	sand	
2005/2006	0.13	6.2	330	40.0	1.6	54.5	23.1	22.4	Clayey
2006/2007	1.12	6.3	320	40.0	1.6	54.5	22.9	22.6	Clayey

*** 1:2.5 Soil : Water suspension**
**** Soil paste extract**

RESULTS AND DISCUSSIONS

1- Effect of irrigation water on soil chemical properties :

Data presented in Table (2) show that ECe and SAR of soil paste extracts greatly increased with increasing salinity levels as compared with control treatment. ECe values indicate that the increase in the soil salinity was promoted by more than 2.85 fold with W2, 6.10 fold with W3 and 7.85 fold with W4, in comparison with soil irrigated with control (W1) (EC 0.5 dS/m). This may be ascribed to the addition of the more soluble bases into the soil through the application of saline water. The same trend was found by (Abd El-Nour 1989 and Etrieby *et al*., 2001). They noted that EC and SAR values of soil were increased as a result of rising salinity of irrigation water. The recorded data in Table (2) show that SAR values were increased from (4.74 - 4.18) with W1 to (7.79 - 7.63) (12.78 -12.14) and (14.42-15.01) with W2, W3 and W4 in the tow seasons, respectively. Also in two seasons. Table (2) show that chloride (Cl^-) content (meq/L) in the soil irrigated with saline water increased from (9.3 , 9.5) with W1 to (27.5 , 26.5) , (62.1, 60.7) and (74.1 , 76.0) meq/L with W2, W3 and W4 in both seasons, respectively.

On the other hand data in Table (2) show that soluble Na^+ increased from (10.6 , 9.8 meq/L) with W1 to (29.0 , 28.8) , (67.2 , 66.8) and (80 , 81) meq/l with W2, W3 and W4 in two seasons respectively. This is in fact due to irrigation water salinity. These results are in agreement with those obtained by El-Etrieby *et al.* (2001) and Atwa (2005). They found that soil content of soluble Na+ was increased with increasing the salinity of irrigation water.

2- **Crop yields** :

Data in Table (3) show that, increasing salt concentration of the irrigation water reduced all the crop characteristics studied.

2.1. Seed yield/plant :

Giza 461 and Rina More appeared to be more sensitivity to salinity in comparison with the other studied variety, while the maximum mean values of seed yield, (g /plant) were (10.53, 10.5) and (8.82, 8.79) (g/plant) at W1 and W2 with Sakha 2 in the first and second season respectively. Also the maximum mean values of seed yield (g/ plant) were (5.2, 5.2), (5.1, 5.07) and (5.1, 5.08) with W3 and (2.92, 2.96) (2.95 , 3.00) and (2.97, 3.00) with W4 for Sakha 2, Misr 1 and Misr 2 in the two growing seasons, respectively (Table 3 and Fig. 1). Rabie and Almandini (2005) showed that the number of nodules was significantly reduced in faba plants by increasing the level of salinity. At 6.0 dS/m salinity the number of module decreased by about 92% of that formed by faba bean plants. The seed yield g/plant was arranged as follow :

With W_1 : Sakha2 > Giza 461 = Misr1 > Rina More = Misr2 = Nobaria 1 = Sakha 1 = Giza 3 = Sakha 3 > Giza 843,

With W_2 : Sakha 2 > Misr 1 > Misr 2 > Nobaria 1 = Sakha 1 = Sakha 3 = Giza 3 > Giza 843 = Giza 461> Rina More,

With W_3 : Sakha 2 = Misr 1 = Misr 2 > Nobaria 1 = Giza 3 > Sakha 1 = Giza 843 = Sakha 3 = Rina More = Giza 461 and

With W_4 : Misr 2 = Misr 1 = Sakha 2 > Nobaria 1 = Sakha 1 = Sakha 3 > Giza 3 = Giza 843 > Rina More = Giza 461.

2.2- Straw yield (g/plant):

The statistical analysis indicated that, irrigation water salinity levels have significant harmful effect on straw yield of faba bean varieties in both seasons. Table (3) and (Fig. 2). The straw yield, g/plant was arranged as follow :

With W_1 : Sakha 2 = Giza 3 = Rina More > Giza 461 > Misr 1 > Sakha 3 = Nobaria 1 > Sakha 1 > Misr 2 > Giza 843,

With W_2 : Sakha 2 = Misr 1 > Giza 3 = Sakha 3 > Nobaria 1 > Sakha 1 = Misr 2 > Rina More > Giza 461> Giza 843,

With W_3 : Misr 1 > Misr 2 = Sakha 3 = Sakha 2 = Giza 3 > Nobaria 1 > Sakha 1 > Giza 461 > Rino More = Giza 843 and

With W_4 : Misr 2 = Misr 1 = Giza 3 > Sakha 2 = Nobaria 1 > Sakha 1 = Sakha 3 > Giza 843 > Giza 461 > Rina More. Similar results (Fatma El-Shafie, S. and S.A. El-Shikha 2003).

2+3

2.3: Number of pods / plant :

Number of pods/ plant significantly decreased with increasing water salinity levels. The highest number of pods/plant (5.07 and 5.03) were obtained with Sakha 2 varieties at W1 in two seasons, respectively. At W2 the highest number of pods/plant decreased to 4.0 and 4.0 with the same variety in the first and second seasons, respectively. At W3 the number of pods/plant were 3.34 and 3.37 with Sakha 2 also. At the highest salinity level of water (W4) the highest values of number of pods/plant were (2.90, 2.95) and (2.86 , 2.90) and (2.85 , 2.9) with Misr 2, Misr 1 and Sakha 2 varieties in the first and second season, respectively. (Table 4) and (Fig. 3). On the other hand the lowest number of seeds/plant values were recorded with Giza 461 and Rina More varieties in both seasons. Similar results were reported by Mansour and Bastawisy (1997).

2.4: Number of branches /plant :

Number of branches / plant of faba bean varieties had significantly decreased with increasing water salinity levels in both seasons. The highest number of branches/ plant were obtained at W1 with Rina More, Sakha 2, Sakha 3, and Nobaria 1. While the highest values at W2, W3 were with Sakha 2. Also at W4 the highest values were with Sakha 2, Sakha 3 and Nobaria 1 (Table 4).

2.5 :Number of seeds / plant :

Number of seeds/plant of faba bean varieties had significantly decreased with increasing water salinity levels (Table 4). The highest number of seeds/plant were (15.16, 15.25) (12.9, 12.98) (10.47, 10.2) and (9.21, 9.36) with Misr 1 at the studied four levels of water salinity in the first and second seasons, respectively. On the other side the lowest values were obtained with Rina More at four levels of water salinity.

2.6 : 100 -seeds weight (g):

100-seed weight (g) of faba bean varieties was significantly decreased with increasing water salinity levels (Table 4). The highest 100-seed weight (102, 102.3) with Rina More was at W1 while at W2 they were (84.3, 82) and (85 , 84.7) with Rina More and Nobaria 1. Also the results in the Table at W3 and W4 with Nobaria1. But the reduction were (67.10, 58.54) comparison control W1 with Giza 461 and Rina More varieties.

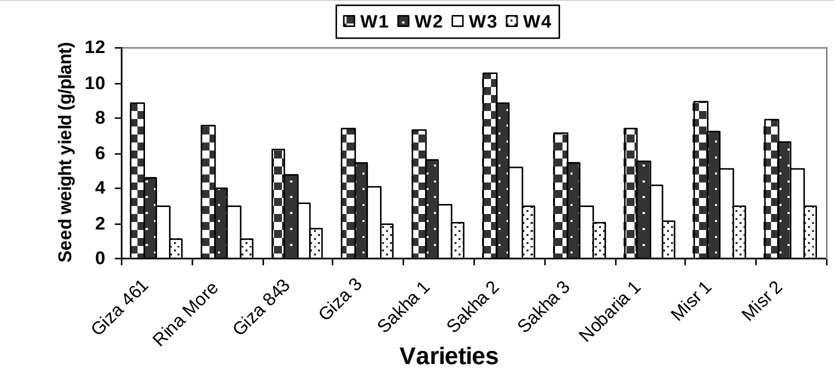


Fig (1):Effect of irrigation water salinity on seed yield (g/plant) of some faba been varieties (mean-two seasons)

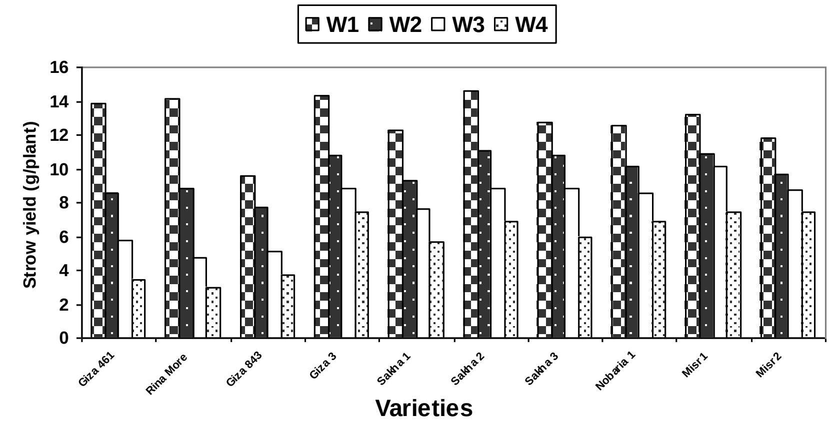
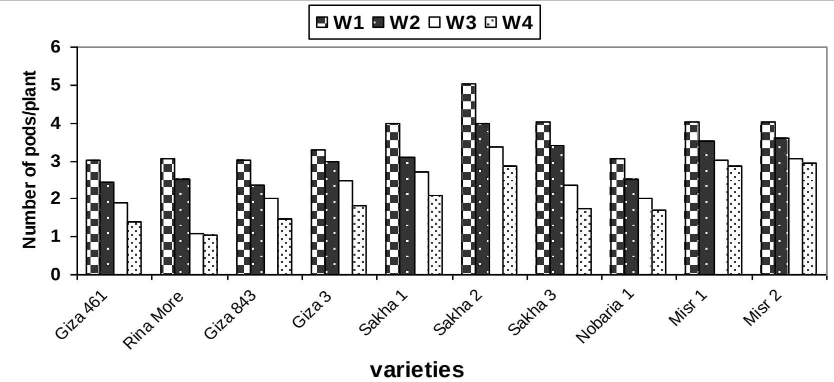


Fig (2): Effect of irrigation water salinity on straw yield (g/plant) of some faba been varieties (mean-two seasons)



Fig(3): Effect of irrigation water salinity on number of pods /plant in faba been varieties (mean-two seasons)

Table (4) : Effect of irrigation water salinity on number of pods /plant, number of branches/plant, number of seeds/plant and 100-seedS weight in faba bean varieties

Variety	First season water salinity dS/m				Second season water salinity dS/m			
	W1 (0.5)	W2 (2.94)	W3 (4.82)	W4 (7.0)	W1 (0.5)	W2 (2.94)	W3 (4.82)	W4 (7.0)
Number of pods /plant								
Giza 461	3.02 d	2.43 e	1.9 f	1.40 e	3.03 d	2.43 e	1.89 e	1.38 e
Rina More	3.01 d	2.50 e	1.13 g	1.03 f	3.10 d	2.52 e	1.03 f	1.02 f
Giza 843	3.00 d	2.40 e	2.00 f	1.5 e	3.05 d	2.34 e	2.05 e	1.48 e
Giza 3	3.30 c	3.00 d	2.5 d	1.84 d	3.3 c	3.00 d	2.48 d	1.82 d
Sakha 1	4.00 b	3.10 d	2.7 c	2.10 c	4.00 b	3.12 d	2.69 c	2.09 c
Sakha 2	5.07 a	4.00 a	3.34a	2.85 ab	5.03 a	4.00 a	3.37 a	2.9 ab
Sakha 3	4.00 b	3.4 c	2.34 e	1.75 d	4.01 b	3.42 c	2.36 d	1.75 d
Nobaria 1	3.04 d	2.5 e	2.00 f	1.70 d	3.05 d	2.53 e	2.03 e	1.72 d
Misr 1	4.02 b	3.5 bc	3.00 b	2.86 ab	4.05 b	3.52 b	3.04 b	2.90 ab
Misr 2	4.03 b	3.6 b	3.02 b	2.90 a	4.05 b	3.59 b	3.05 b	2.95 a
Number of branches / plant								
Giza 461	2.00 d	1.6 g	1.4 f	1.0 d	2.00 c	1.6 f	1.37 f	1.0 c
Rina More	3.00 a	2.00 c	1.12 g	1.0 d	3.00 a	2.0 c	1.10 g	1.0 c
Giza 843	2.11 c	1.82 e	1.71 c	1.10 c	2.10 bc	1.8 de	1.7 e	1.1 c
Giza 3	2.00 d	1.6 g	1.43 f	1.25 b	2.00 c	1.6 f	1.3 ef	1.25 b
Sakha 1	2.00 d	1.9 d	1.6 d	1.0 d	2.00 c	1.9 cd	1.6 cd	1.0 c
Sakha 2	3.00 a	2.7 a	2.4 a	1.7 a	3.00 a	2.7 a	2.4 a	1.7 a
Sakha 3	3.00 a	2.3 b	1.9 b	1.6 a	3.00 a	2.3 b	1.87 b	1.5 a
Nobaria 1	3.00 a	2.3 b	1.85 b	1.65 a	3.00 a	2.3 b	1.85 b	1.65 a
Misr 1	2.2 b	1.7 2f	1.51 e	1.1 b	2.20 b	1.7 ef	1.4 de	1.3 b
Misr 2	2.2 b	1.71 f	1.51 e	1.2 b	2.20 b	1.7 ef	1.5 de	1.3 b
Number of seeds/plant								
Giza 461	13.55 b	9.43 e	7.53 e	4.78 h	13.60 b	9.45 d	7.67 e	5.09 h
Rina More	7.5 i	4.68 j	4.31 j	2.57 j	7.30 j	4.89 h	4.41 j	2.55 j
Giza 843	10.82 f	8.69 g	6.55 f	5.54 ef	10.68 g	9.11 e	7.32 f	5.61 f
Giza 3	13.06 d	10.34 d	8.88 c	6.59 c	13.10 d	10.74 c	9.10 c	6.30 d
Sakha 1	10.88 f	9.06 f	6.68 g	5.33 g	10.94 f	9.38 d	6.80 g	5.40 g
Sakha 2	12.34 e	10.75 c	8.25 d	6.86 c	12.37 e	10.89 c	8.29 d	6.88 de
Sakha 3	10.10 g	8.50 h	5.91 h	5.68 c	10.18 h	8.69 f	6.02 h	5.80 c
Nobaria 1	8.14 h	6.54 i	5.31 i	4.42 i	8.16 i	6.56 g	5.38 i	4.46 i
Misr 1	15.16 a	12.90 a	10.47 a	9.21 a	15.25 a	12.98 a	10.20 a	9.36 a
Misr 2	13.38 c	11.24 b	9.44 b	8.91 b	13.44 c	11.53 b	9.53 b	9.03 b
100-seeds weight (g)								
Giza 461	66.0 e	48.2 f	39.4 g	22.33 g	65.70e	48.1 g	39.1 g	21.00 e
Rina More	102 a	84.3 a	69.0 b	42.0 c	102.3 a	82.0 b	67.7 b	42.70 b
Giza 843	57.3 fg	55.0 d	44.0 f	31.0 ef	58.3 fg	53.0 ef	43.70 f	31.33 d
Giza 3	56.33 g	52.0 e	45.70 f	30.33 f	56.33 g	51.0 f	45.7 f	31.70 d
Sakha 1	67.33 e	61.0 c	45.33 f	39.33 d	67.33 e	60.0 d	45.70 f	38.33 c
Sakha 2	85.4 c	82.0 b	63.0 c	43.00 c	84.9 c	80.70 b	62.70 c	43.00 b
Sakha 3	70.3 d	63.0 c	50.70 d	35.70 d	70.00 d	62.70 c	50.00 d	34.33 c
Nobaria 1	91.23 b	85.0 a	79.00 a	48.33 a	90.6 b	84.70 a	78.00 a	48.00 a
Misr 1	58.70 fg	55.70 d	48.70 e	32.0 ef	58.33 fg	56.0 e	49.70 e	32.00 d
Misr 2	59.00 f	56.7 d	54.0 d	33.33 e	59.00 f	56.0 d	53.3 d	33.3 d

In general the order of the effect of water salinity were W1< W2< W3 < W4 on the reduction of yield and yield component of faba bean varieties due to the deleterious effect of salinity on leaf area and net assimilation rate leading to a reduction in the amount of dry matter translocated and stored in the grains (Abou-Khadrah *et al*. 1999).

3- Guideline for responsing faba bean varieties to irrigation water salinity:

The yield of crop is taken as a criterion when cultivated plants are compared together according to their tolerance to salt stress. The relative yield of the crops irrigated with saline water is compared with its absolute yield irrigated with fresh water. The salinity level of irrigation water causing a 25% yield reduction is taken as a threshold for the given variety (FAO 1985).

Data of the relative decrement of yield versus salinity of water were evaluated throughout linear equations for faba bean varieties. The relative yield decrement % represent the dependent variable and the equation takes the form $y = a x + b$

Where :

y = relative decrement %

x = water salinity

a = (slope) yield reduction % with increasing EC_w by one unit

b = the intercept

the regression equations describe the effect of water salinity (EC_w) on yield decrement % of ten varieties of faba bean were calculated and shown in Table (5).

Table 5 : Regression equations for yield decrement and values of tolerant water salinity for different faba bean varieties

Variety	y = a x + b	EC_w caused 25% dS/m
Giza 461	y = 13.348 x – 0.13048	1.88
Rino More	y = 12.977 x – 0.1858	1.94
Giza 843	y = 11.321 x – 6.9809	2.82
Giza 3	y = 11.05 x – 6.3538	2.84
Sakha 1	y = 11.606 x – 5.7661	2.65
Sakha 2	y = 11.504 x – 9.602	3.01
Sakha 3	y = 11.581 x – 5.8127	2.66
Nobaria 1	y = 10.837 x – 6.473	2.90
Misr 1	y = 10.418 x – 7.6964	3.14
Misr 2	y = 9.6136 x – 8.1963	3.45
	FAO (1985)	2.0

From data in Table (5) it could be showed that Misr 2, Misr 1 and Sakha 2 can be classified as tolerant varieties where the threshold values were 3.45, 3.14, and 3.01 dS/m, respectively. According to the FAO (1985) that the threshold more than 3 dS/m indicate that the variety is tolerant. While Giza 461 and Rino More can be classified as sensitive varieties where the threshold values were 1.88 dS/m and 1.94 dS/m comparison with the value recorded by FAO (2.0dS/m caused reduction 25% in yield).

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تأثير ملوحة ماء الرى على خواص الأرض الكيميائية وبعض أصناف الفول

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الهدف الرئيسى لهذا البحث هو دراسة وتقييم إنتاجية عشرة أصناف من الفول وكذلك خواص الأرض الكيميائية تحت مستويات مختلفة من ملوحة ماء الرى حيث أقيمت تجربتى أصص داخل الصوبه السلكيه بمحطة البحوث الزراعية بسخا – محافظة كفر الشيخ خلال موسمى 2005 / 2006 ، 2006 /2007 وكانت الأصناف هى : نوباريه1 ، جيزة 3 ، جيزة 461، سخا 1، سخا 2 ، سخا 3، رينا مورا (R.M)، مصر 1، مصر 2 و جيزة 843 تحت أربعة مستويات مختلفة من ملوحة ماء الرى وهى :

W1= 0.5 dS/m, W2 = 2.94 dS/m , W3 = 4.82 dS/m W4 = 7.0 dS/m

وتتلخص النتائج التى تم التحصل عليها فيما يلى :

أدت زيادة ملوحة ماء الرى إلى زيادة ملوحة التربة بعد حصاد المحصول من (1.9 – 2.0) dS/m قبل الزراعة إلى (5.93 ، 5.99) (12.53 ، 13.00) (14.44 ، 14.2) dS/m عند معاملات ملوحة الرى W2 ، W3 ، W4على الترتيب فى الموسم الزراعى الأول والثانى كذلك زادت نسبة إدمصاص الصوديوم (SAR) وكانت (4.64 – 4.48) قبل الزراعة إلى (7.79 – 7.63) (12.78 – 12.14) و (14.42 – 15.01) مع W2 ، W3 ،W4 بعد حصاد المحصول على الترتيب فى الموسمين الزراعيين.

كما أدت زيادة ملوحة ماء الرى إلى زيادة أيونات Na^+ , Cl^- فى المحلول الأرضى بعد الزراعة.

بزيادة ملوحة ماء الرى إنخفض المحصول ومكوناته لأصناف الفول ويختلف النقص وذلك تبعا لإختلاف الصنف وملوحة ماء الرى.

أظهرت الأصناف الترتيب التنازلى الآتى وفقاً لإنتاجية البذور و إنتاجية الأصناف مع مستويات ملوحة ماء الرى المختلفة

أولا : مع W1 سخا 2 > جيزة 461 = مصر 1 > R.M = مصر 2 = نوباريه 1 = سخا 1 = جيزة 3 = سخا 3 > جيزة 843.

ثانيا : مع W2 : سخا 2 > مصر 1 ، مصر 2 > نوباريه1 = سخا 1 = سخا 3 = جيزة 3 > جيزة 843 = جيزة 461 > M. .

ثالثا : مع W3 : سخا 2 = مصر 1 = مصر 2 > نوباريه1 = جيزة 3 > سخا 1 = جيزة 843 = سخا 3 = جيزة 461 = R.M .

رابعا : مع W4 : مصر 2 = مصر 1 = سخا 2 > نوباريه1 =سخا 1 = سخا 3 > جيزة 3 = جيزة 843 > جيزة 461 = R.M .

كما أوضحت النتائج أن زيادة ملوحة ماء الرى أدى إلى نقص محصول القش وعدد الأفرع / نبات وعدد القرون / نبات وعدد البذور / نبات ووزن مائة بذرة تبعاً لإختلاف الأصناف وتوضح النتائج أن الأصناف مصر 2 ، مصر 1 ، سخا 2 أكثر الأصناف تحملا لملوحة ماء الرى مما يمكن التوصية بزراعتها فى حالات الإضطرار لإستخدام مثل هذه النوعيات من مياه الرى وكانت الأصناف جيزة 461 وريناموار حساسة طبقاً للـ (1985) FAO.

Table (2) : Some chemical analysis of soil after harvesting of faba bean

Season	Irrigation water salinity dS/m	ECe dS/m	Soluble cation meq/L				Soluble anion meq/L				Total N %	Availa
			Ca^{+2}	Mg^{+2}	Na^{+}	K^{+}	CO_3^{--}	HCO_3^{-}	Cl^{-}	So_4^{--}		P
First season	W1 (0.50)	2.08	7.6	2.4	10.6	0.2	-	3.5	9.3	8.0	0.08	5.6
	W2 (2.94)	5.93	22.2	5.5	29.0	2.6	-	7.5	27.5	24.3	0.09	5.7
	W3 (4.82)	12.53	36.5	18.8	67.2	2.8	-	8.6	62.1	54.6	0.09	5.7
	W4 (7.00)	14.44	38.4	23.1	80.0	2.9	-	9.5	74.1	60.8	0.10	5.8
Second season	W1 (0.5)	2.10	6.8	4.18	9.8	0.22	-	3.5	9.5	8.0	0.07	5.5
	W2 (2.94)	5.99	20.0	8.50	28.8	2.6	-	7.0	26.5	26.4	0.08	5.6
	W3 (4.82)	13.00	33.5	27.0	66.8	2.7	-	7.8	60.7	61.5	0.09	5.6
	W4 (7.00	14.20	37.5	20.7	81.0	2.8	-	8.8	76.0	57.4	0.09	5.7

Table (3) : Effect of irrigation water salinity on seed weight and straw yield of some faba bean varieties

Variety	First season (water salinity dS/m)				Second season (water salinity		
	W1(0.5)	W2 (2.94)	W3 (4.82)	W4 (7.0)	W1(0.5)	W2 (2.94)	W3 (4.8
Seed yield, g/plant							
Giza 461	8.78 b	4.55 e	2.97 c	1.07 d	8.90 b	4.65 e	3.00 c
Rina More	7.65 c	3.95 f	2.98 c	1.08 d	7.47 c	4.01 f	2.99 c
Giza 843	6.2 d	4.78 e	3.03 c	1.72 c	6.23 d	4.83 cd	3.2 c
Giza 3	7.36 c	5.38 d	4.06 b	2.00 c	7.38 c	5.48 d	4.16 b
Sakha 1	7.33 c	5.53 d	3.03 c	2.10 bc	7.37 c	5.63 d	3.11 c
Sakha 2	10.53 a	8.82 a	5.2 a	2.92 ab	10.5 a	8.79 a	5.2 a
Sakha 3	7.10 c	5.36 d	3.0 c	2.03 bc	7.13 c	5.45 d	3.01 c
Nobaria 1	7.43 c	5.56 d	4.2 b	2.14 bc	7.4 c	5.56 d	4.2 b
Misr 1	8.9 b	7.19 b	5.1 a	2.95 a	8.9 b	7.27 b	5.07 a
Misr 2	7.9 c	6.6 bc	5.1 a	2.97 a	7.93 c	6.69 bc	5.08 a
Straw yield, g/ plant							
Giza 461	13.56 b	8.22 fg	5.95 f	3.07 h	14.25 c	8.83 f	5.61 g
Rina More	14.12 a	8.58 e	4.95 g	2.58 i	14.13 c	9.17 e	4.61 i
Giza 843	9.31 g	7.33 h	4.82 g	3.41 fg	9.95 I	8.16 g	5.45 h
Giza 3	14.16 a	10.44 b	8.45 bc	7.46 a	14.56 b	11.15 b	9.11 bc
Sakha 1	11.9 e	8.98 d	7.33 e	5.4 de	12.69	9.65 d	8.00 e
Sakha 2	14.26 a	10.78 a	8.50 b	6.62 bc	14.92 a	11.44 a	9.10 bc
Sakha 3	12.44 d	10.42 b	8.56 b	5.35 de	13.13 e	11.12 b	9.21 b
Nobaria 1	12.27 d	10.09 c	8.17 d	6.61 bc	12.83 f	10.10 c	9.00 c
Misr 1	12.81 c	10.56 ab	9.78 a	7.45 ab	13.63 d	11.23 b	10.41 a
Misr 2	11.19 f	9.33 d	8.46 b	7.46 a	11.81 h	10.00 c	9.12 bc

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