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EVALUATION OF WATER SALINITY ON SOME SOIL PROPERTIES AND SALT TOLERANCE OF SOME WHEAT CULTIVARS

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ABSTRACT

Two pot experiments were conducted under wire proof-green house conditions to study the influence of irrigation water salinity on the state of soil salinity yield, yield components and chemical composition of four wheat cultivars. The wheat cultivars were; Sakha 93 (CV_1), Sakha 94 (CV_2), Gemmiza 10 (CV_3) and Sakha8 (CV_4). The levels of salinity of the irrigation water were; 0.4 (control treatment), 4.0, 8.0, 12.0 and 16.00 dS/m; S_1, S_2, S_3, S_4 and S_5 respectively at sodium absorption ratio about 7 (SAR 7). The observed results can be summarized as follows:

1- The results revealed that the increase in EC_e value of studied soil samples were 10.46, 16.26, 22.93 and 24.65 dS/m which resulted from using irrigation water having EC_w of 4.0, 8.5 , 12.5, and 16/dSm, respectively compared with control EC_e value of 5.2 dS/m. Sodium adsorption ratio (SAR) and ESP were increased as a result of Na accumulation in the used soils.
2. Grain and, straw yields, total dry matter, 100 grain weight and harvest index were significantly decreased with increasing EC_w . The observed reduction in grain yield caused by increasing water salinity from 0.4 to 16.0 dS/m were (71.05 and 63.66%) , (72.21 and 69.55%) , (66.55 and 73.9%) and (70.63 and 77.85%) for CV., CV_2, CV_3 and CV_4, respectively in the first and second seasons.
3. The study showed that the cultivars differed in their tolerance to water salinity levels. Sakha 94 wheat cultivar was tolerate up to EC_w=8.0 dS/m. While Sakha 93, Gemmeiza (10) and Sakha 8 were tolerate up to 4.0 dS/m.
4. The chemical composition of wheat cultivars was affected by water salinity levels. The control treatment obtained the highest values of N,P, and Kuptake by grain and straw yields.

Keywords: Soil salinity, water salinity, wheat cuiltivars.

INTRODUCTION

In view of the enormous expenses of saline soils and the necessary increase in crop prod':ction to meat the world's expanding population such as breeding programe may well prove to be of extreme importance. Egypt started to look at waste water reuse for irrigation and crop production in order to cover the shortage of good quality water and meet their demands for more food production. About 7.7 billion cubic meter of drainage water are expected to used for irrigation in the Delta by the year 2000 (Abou- Zeid, 1995). This water contains more of soluble salts which can affect plant growth. Water stress and salt damage of effects are the most important limiting factors in wheat productivity in the semi-arid region of the world. Therefor, the new wheat cultivars that use little available water are more efficiently and able to tolerate drought is a major goal for increasing productivity under the drought conditions in Egypt. The management of saline irrigation waters require a good understanding of crop- salinity relations and particularly under field conditions. Wheat was chosen for this study because of wheat bread is the main diet for the Egyptian population. Mass (1986)stated that wheat is a tolerant crop to salt concentration.

The objective of this study is to evaluate the effect of saline irrigation water on soil properties and to select the suitable tolerant wheat cultivars adopted for this level of water salinity and soil conditions.

MATERIALS AND METHODS

The study was conducted under wire proof house conditions at Sakha agriculture Research Station.

The experiment was carried out under free drainage condition in clay pots (30cm diameter and 40 cm hight). The soil used was clayey texture (51.27% clay, 28.29% silt and 20.44 sand). Soil samples were air dried and the soil paste extract was analysed for EC_e, soluble cations and anions (Table 1) and mechanical analysis was carried out according to Richards (1954). Four wheat cultivars were tested Sakha 93 (CV_1), Sakha 94 (CV_2) Gemmiza 10 (CV_3) and Sakha 8 (CV_4). Wheat cultivars were planted at rate of 10 grains / pot in winter seasons of 2004 and 2005.

Table (1) Chemical characteristics of the investigated soil

EC_e	Soluble cations (me /L)				Soluble anion (me /L)				SAR^*	ESP^{**}
dS/m	Ca^{++}	Mg^{++}	K^+	Na^+	CO_3^{--}	HCO_3^-	CL^-	SO_4^{--}		
4.8	6.92	7.73	0.68	32.76	-	3.2	34.24	10.61	12.16	14.30

*-Calculated according to jurinak and Saurez (1990)
**-Calculated according to Gazia (2001).

All pots were irrigated with tap water for the fist time. After germination constant a volume of water was used to irrigate all pots. The levels of salinity of irrigation waters were 0.4 (Tap water), 4.0, 8.0, 12.0 and 16.0 dS/m for the control S_1, S_2, S_3, S_4, and S_5 treatments respectively. The salinity of irrigation water adjusted by blending appropriate amounts of NaCl, $CaCl_2$ and Mg CO_3 with tap water to give the required levels of water salinity at sadium absorption ratio of 7 according to Atwa (2005). All pots of the experiment were treated with 15.5 Kg P_2O_5 / fed as super pheshate fertilizer (15.5% P_2O_5) at the time of planting and 75 kg N/fed in the form of urea (46 % N) which splitted in three equle doses, the first dose at sowing, the second and the third ones were applied at tillering and booting stages. The experiments were conducted in split plot design with four replicates, the main plots were arranged for salinity levels and the sup plots were for wheat cultivars. Data were subjected to statistical analysis according to Snedecor and Cochran (1980). After maturity the plants were weighted for fresh weight and then dried at 70°C for 48hr. The parameters of yield and yield components were recorded (Table 3).

The dried plant samples were ground and then wet digested according to the method described by Chapman and Pratt (1961) to determine total N, P, K and Na (mg/pot) Tables (4 and 5). Total nitrogen percent in the digested was determined by using the modified Kjeldahl method (Cottenie et al, 1982). Total phosphorus was determined using the colorimetric method (Jackson, 1958). Potassium and soduim were determined by using a faime photometer (Jackson , 1958)

After the harvesting soil samples were taken from all pots and analyzed for salinity measurements and soluble cation and anion (Table 2).

Table (2) Chemical characteristics of the investigated soil as affected by irrigation water salinity after harvesting.

EC_w dS/m	EC_e dS/m	Soluble cations (me/ L)				Soluble anion (me /L)				SAR*	ESP**
		Ca^{++}	Mg^{++}	K^+	Na^+	CO_3^{--}	HCO_3^-	CL^-	SO_4^{--}		
04	5.2	7.5	8.38	0.74	35.5	-	4.06	37.14	10.92	12.59	14.76
4.0	10.46	21.88	16.90	0.87	66.25	-	4.37	81.25	20.28	15.04	17.32
8.0	16.26	31.43	26.30	1.18	104.76	-	4.50	132.19	26.98	19.49	21.55
12.0	22.93	32.42	29.66	1.22	166.00	-	4.68	183.00	41.62	29.79	29.33
16.0	24.65	38.47	34.68	1.35	173.00	-	5.93	197.00	44.57	28.60	28.58

*-Calculated according to jurinak and Saurez (1990)

**-Calculated according to Gazia (2001).

RESULTS AND DISCUSSION

Soil salinity :

Data in table (2) and Fig (1) showed the electrical conductivity of soil paste extracts (EC_e) were increased as the elctrical conductivity of irrigation water increased this was from salt accumulation by evapotranspiration process and relative high residual salt content for alluvial soil beside of the addition of more soluble base into the soil through the application of saline water. The increase in EC_e was promoted by 2.61 folds with S_2 and 2.03 fold with S_3. These results are close to Atwa (2005). While at S_4 and S_5 the experimental results indicated that soil salinity (EC_e) is approximately equals to 1.9 and 1.54 times of irrigation water salinity EC_w which is close to that obtained by Mass and Hothman (1977). They recorded that (EC_e= 1.5 EC_w).

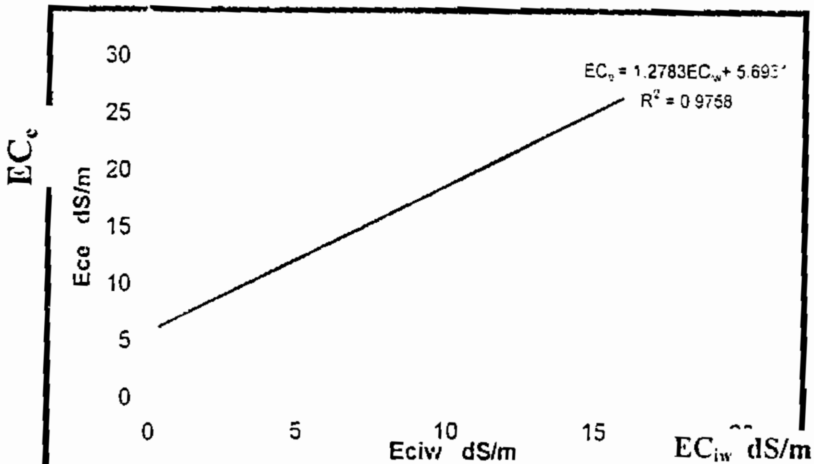

Fig1 : Electrical conductivity of soil soluoation extract as a function of the electrical conductivityof irrigation water

Table (3): Effect of irrigation water salinity on total dry weight (g/pot), grain and straw yields (g/pot), 100 grains weight (g) and harvest index.

Salinity levels, dS/m	2004-2005 season					2005-2006 season				
	Cultivars									
	CV_1	CV_2	CV_3	CV_4	Meun	CV_1	CV_2	CV_3	CV_4	Meun
					Grain yield (g/pot)					
S_1	16.360a	15.360a	12.043a	18.108a	15.468a	16.448a	14.823a	15.425a	22.013a	17.177
S_2	15.053a	14.040a	11.798a	17.148a	14.509a	16.273a	12.870ab	10.980b	19.223a	14.836
S_3	8.973b	13.76a	6.875b	10.065b	9.918b	8.038b	11.800b	10.608b	11.623b	10.287
S_4	6.038bc	6.358b	4.105b	6.028c	5.632c	6.435b	7.258c	7.155c	6.290c	6.784
S_5	4.735c	4.268b	3.793b	5.318c	4.528c	5.997b	4.513c	4.023c	4.880c	4.848
Mean	10.232	10.757	7.722	11.333	10.011	10.634	10.169	9.638	12.806	10.787
					Straw yield (g/pot)					
S_1	23.258a	25 149a	20.378	24.845	23.406	23.538a	17.543a	23.685a	29.330a	23.524
S_2	18.288	16.465	16.223	23.550	18.631	23.413a	17.270a	15.985b	23.390b	20.014
S_3	14.988	14.183	14.090	13.373a	14.158	11.693b	14.283b	15.100bc	13.863c	13.734
S_4	9.323	9.680	8.575	8.643	9.055	11.200b	11.445bc	12.535cd	10.325d	11.0376
S_5	9.303	7.640a	7.508a	7.133a	7.896	10.593b	10.065c	10.335d	5.913e	9.226
Mean	15 032ab	14 622ab	13.355b	15 509a	14.629	16.087	14.121	15.528	16.564	15.575
					Total dry weight (g/pot)					
S_1	47.173	42.64	41.995	47.768	44.894	45.745a	38.518a	45.403a	54.288a	45.988
S_2	33.740	34.268	36.700	45.165	39.218	42.052a	34.335ab	32.220b	49.245a	39.463
S_3	27.260	31.005	24.248	27.116	27.407	24.640b	30.080b	31.060b	28.483b	28.566
S_4	18.178	20.440	18.053	19.290	18.990	22.655b	22.560c	23.593c	21.275c	22.521
S_5	14.098	15.600	13.900	15.720	14.831	20.100b	18.325c	17.598d	12.893d	17.229
Mean	29.090a	29.191ab	26.979b	31.013a	29.068	31.039	28.764	29.975	33.237	30.753
					100- grains weight (g)					
S_1	3.706	3.975	3.093b	3.923	3.674	4.508a	3.588a	3.630a	3.855a	3.895
S_2	3.690	3.223	3.135	3.965	3.503	3.743b	3.408a	2.828bc	3.168bc	3.286
S_3	2.990	3.545	3.613	4.085	3.558	2.928c	3.290a	3.343ab	3.490c	3.263
S_4	2.783	2.700	3.010	3.248	2.935	2.718c	3.113a	2.735cd	2.805c	2.843
S_5	3.178	2.788	3.040	2.765	2.943	2.878c	2.540b	2.223d	2.745c	2.596
Mean	3.270ab	3.246ab	3.178b	3.597a	3.333	3.355	3.188	2.952	3.213	3.177
					Harvest indes					
S_1	0.343a	0.353abc	0.283a	0.388a	0.341a	0.355ab	0.408a	0.338a	0.409a	0.376a
S_2	0.380a	0.388ab	0.320a	0.380a	0.367a	0.400a	0.375a	0.348a	0.383a	0.376a
S_3	0.330a	0.443a	0.280a	0.370a	0.356	0.330ab	0.395ab	0.343a	0.403a	0.352ab
S_4	0.328a	0.315bc	0.223a	0.310a	0.294b	0.288b	0.328ab	0.300ab	0.298a	0.303bc
S_5	0.343a	0.273c	0.240a	0.303a	0.289b	0.300ab	0.238b	0.218b	0.375a	0.283c
Mean	**0.345**	**0.354**	**0.269**	**0.350**	**0.329**	**0.335**	**0.337**	**0.309**	**0.372**	**0.338**

$Yr = 100\text{-}b\ (EC_e - a)$

Where: Yr = Relative yield (percent)

EC_e = Salinity of soil saturation extroctin dS/m

a =salinity threshold value.

b =yield loss per unit increuse in salinity

The threshold EC_e values (â) were 2.5 for CV1 , CV3 and CV4 and the value was 5 forCV_2. The slope (b) values were approxinately – 3.43, -3.15, -3.30 and –3.16. Mass (1990) shows that the threshold value for wheat (TriTcum Aestivum) was 6.0 dS/m and b was 7.1 but he suggested that absolute tolerances vary depending upon climate, soil condilions, and cultural practices.

The resulte show that at the water salinity levels from 4 and 8 dS/m the increasing of EC_e were more than that of 12 and 16 dS/M of water salinity. The relative cation composition of saturation extract which is indicator for soil solution was materially altered by saline irrigation water. The dominante cation becoms sodium and the SAR value was increased from 12.16 to 28.60 with increasing EC_w value up to 16 dS/m. Meanwhile, the calculated ESP value was also increased to be 26.58. El Ashtar (2005) reported similar trend. The concentration of Ca and Mg ions in the soil extract was significantly increased as a result of increasing water salinity, However, K concentration was slightly affected.

Effect of salinity on yield:

Grain yield (g/Pot):

There was a significant decrease in grain yield as water salinity increased from 0.4 to 16.0 dS/m (Table 4). The observed reduction were (71.05% and 63.66%), (72.21 and 69.55%), (68.5% and 73.91%) and (70.63% and 77.83%) for CV_1, CV_2, CV_3 and CV_4, respectively in the first and second seasons.

According to FAO (1973) scale for salinity tolerance depending on relative yields (75% of the control) the data of the first and second seasons Fig (2,3) showed that Sakha 94 wheat cultivar (CV2) tolerates up to 8.0 dS/m while Sakha 93 (CV1), Gemmeiza 10 (CV3) and Sakha 8 (CV4) tolerant up to 4.0 dS/m . When salinity level was increased up to 12 and 16 dS/m all cultivars were sensitive to irrigation water salinity and the grain yield reduction was more than 50% of control. Mengel and Kirkby (1987) showed that soluble salts depress the water potential of the nutrient medium and hence restrict water uptake by plant roots.

Plants can adapt to this water stress by osmoregulation or osmtic adjustment by uptake of inorganic ions and syninesis and accumulation of organic solutes. Fig (4) show the relationship between the relative grain yield and soil salinity (EC_e) which can be expressed as stated by Mass and Hoffman (1977) and Bresler (1987) in this formula.

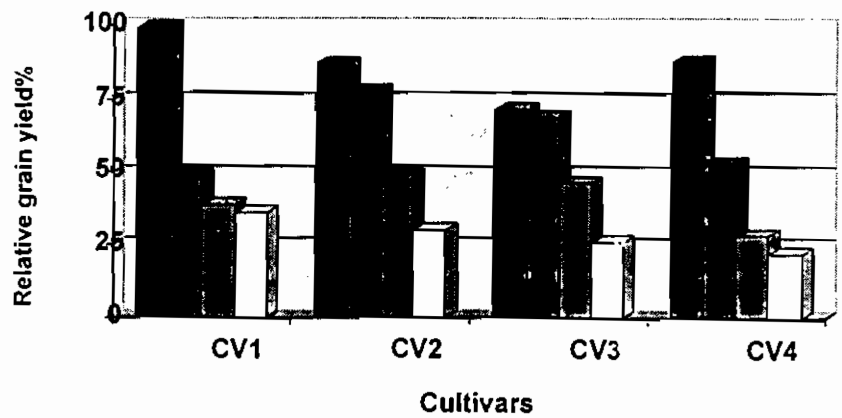

Fig (2): Relative grain yield (0.4 dS/m as a control) of wheat cultivars in first season.

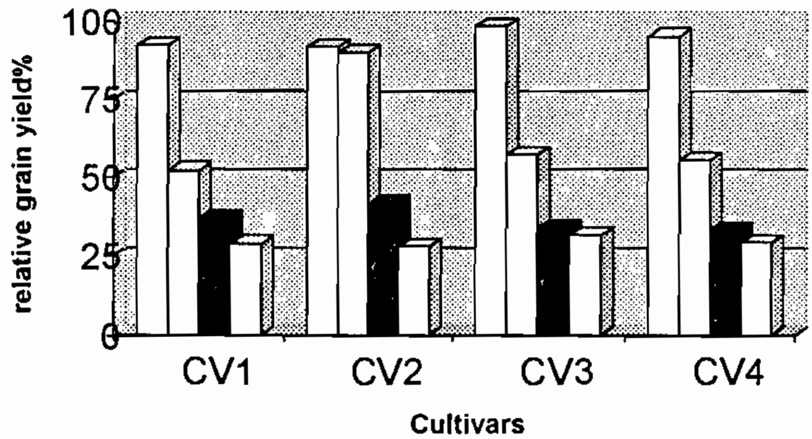

Fig (3): Relative grain yield (0.4 dS/m as a control) of wheat cultivars in second season.

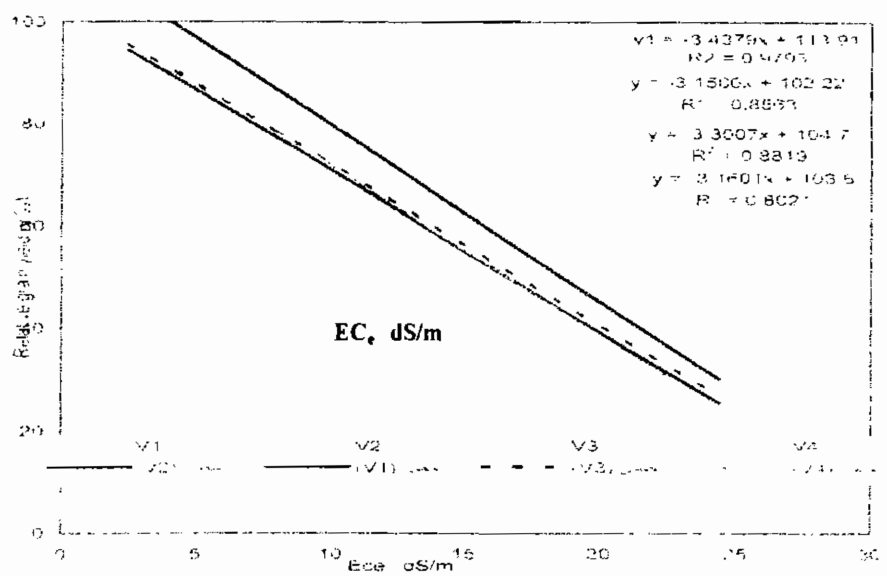

Fig ( )The relative values of the garin yield of the four shold cultivars as a function of soil salinity

Straw yield (g/pot)

Straw yield data in Table (4) showed that it was decreased by increasing water salinity from 0.4 to 16 dS/m, the reductien were (60.00 and 54.94%), (69.61 and 42.62%), (63.15 and 56..36%) and (71.28 and 79.83)% for CV1, CV2 , CV3 and CV4, respeclively in the first and second seasons these results are in agreement with those obtained by Zein et al., (2003).

attributed to the decrease in number and length of stem internods. This result denotes that under these conditions straw yield was generally less sensitive to salinity than grain yield.

This finding is disagrees with Mengel and Kirkby (1987). Thay stated that in most cereal crops grain yields are less affected than straw yields

Total dry matter (g/pot):

Data in Table (4) revealed that the total dry matter for studied wheat cultivars were decreased with increasing salinity levels of irrigation water. The observed reductions caused by increasing water salinity from 0.4 to 16 dS/m were (70.11 and 56.06%), (63.41 and 52- 41%), (66.46 and 61.24%) and (67.5 and 76.25%) for CV_1, CV_2, CV_3, and CV_4, respectively in the first and second seasons. This results agree with those repoted by Kramer (1975) and Jonas et al, (1992) who noted that under stress conditions, photosynthesis was reduced by closing of stomata, which decreased the supply of carbon dioxide and thus growth. The results of reduction in the two seasons indicate that Sakha 94 wheat cultivar was more tolerant to salinity than the others.

Table (4): Effect of water salinity levels on N, P, K and Na uptake by wheat grain yield.

Salinity levels, dS/m	2004-2005					2005-2006				
	Cultivars									
	CV_1	CV_2	CV_3	CV_4	Mean	CV_1	CV_2	CV_3	CV_4	Mean
	N uptake (mg/pot)									
S_1	498.260a	412.013a	3.78.385a	443.635a	433.073a	417.208a	257.583a	397.833a	478.523a	387.786
S_2	383.758b	372.063a	3.44.483a	414.965a	378.818b	347.230b	267.723a	304.668b	344.725b	316.086
S_3	254.820c	346.753a	195.253b	293.698b	272.681c	172.238c	217.008ab	243.873b	223.435c	214.138
S_4	139.468d	160.210b	90.725c	163.948c	138.588d	124.180c	151.503bc	123.113c	132.060d	132.714
S_5	185.590d	101.723b	76.715c	101.168c	96.299e	119.298c	102.430c	67.815c	100.165d	97.427
Mean	276.379	278.552	217.113	283.523	263.892	236.031	199.249	227.460	255.782	229.530
	P uptake (mg/ pot)									
S_1	77.75	76.750	60.000	81.000	73.875	73.750a	69.500a	66.750a	79.000a	72.250a
S_2	69.500	63.000	66.500	72.00	67.750	61.750a	56.500a	45.000b	76.250a	59.875b
S_3	38.750	60.750	44.250	51.000a	48.618	32.250b	40.750b	45.750b	51.500b	42.563c
S_4	29.750	30.000	19.250	29.500a	27.125	28.250b	32.250bc	31.750bc	29.750c	30.500d
S_5	26.00	19.250	19.250	22.250a	21.683	26.500b	21.500c	18.250c	22.500c	22.188e
Mean	48.350ab	49.950a	41.150b	51.150a	47.825	44.500	44.100	41.500	51.800	45.475
	K uptake (mg/ pot)									
S_1	8.500a	6.753a	6.013a	7.058a	7.081a	9.860a	8.852a	9.363a	11.150a	9.805
S_2	7.518a	6.033a	5.775a	6.673a	6.499a	10.335a	6.772ab	5.890b	10.905a	8.476
S_3	4.893b	5.635a	4.988a	4.528b	5.011b	5.543b	5.720b	6.020b4	6.658b	5.985
S_4	3.430bc	2.915b	2.008b	2.958c	2.828c	4.693b	5.088bc	4.370bc	3.723c	4.468
S_5	2.755c	1.915b	1.993b	1.835c	2.124c	4.020b	3.048c	3.070c	2.958c	3.274
Mean	5.419	4.650	4.155	4.610	4.708	6.890	5.896	5.743	7.079	6.402
	Na uptake (mg/ pot)									
S_1	12.188a	10.753a	7.735a	12.050a	10.661	12.243a	10.375a	10.073a	13.718a	11.603
S_2	6.050bc	8.425a	7.078a	10.280a	7.951	7.333b	7.723b	6.588b	11.530a	8.293
S_3	8.522b	8.943a	4.125b	4.470b	6.505	7.637b	7.258b	6.323b	6.323b	6.885
S_4	4.475c	3.813b	3.088b	4.218b	3.898	4.828c	4.355c	5.373bc	4.403bc	4.739
S_5	3.500c	2.988b	3.465b	4.133b	3.521	4.503c	3.160c	3.623c	3.645c	3.733
Mean	6.941	6.984	5.098	7.030	6.513	7.309	6.5711	6.397	7.923	7.051

100 grains weight (g)

100 grain weight was signifiantly decreased with increasing water salinity from 0.4 to 16 dS/m in both seasons. The observed reductions were (14.29 and

36.15%), (29.86 and 29.21%), (1.17 and 38.76%) and (29.51 and 28.79%) for CV_1, CV_2, CV_3, and CV_4 in the first and second seasons similar results were found by Abou- Kbadrah et al. (1999)

Harvest index: (Total grain / total dry mater)

The harvest index percentage is an important yield parameter of wheat crop. The results in Table (4) indicated that, the harvest index was affected significantly with water salinity levels. The overall mean values of harvest index for wheat cultivarsx were in the order Sakha 94> Sakha 8> Sakha 95> Gemmeizen 10 in the first season while in second season this order was Sakha 8> Sakha 94> Sahka 93> Gemmeiza 10 these results indicate that Sakha 94 and Sakha 8 were relatively tolerent to water salinity while gemmeiza (10) was sensitive.

Nutrients uptake:

Nitrogen uptake:

Data recorded in Table (5) indicat that the mean of nitrogen absorbed by grain yield of wheat crop (mg/ pot) tended to decrease significantly due to the increase of the levels of water salinity. The control treatment produced the highest values of N-uptake in both two seasons. The observed reductions in N uptake by grain yield caused by in creasing water salinity from 0.4 to 16 dS/ m were (78.80 and 71.40%), (75.31 and 60.23%), (79.97 and 82.95%) and (77.19 and 79.6%), respectively for CV_1, CV_2, CV_3, and Cv_4 in the first and second seasons. These results are in accordance with that found by Atwa (2005) who supported that the depressive effect can be attributed to the reduction in yield of dry matter and descent in N- concentration due to CL competes very strongly with NO_3^- for binding sites of the plasma membrane and can suppress the transport of NO_3^- from the external solution. The results in (Table 4), show that the amount of nitrogen in straw yield of wheat was significantly decreased with increasing water salinity levels. The highest nitrogen content was obtained with control treatment. The observed reductions were (62.37 and 55.58%), (72.94 and 48.94%), (57.98 and 51.21%), and (57.34 and 69.77%) for CV_1, CV_2, CV_3, and CV_4, respectively in the firest and second seasons.

These results are in close agreement with those obtained by Abo El-Soud (1989), parasher and Varma (1987) and Padole (1991).

Phosphorus uptake:

Water salinity exerted a significant effect on the P uptake decreasing it as water sulinity increased. The reductions in P uptake in grain yield with increasing water sainity from 0.4 to 16 dS/m were (66.55 and 64.06%), (71.91 and 69.06%), (67.91 and 72.65%) and (72.53 and 71.51)%, respectively for CV_1, CV_2, CV_3, and CV_4 in the first and second seasons. The reductions in P uptake for straw yield were (57.04 and 52.86%), (44.32 and 44.56%), (79.78 and 58.21%) and (53.90 and 77.25%) for CV_1, CV_2, CV_3, and CV_4 in the first and second seasons. This reduction may be attributed to the effect of water salinity in stunting plant growth and dry matter content in addition to effect of salinity in decreasing phosphorus concentration in wheat grains. These results are satisfactory consistent with Singh et al. (1992), Mingel and

Kikrby (1987) who mentioned that if the P supply to cereals is inadequate during the early stages of development, a reduction in the number of ears per unit of area and hence a depression in crop yield will be resulted.

Potassium uptake:

The results in Table (5) show that K uptake in grain yield of wheat cuetivars was not affected significantly by water salinity levels, S_1, S_2 in season (2005) and S_1, S_3 in season (2006), and was affected significantly by other water salinity levels. K uptake in straw yield of wheat cultivars (Table (5) was affected significantly by water salinity S_2 in season (2005) and S_2, S_3, S_4, and S_5 in season (2006) while was not affected by other water salinity levels, The observed reductions in K uptake in grain yield as water salinty increased from 0.4 to 16 dS/m were (67.59 and 59.23%), (71.64 and 65.65%), (66.85 and 67.21%), and (74.00 and 73.47%) for CV_1, CV_2, CV_3, and CV_4, respectively in season (2005) and (2006), with respect to K uptake in straw the reduction were (69.38 and 65.55%), (71.08 and 43.1%), (79.61. and 75.64%) and (20.86 and 81.48%) for CV_1, CV_2, CV_3, and CV_4 in seasons (2005) and (2006), Mingle and Kirkby (1987) suggested that plants which are poorly supplied with k^+ accumulates in them low molecular weight such as amino acids and sugars and leads to impare enzyme activity and also to an indaquate energy (ATP) supply which consequently may induce delay in ptotine synthesis.

It is of important to note that the mean of K uptake in straw was much higher than in grain these data were supported by the data obtained by El-Yamani (1994) and Zein et al. (2002) who found that the mean K concentration in straw was 6 folds higher than that the mean value in root of wheat.

Sodium uptake:

The results in Table (5) show that Na uptake in grain yield of wheat cultivars was not affected significantly by water salinity level S1 in 2005 and 2006 seasons and was affected significantily by other water salinity leveles, Na-uptake in straw yield of wheat cultivars (Table 5) was affected significantly by water salinity levels. Results showed that Na concentration in straw was much higher than in grain of wheat such result was previously found by Zein et al. (2002). Sodium concentration in grain was increased from 0.06% to 0.09% with increasing EC_w from 0.4 to 16.0 dS/m while this increasing in straw were (0.78% to 1.60%). (These values are the means of the two seasons).

Mingle and Kirkby (1987) found that where an excess of Na^+ and low k^+ concentration was found. This imbalanced ionic status was associated with impaired Co_2 assimilation and a drastic reduction in lipid turnover. The lowest Na uptake in straw was obtained by Sakha 94 at S_2, S_4 and S_5 (2005) and at S_1, S_2, S_3, S_4, S_5 (2006). Ahsan et al (1996) found that salt-tolerant lines had significantly lower accumulation of Na in leaves than salt-sensitive lines. This is lead to that Sakha 94 wheat cultivar was more tolerant than the others. In the other hand Gemmiza wheat cultivars was the only cultivar in which Na uptake in straw was increased from (125.63 to 147.18) to (126.54 to 174.16) in 2005 and 2006 seasons, respectively with increasing EC_w from 0.4

to 16.0 dS/m. This indices that Gemmeiza (10) was more sensitive to irrigation water salinity.

Table (5): Effect of salinity levels on N, P, K and Na uptake by straw yield of wheat.

Salinity levels, dS/m	2004-2005					2005-2006				
	Cultivars									
	CV_1	CV_2	CV_3	CV_4	Mean	CV_1	CV_2	CV_3	CV_4	Mean
					N-uptake (mg/pot)					
S_1	159215a	210835a	16723a	155936a	173569	161200b	149378a	194553a	184765a	172174
S_2	153730a	103520b	148010ab	196298a	150389	194533a	109653bc	143315b	192555a	160047
S_3	95245b	119140b	118070bc	106495b	109738	89608c	119973ab	159115b	111638b	120047
S_4	67790b	77110bc	78382ad	98100b	80346	80660c	105670bc	103175c	87053bc	94139
S_5	59905b	57045c	70257d	65898b	63524	71468c	76185c	94910c	55853c	74604
Mean	107.170	113531	116392	124953	115513	119494	112178	139014	126399	124271
					P-uptake (mg/pot)					
S_1	33720a	28913a	35658a	22408b	30179	21.183a	17003a	23733a	26065a	21997
S_2	16538b	23673ab	16862b	35323a	23176	21328a	15540ab	16400b	21600b	18747
S_3	15258b	24815ab	14080bc	24738b	19875	12405b	12615bc	15713b	13180c	13486
S_4	7640c	13350bc	7973cd	15129c	12276	8905b	10300c	11600c	10145c	10261
S_5	14463b	16095c	7206d	10336c	12031	9986b	9425c	9920c	5928d	8814
Mean	17658	22411	16359	21592	19507	14785	12977	15494	15358	14661
					K-uptake (mg/pot)					
S_1	41600a	415000a	460000a	400000a	437500	4500a	2900a	5400a	5425a	455625
S_2	327500ab	277500b	272500b	38250a	31500	4275b	2900a	2625b	3475b	311875
S_3	182500a	212500a	157500a	15500a	194375	1775b	2125c	2300b	2225c	213125
S_4	12250a	12000a	17500a	11000a	131875	1475b	1525b	2575b	1325d	172500
S_5	12750a	12000a	9375a	8300a	107313	1550b	1650b	1315c	7325d	131.183
Mean	2350	2290	237.75	24.71	237213	27150	22200	2343	25565	250363
					Na-uptake (mg/pot)					
S_1	220.110a	175518a	12563a	21431b	183897ab	222538b	19185	147.163a	252225a	167.117
S_2	21834a	15457ab	168325a	278298a	209883	279955a	16234a	183625a	274405a	226346
S_3	199.768ab	147223ab	135.778a	148613c	157875bc	187950b	148943a	163925a	155280b	169021
S_4	143145b	117605ab	13551a	138933c	134056cd	172275b	147808a	159.778a	165878b	171.434
S_5	154955b	107.718b	126540a	112945c	125764d	182700b	138273a	1714.165a	95745c	147.736
Mean	187305	140547	142503	173926	162295	209096	130376	173.747	138.705	176731

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تقييم تأثير ملوحة مياه الرى على بعض خواص التربة ومـدى مقاومـة بعـض أصناف القمح للملوحة.

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أقيمت تجربتان فى أصص بالصوبة السلكية بمحطة البحوث الزراعية بسخا لدراسة تأثير مياه الرى المالحة على ملوحة التربة وعلى محصول القمح ومكوناته وتركيبه الكيميـائى لأربعـة أصناف من القمح وهى سخا ٩٣، سخا ٩٤، جميزة ١٠، سخا ٨ ورويت هذه الأصناف بخمسـة مستويات من المياه المالحة وهى ٠,٤ (معاملة مقارنة)، ٤، ٨، ١٢، dS/m١٦.

ويمكن تلخيص النتائج كما يلى:-

١- الزيادة فى التوصيل الكهربى للتربة EC_e كانت ١٠,٤٦، ١٦,٢٦، ٢٢,٩٣، ٢٤,٦٥ dS/m مع تركيز ملوحة مياه الرى ٤، ٨، ١٢، ١٦ dS/m وقد زادت قيمة SAR، ESP نتيجـة تراكم الصوديوم فى التربة.

٢- أوضحت النتائج أن زيادة الملوحة أدت الى انخفاض انتاجية كل من محصول الحبوب والقش والمادة الجافة ووزن المائة حبة ودليل الحصاد وكان الإنخفـاض فـى الحبـوب كالتـالى (٧١,٠٥و٦٣,٦٦%)، (٧٢,٢١و٦٩,٥٥%)، (٦٨,٥و٧٣,٩١%)، (٧٠,٦٣و ٧٧,٨٥%) للموسم الأول والثانى على الترتيب

٣- أظهرت النتائج أن صنف قمح سخا ٩٤ كان متحملا لملوحة مياة الرى حتى ٨ dS/m بينما سخا ٩٣، جميزة ١٠ وسخا ٨ تحملت الملوحة حتى ٤ dS/m.

٤- تأثر التركيب الكميائى لإصناف القمح المختلفة تأثيرا معويا بزيادة الملوحة وكانت أعلى قيمة لمحتوى الحبوب والقش من عناصر النيتروجين والفسـفور و البوتاسـيوم عنـد معاملـة الكنترول.