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SOAKING OF WHEAT GRAINS WITH DIFFERENT SOLUTIONS BEFORE CULTIVATION IN CLAY LOAM SOIL IRRIGATED WITH DILUTED SEA WATER

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ABSTRACT

To study the effect of soaking of wheat grains in solutions of different materials groups on plant dry matter yield and mineral composition under irrigation with saline water, a pot experiment was conducted. The groups included 4 growth regulators, 3 amino acids, 2 chloride solutions, 2 potassium solutions, 4 sulphates of micronutrient solutions and distilled water as a control in addition to not soaked grain treatment. Diluted sea water of 0.52% total soluble salts was used in irrigates pot after till wheat maturity 14 days of planting. Statistically analyzed data revealed that wheat plants responded markedly to soaking treatments at different levels reached to relative increases of 140 and 120% of soaking in distilled water treatment for grains and straw yields respectively. Nitrogen and micronutrients uptake by grains and straw was increased by using solution soaking over dry planted grains or those soaked in distilled water. Phosphorus and potassium uptake produced increases in some treatments and reductions in others. It could be concluded that soaking pretreatment for germinated grains was useful as a general under these conditions where using diluted sea water is the obligatory irrigation water.

Key words: clay loam soil, wheat, soaking solutions, saline irrigation water.

INTRODUCTION

Under some special cases such as salinity stress in soil or irrigation water, untraditional treatments should be needed to encourage plants to face these hard conditions. Seed soaking is one of these treatments.

Zankov(1962) revealed that presowing grains of maize in a solution containing 150mg of each of $CuSO_4$, borax, $ZnSO_4$ stimulated seeds as well as increased plant growth. On the other hand, Sing and Darra(1971) stated that seed presoaking of IAA, NAA and GA_3 had the favorable effect on the yield of wheat grains.

In this respect, Chhipa and Lai(1978) and Mehta *et al.*, (1979) concluded that soaking of wheat seeds in 3% NaCl has a good effect for increasing grain yield. Also, Padol (1979) found that soaking of wheat seeds in solution of both 2%Urea or KH_2PO_4 and 0.04% $ZnSO_4$ or $MnSO_4$ for 6 h increased the grain yield. Seed pretreatment in growth regulators i.e. IAA, IBA, NAA and /or GA_3, increased straw yield of wheat under saline conditions (Balki and Padol, 1982, and Parashar and Varma, 1988).

Ibrahim and Shalaby (1994) reported that the wheat yield was increased by the seed soaking in Zn and Cu, more than the Fe and Mn. They also found that soaking of wheat seeds in Fe, Zn and Cu significantly increased N and P in wheat (straw and grains) and grains, respectively. Seed soaking in Fe, Mn and Zn significantly increased the uptake of Fe and Zn in wheat straw and grain.

Barsoom (1998) found that the dry weight of pretreated plant seeds with two or more micronutrient elements is higher than those of one element. Also, they mentioned that treatment of seeds before plantation has a great effect on increasing of the absorbed elements. However, highly effect on yield, was found by the wheat seeds soaking in $ZnSO_4$ solution (Sallam, 1992 and Saad *et al.,* 1999). El-Maghraby (2000) showed that soaking wheat seed in $ZnSO_4$ or $CuSO_4$ greater increased the plant weight and the uptake of Zn and Cu, respectively.

So, this work was planed to investigate the effect of different soaking materials on wheat seeds planted in a clay loam soil irrigated with diluted sea water.

MATERIALS AND METHODS

Pots of 6 kg capacity with a drainage hole in the bottom were filled with clay loam soil from the permanent experimental field of Agricultural Research Centre Farm-Giza Governorate. The main characteristics of the soil samples are shown in Table (1). Sea water samples were collected from El-Madia No.6, Al-Esmailia Governorate and was diluted with tap water having a final concentration of about (5242) ppm for using in irrigation as shown in Table (2). Samples of wheat seeds (Sakha 8) were soaked for 12 hours before seedling in (6) groups of soaking solutions. The first group involved for growth regulators, i.e. Indole-3-acetic acid (IAA), Indole-3-butyric acid (IBA), Alpha-naphthalene acetic acid (NAA) and Gibberellic acid (GA). The second group involved three amino acids, namely, Proline, Glutomic and Aspartic acids. The third group included the chloride solutions of both sodium and magnesium while the fourth group contained two solutions of potassium in the form KH_2So_4 or KNo_3. The fifth group concluded sulphate solutions of each Zn, Mn, Cu or Fe. Distilled water was the sixth group soaking solutions. The concentrations of soaking solutions are shown in Table (3). Requirements of NPK were added. After the seedlings were emerged, only 4 plants/pot were maintained. Diluted sea water was used for irrigation. Tap water was used as a control.

At the end of the experiment (140 days), plants were harvested and dried at 70° c. the dry matter content as well as uptake of some nutrients, N, P, K, Zn, Mn, Cu and Fe were determined using the method described by Chapman and Pratt (1961).

Sea water was chemically analyzed using the methods of Richards (1954). Soil samples were chemically characterized according to Richards (1954). Zn, Mn, Cu and Fe were determined in sea water using an atomic absorption spectrophotometer Elemer model 327.

Table (1): physical and chemical properties of the tested soil samples.

Particle size distribution after $CaCO_3$ removal (%):							
Coarse sand		**Fine sand**	**Silt**	**Clay**		**Textural class**	
10.45		23.11	26.87	39.57		Clay loam	
Water Holding Capacity (WHC) %:						**Field Capacity (FC)%:**	
57.00						36.00	
Soluble anions and cations in soil paste extract (meq/100g soil)							
$CO_3^=$	HCO_3^-	Cl^-	$SO_4^=$	Ca^{++}	Mg^{++}	Na^+	K^+
0.00	0.15	0.50	0.60	0.56	0.25	0.40	0.05
EC. mmhos/cm at 25C (soil paste)		**pH (1:2.5) soil-water suspension**		**Organic matter %**		**$CaCO_3$ %**	
2.29		8.20		2.60		3.87	
Available nutrients (ppm)							
N			**P**		**K**		
45.00			12.80		340.00		
DTPA- extractable (ppm)							
Iron		**Manganese**		**Zinc**		**Copper**	
9.40		11.40		2.85		0.45	

Table (2): Concentration of soaking solutions used in the experiment in ppm.

No. of treatment	Soaking treatment	Concentration of soaking treatment(ppm)
1	Without soaking	---
2	Distilled water	--
3	IAA	200
4	IBA	300
5	NAA	100
6	GA_3	300
7	Proline	5
8	Glutamic acid	5
9	Aspartic acid	5
10	NaCl	30000
11	$MgCl_2$	20000
12	KH_2PO_4	1000
13	KNO_3	500
14	$ZnSO_4$	300
15	$MnSO_4$	300
16	$CuSO_4$	300
17	$FeSO_4$	300

Table (3): Chemical analysis of the used diluted irrigation water.

EC (dS/m at 25C : 7.25							
Total soluble salts (TSS): 0.52%							
Soluble cations and anions (ppm)							
$CO_3^=$	**HCO_3^-**	**Cl^-**	**$SO_4^=$**	**Ca^{++}**	**Mg^{++}**	**Na^+**	**K^+**
5	91	2949	277	63	182	1633	44
Sodium adsorption ratio (SAR) : 23.43							
Micronutrients ions(ppm)							
Fe	**Zn**	**Mn**	**Cu**	**B**			
0.345	0.008	0.026	0.011	0.750			

RESULTS AND DISCUSSION

The weight of wheat grains:

The grain yield:

Regarding the weight of wheat grains expressed as (g/pot) and the grain yield expressed as (ardab/feddan). The obtained data in Table 4 revealed significant difference effect between the various soaking media on weight of wheat grains under irrigation with saline water.

The different substrates affected grain yield in the order: IBA, Proline, Aspartic acid, NaCl, KH_2PO_4 and/or $ZNSO_4$, where the corresponding average values of wheat grain yield exceeded by about 35.62%, 40.28%, 40.36%, 28.20%, 10.59% and 37.76% over control, respectively.

The investigated substances, could be arranged with respect to their effect on grain yield in the following order: Aspartic acid = Proline = $ZnSO_4$ = $FeSO_4$ = IBA > IAA > Glutamic acid = NaCl > $MnSO_4$ > NAA = $CuSO_4$ = $MgCl_2$ > GA_3 > KH_2PO_4 = KNO_3 > Distilled water.

These increases in grain yield of wheat with IAA and NAA seed presoaking are in agreement with those obtained by Bhardwaj (1962) on wheat and Dave and Gauer (1970) on barely yield which increased with presoaking in GA_3.

The obtained results are in agreement with those reported by Amer (1989) who found that foliar application of 5 ppm amino acid solution (Proline and glutamic) at seedling stage of barley plants under irrigation with diluted sea water (22 mmhos/cm), increased the grain yield by about 72% in either sandy or calcareous soils. Moshetal (1985) reported the possibility of enhancing further tolerance through the manipulation with certain amino acids such as proline and glutamic together may be attributed to provide some means of protecting electrolyte-sensitive sites against damage in salt stressed cells by maintenance of adequate turgor in the cells. These results are confirmed with the results of Sing and Darra (1971), Chhipa and Lai (1978), Mehta *et al.* (1979), Padole (1979), Ibrahim and Shalaby (1994), Barsoom (1998) and Saad *et al.* ((199

The yield of wheat straw:

Data in Table (4) demonstrated the effect of the investigated soaking solutions on yield of wheat straw at harvest after 140 days from sowing, expressed as (g/pot).

The corresponding average values of the dry matter content of wheat plants produced under each grain pretreatments and saline conditions could be arranged in the descending order: $CuSO_4$> Proline> KNO_3> NaCl> $MnSO_4$ = $ZnSO_4$ = NAA= KH_2PO_4> Aspartic acid> Glutamic acid = IAA> $MgCl_2$> Distilled water> GA_3 = IBA> $FeSO_4$.

The corresponding average values for the highest yields values of wheat straw produced from grains treated with different treatments were increased by about 21.74%, 18.06%, 14.05%, 12.64% and 11.10% over control for $CuSO_4$, Proline, KNO_3, NaCl and NAA, respectively.

These results are in agreements with those obtained by Chhipa and Lai (1978) who stated that presoaking of wheat grains in 1% $MgCl_2$ or 3% NaCl increased straw yield of wheat. Also obtained results are similar with with those of Balki and Padole (1982); Parashar and Varma (1988) and Amer (1989).

The relative yield of both grain and straw:

Regarding the effect of the various soaking pretreatments on relative yield of both grains and straw (Table 4), all the studied soaking solutions increased both of relative grain and straw yield of wheat plants except for IBA, GA_3 and $FeSO_4$ where its effect was positive on the relative grain yield and negative on the relative straw yield.

The highest values of relative grain yield were gained by treating the seeds with Aspartic acid, $FeSO_4$, Proline, $ZnSO_4$, IBA and IAA. The relative yield of grain corresponding to these treatments was increased over the distilled water soaked seeds by about 40.37%, 40.37, 40.23%, 37.74%, 35.61% and 33.26%, respectively.

With respect to the relative straw yield of wheat plants produced from the various seed pretreatments, the corresponding average which gained the highest relative straw yield are: 21.81%, 18.07%, 14.06%, 12.85%, 11.65% and 11.25% with $CuSO_4$, Proline, KNO_3, NaCl, $MnSO_4$ and $ZnSO_4$, respectively over the plants developed from seeds soaked in distilled water.

Macronutrients uptake by grains and straw of wheat:

Table (5) demonstrated the grain uptake yield of the nitrogen, phosphorus and potassium (mg/pot), and also the protein yield (g/pot) of wheat grains as affected by various seed soaking pretreatments under saline conditions.

Nitrogen uptake:

Data indicated that both of IAA and IBA were of a significant effect on nitrogen uptake of grains. The two studied growth regulators either NAA or GA_3 did not show such effect. All the amino acids and chloride solutions affected significantly nitrogen uptake of grains.

Table (4): Effect of seed soaking pretreatments on yield, relative yield of both grain and straw compared with distilled water grown under saline conditions.

No.	Soaking treatment	Weight of grains (g/pot)	Weight of grains /g	Relative grain yield	Relative straw yield
1	Dry grains	12.24	15.35	96.66	102.81
2	Distilled water	12.66	14.95	100.00	100.00
3	IAA	16.87	15.83	133.26	106.02
4	IBA	17.17	14.63	135.61	97.46
5	NAA	15.16	16.61	119.76	111.25
6	GA	14.26	14.65	112.65	97.99
7	Proline	17.76	17.65	140.23	118.07
8	Glutamic acid	16.34	15.84	129.07	106.02
9	Aspartic acid	17.77	16.36	140.37	109.64
10	Na Cl	16.23	16.84	128.15	112.85
11	Mg Cl_2	15.0	15.68	118.48	104.82
12	KH_2PO_4	14.00	16.56	110.59	110.84
13	KNO_3	13.99	17.05	110.52	114.06
14	$ZnSO_4$	17.44	16.61	137.74	111.25
15	$MnSO_4$	15.59	16.66	123.10	111.65
16	$CuSO_4$	15.14	18.20	119.55	121.81
17	$FeSO_4$	17.38	14.54	140.37	97.19
L.S.D at 5%		1.319	1.426	--	--

Table (5): Effect of seed soaking pretreatments on N, P and K uptake (mg/pot) and protein yield (g/pot) in grain yield of wheat plants grown under saline conditions.

Soaking treatment	Protein yield (g/pot)	N- uptake		P- uptake		K- uptake	
		grain	straw	grain	straw	grain	straw
Dry grains	92.05	161.57	82.89	59.98	13.82	64.87	320.81
Distilled water	85.20	149.39	71.76	34.18	8.97	50.64	263.12
IAA	135.64	238.55	98.15	77.60	12.66	80.98	292.86
IBA	135.13	236.95	80.47	74.92	12.68	82.41	261.88
NAA	96.72	169.79	98.00	39.42	14.95	51.54	297.32
GA	99.96	178.25	104.02	42.78	10.26	52.76	263.70
Proline	126.63	222.00	104.14	51.50	19.42	83.47	319.47
Glutamic acid	118.30	207.52	93.46	55.55	12.67	71.90	280.37
Aspartic acid	117.46	206.13	83.44	49.76	13.09	62.20	294.48
Na Cl	119.29	209.37	101.04	61.67	18.52	73.04	287.96
Mg Cl_2	124.80	219.00	90.94	43.50	9.41	63.00	277.54
KH_2PO_4	89.32	156.80	89.42	50.40	16.56	51.80	294.77
KNO_3	106.04	188.87	98.89	41.97	15.35	51.76	300.08
$ZnSO_4$	116.33	204.05	101.32	47.09	13.29	66.27	308.95
$MnSO_4$	102.27	179.29	83.30	60.80	14.99	62.36	293.22
$CuSO_4$	107.95	189.25	100.10	56.02	18.20	63.59	293.02
$FeSO_4$	128.79	225.94	71.25	78.21	13.09	72.99	277.71
L.S.D at 5%		45.306	21.492	6.820	1.937	12.349	34.830

On the other hand, neither KH_2PO_4 nor KNO_3 of potassium solutions show such effect on the nitrogen uptake as compared with those obtained from grains soaked in distilled water. Zn and Fe affected significantly nitrogen uptake of wheat grains while both of Mn and Cu were of insignificant effect.

The various soaking solutions after harvesting on the N uptake of straw yield was significantly influenced by IAA, NAA, GA, Proline, Glutamic acid, NaCl, KNO_3, $ZnSO_4$ and $CuSo_4$

The highest increase was obtained from Proline, GA, $ZnSO_4$, NaCl, $CuSO_4$, the N uptake were 104.14, 104.02, 101.32, 101.04, 100.10 (mg/pot) respectively compared with plants develop from seeds presoaked in distilled water. Data in Table(5) indicated that Nitrogen uptake of grain yield was significantly affected by IAA, IBA, Proline, Glutamic acid, Aspartic acid, NaCl, $MgCl_2$, $ZnSO_4$ and $FeSO_4$.

These results agreed with Chhipa and Lai (1978). They reported that wheat seed soaking in 1% $MgCl_2$ or 3% NaCl, increased nitrogen uptake in straw yield of plants irrigated with saline water. Also Chhipa and Lai (1988) stated that soaking wheat grains in 200 ppm IAA or IBA increased nitrogen uptake in straw yield of plants grown on sodic soils.

Protein yield:

Obtained data revealed that protein yield of wheat followed the same trend of nitrogen uptake as well as the dry matter content (Table 5).

Also, data showed that the various response due to the effect of grain pretreatments. However, it is worthy to mention that the protein yield was more obvious from using IAA and IBA as soaking solutions (growth regulators) as well as Proline (amino acids) and $FeSO_4$ (micronutrients sulphate solutions).

The highest value (135.79 g Protein/pot) was recorded with IAA seed pretreatment whereas the lowest value (89.38 g Protein/pot) was occurred with KH_2PO_{34} seed pretreatment.

These results agreed with those reported by Salama and Abdel-Basset (1987) who stated that seed soaking in growth regulators such as IAA at (4-10 M) increased the protein content in grain yield under saline conditions.

With respect to the nutrient soaking media, Mironova and Muzaleva (1964) found that presowing treatment for red clover seeds with 0.01% solution of either Mn or Zn caused an increase in protein content. Similar results were obtained by Darmenko and Ryabets (1962) on wheat grains.

Phosphorus uptake:

Results in Table (5) revealed that, except NAA media, grain soaking pretreatment was of significant positive effect on phosphorus uptake by wheat grains.

The highest value of phosphorus uptake by grains (78.21 mg P/pot) existed in case of $FeSO_4$ soaking solution whereas the lowest value (39.42 mg P/pot) occurred with grain pretreatment of NAA.

Data in Table (5), demonstrated P-uptake when grain were soaked in IAA, IBA, NAA, NaCl, all the amino acids, potassium solutions and all the sulphate solutions of the micronutrients.

Results in Table (5) showed that, except NAA media, seed soaking pretreatment was markedly significantly affected phosphorus uptake by wheat grains. The highest value of phosphorus uptake by grains (78.21 mg P/pot) existed in from of $FeSO_4$ soaking solution whereas the lowest value (39.42 mg P/pot) was occurred with grain pretreatment of NAA.

These results agree with those reported by Mironova and Muzaleva (1964) who stated that presowing treatment for red clover seeds with 0.01% solution of either Mn or Zn caused an increase in phosphate accumulation. Also, results were obtained by Chhipa and Lai (1978) who reported that wheat seed soaking in 1% $MgCl_2$ or 3% NaCl, increased phosphorus uptake by straw yield when irrigated with saline water. Similarly, Chhipa and Lai (1988) found that seed was soaking in growth regulators such as IAA or IBA, increased phosphorus uptake in straw yield of wheat plants grown on sodic soils.

Potassium uptake:

Data presented in Table (5) showed potassium uptake (mg/pot) by straw as affected by the various grain pretreatments. Potassium was significantly influenced by NAA, Proline, KNO_3 and $ZnSO_4$. The highest increase was obtained Proline and $ZnSO_4$, the K-uptake were 319.47 and 308.95 (mg/pot) respectively, while the lowest decrease was the seeds presoaked in IBA which was 261.8 (mg/pot).

Potassium uptake by grain yield was affected significantly by using IAA, IBA, Proline, Glutamic acid, NaCl, $MgCl_2$, $ZnSO_4$, $CuSO_4$ and $FeSO_4$. The highest increase was for Proline, IBA and IAA were 83.47, 82.41 and 80.98 respectively and the lowest value (51.54 mg/pot) was recorded with NAA seed pretreatments.

In this respect, the effect of growth regulators on the increase of N, P and K uptake of grain yield for what plants was previously investigated by Balki and Padole (1982) who stated that seed soaking pretreatment in growth regulators such as (IAA, NAA and GA_3) increased N, P and K contents in grain yield of wheat plants under different levels of salinity.

The obtained results agreed with Chhipa and Lai (1978) who found that grain soaking pretreatments in 1% $MgCl_2$ or 3% NaCl, increased N, P and K content in grain yield of wheat plants irrigated with saline waters.

These results are in harmony with Padole (1979) who reported that soaking wheat seeds in 1-2% KH_2PO_4 or Urea and 0.02- 0.04% $ZnSO_4$ or $MnSO_4$ for 6 hours increased grain content of N, P and K compared with unsoaked or water-soaked seeds.

Micronutrients uptake by grains and straw of wheat:
Zinc uptake:

Data in Table (6) indicated that each of IBA and GA gave a marked significant effect on Zn-uptake (mg/pot), however, neither IAA nor NAA showed such effect. Whereas, Aspartic acid affected significantly Zn-uptake of wheat grains.

Except for the NaCl, grain soaking in solutions containing potassium of either phosphate or nitrate, chloride of magnesium and sulphate of Zinc, manganese, copper and iron affected insignificantly Zn-uptake of grain wheat as compared with those obtained from grains soaked in distilled water.

Also, the obtained results revealed that mean values of Zn-uptake ranged between 0.98 for either IBA or NaCl media and 0.175 for KH_2PO_4 soaking solution.

Table (6): Effect of seed soaking pretreatments on Fe, Zn,Mn and Cu uptake (mg/pot) in grain and straw yield of wheat plants grown under saline conditions.

Soaking treatment	Fe uptake mg/pot		Zn uptake mg/pot		M n uptake mg/pot		Cu uptake mg/pot	
	grain	straw	grain	straw	grain	straw	grain	straw
Dry grains	0.918	1.980	0.153	2.800	0.561	1.150	0.061	0.115
Distilled water	0.843	1.930	0.475	2.430	0.158	1.870	0.063	0.112
IAA	1.189	2.040	0.633	2.390	0.609	1.580	0.084	0.119
IBA	1.568	2.190	0.980	2.510	0.429	1.730	0.086	0.110
NAA	1.042	2.080	0.569	1.550	0.379	1.930	0.076	0.125
GA	1.004	1.830	0.826	2.740	0.357	1.530	0.072	0.110
Proline	1.254	2.650	0.588	1.320	0.514	2.210	0.089	0.132
Glutamic acid	1.225	2.040	0.544	2.100	0.409	1.840	0.082	0.119
Aspartic acid	1.701	2.450	0.644	2.040	0.444	1.770	0.089	0.123
Na Cl	1.015	2.530	0.980	2.840	0.473	1.750	0.081	0.126
Mg Cl_2	0.997	2.030	0.562	1.830	0.375	1.700	0.075	0.118
KH_2PO_4	1.279	2.070	0.175	2.380	0.350	1.720	0.070	0.124
KNO_3	1.277	2.130	0.578	2.410	0.201	1.980	0.070	0.128
$ZnSO_4$	1.230	2.490	0.576	2.350	0.436	1.660	0.087	0.125
$MnSO_4$	1.103	2.500	0.585	2.080	0.453	1.730	0.078	0.125
$CuSO_4$	1.136	2.350	0.190	1.970	0.379	1.470	0.076	0.137
$FeSO_4$	1.304	1.880	0.361	2.910	0.398	1.330	0.087	0.109
L.S.D at 5%	0.168	0.188	0.160	0.396	0.116	0.224	0.006	n.s

The obtained data in Table (6) showed that the highest Zinc uptake by wheat straw soaked in various soaking pretreatments with IAA, NaCl and $FeSO_4$ was 3.39, 2.84 and 2.91 (mg/pot) respectively, while the lowest value was (1.32 mg/pot) occurred with Proline.

Date in Table (6) indicated that each of IBA, GA, Aspartic acid and NaCl gave a marked significant effect on Zn- uptake in grains of wheat plants. Also the obtained results revealed that the mean values of Zn-uptake ranged between 0.98 for either IBA or NaCl media and 0.175 for KH_2PO_4 soaking solution.

The results of the present study are in conformity with the findings of El-Sherbieny *et al.* (1986) who reported that salinity level of 44 mg (NaCl/liter), resulted in the highest content of Zn in Shoots and spikes of wheat plants grown on sand culture.

Manganese uptake:

Data showed that, except for KNO_3 solution, seed pretreatments in solutions of growth regulators, amino acids, potassium dihydrogen phosphate, chloride of either sodium or magnesium and micronutrient sulphate of Zinc, manganese, copper and iron did not affect significantly on manganese uptake by wheat grains (Table 6).

Also results revealed that the highest value (0.609 mg/pot) existed in case of IAA solution whereas the lowest value (0.201 mg/pot) occurred with application of potassium nitrate soaking media.

Results of manganese uptake by straw (Table 6), showed that all the various soaking pretreatments were insignificantly affected manganese uptake by wheat straw, except Proline which was the most effective.

On the other hand, data showed that except for KNO_3 solution, all the various soaking pretreatments were significantly affected manganese uptake by wheat grains. Also results revealed that the highest value (0.609 mg/pot) existed in case of IAA solution whereas the lowest value (0.201 mg/pot) occurred with application potassium nitrate soaking media.

The increase in uptake of manganese observed under Paline conditions was previously mentioned by Hassan *et al.* (1970) on barly and corn plants and Nabhan and Cottenie (1974) who reported that increasing salinity to certain levels increased Mn-content of corn plants. Also, El-Sherbieny *et al.* (1986) reported that salinity level of 44 mg (NaCl/Liter) resulted in high content of Mn in shoot and spikes of wheat plants grown on sand culture.

Copper uptake:

Data in Table (6) revealed that copper uptake of wheat grains was affected significantly by the various grain pretreatments under saline conditions compared with those obtained from grain soaked in distilled water.

Also, the obtained results showed that the mean values of copper uptake ranged between 0.89 mg/pot for either Proline or Aspartic acid and 0.07 mg/pot for potassium solutions of both phosphate and nitrate.

Results showed that non of the various soaking pretreatments affected significantly Cu-uptake of wheat straw compared to its uptake in distilled water treatment.

These results are in agreement with those obtained by El-Gayar (1988) who reported that Cu-concentration in flax shoots increased with increasing salinity of irrigation water up to 3000 ppm and decreased under the highest level of salinity (4500 ppm).

Iron uptake:

Data in Table (6) indicated that seed pretreatment in various soaking solutions of organic and inorganic substances influenced significantly, except both GA_3 and $MgCl_2$, on iron uptake of wheat grains as compared with those obtained from seeds soaking in distilled water.

Also the obtained results revealed that the highest value (1.701 mg/pot) existed with aspartic acid seed soaking media whereas the lowest value (0.997 mg/pot) was achieved in case of $MgCl_2$ solution.

Data indicated that the highest Fe-uptake by wheat straw soaked in various soaking pretreatments with each group such as growth regulators (IBA), amino acids (Proline, Aspartic acid), chloride solutions (NaCl), potassium solutions (KNO_3) and micronutrients sulphate solutions ($ZnSO_4$, $MnSO_4$ and $CuSO_4$).

Data showed that except for GA and $MgCl_2$ solutions, seed pretreatments revealed a pronounced respond on iron uptake of grain yield as compared with those obtained from seeds soaking in distilled water. Also results revealed that the highest value (1.701 mg/pot) existed with aspartic acid seed soaking media ,whereas the lowest value (0.997 mg/pot) was achieved in case of $MgCl_2$ solution.

In this respect, the increase in Fe-uptake observed under saline conditions was previously mentioned by Ragab and Mohamed (1983) who reported that NaCl treatment resulted in an increase of Fe concentrations of soybean than unsalinized plant.

Generally, the obtained data showed that the highest micronutrients uptake of wheat grains such as Zinc, manganese, copper and iron whose seeds were previously soaked in different soaking solutions with each group followed a particular pattern about similar to that obtained with each other such as either IAA or IBA from growth regulators, each Proline and aspartic acid from amino acids, chloride of both sodium and magnesium, potassium of each phosphate and nitrate and zinc from micronutrients sulphate solutions.

Generally, the above-mentioned results could be explained on the basis that micronutrients caused better uptake and it stimulates the growth and increases the seed yield. Several mechanisms seemed to be involved; these mechanisms were suggested to be such as activation of the biochemical processes in embryos, the influence on cell permeability, phosphate accumulation in seeds or trace-elements such as Zn, Mn, Cu and /or Fe or/and their accompanied cation/anion in the soaking media. According to that, a suggestion could be introduced that soaking practice seemed to be more influential on grown plants than factors dealing with environmental conditions of saline soil. This was suggested to be a resultant of influence of seed soaking on developed root system whose contact with soil particles seemed to be more efficient than with fertilizer to supply the plant with total needs of different elements and these detected later in the developed plants and grain yield.

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نقع حبوب القمح فى محاليل مختلفة كمعاملة أولية عند الزراعـــة فـــى أراضـــى طينية رويت بمياه البحر المخففة

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أجرى هذا البحث لدراسة تأثير معاملة البذور قبل الزراعة بمجموعـــات مختلفـــة مـــن المحاليل وأثرها على حصيلة الوزن الجاف للنبات ومحتواه من العناصر تحت ظروف الرى بمـاء مالح.

وتم اجراء هذا البحث بتجارب أصص وشمل معاملة البذور بستة مجموعات من محاليل النقع وهى أربعة منظمات نمو وثلاثة أحماض أمينية واثنين من محاليل الكلوريـــد واثنيـــن مـــن محاليل البوتاسيوم وأربعة محاليل لكبريتات العناصر الصغرى والمعاملة السادسة تم فيـــها نقـــع البذور فيها بماء مقطر.. واستخدم لرى الاصص ماء بحر تم تخفيفة حتى وصلت نسبة الامـــلاح الكلية الذائبة بة الى ٠,٥٢% وتم الرى بعد ١٤ يوما من الزراعة واســـتمر حتـــى تمـــام نضـــج محصول القمح.

وتشير النتائج الى الاستجابة الواضحة للمعاملات بمستويات مختلفة تصـــل الـــى ١٤٠، ١٢٠% زيادة فى أوزات الحبوب والقش على التوالى عنها فى حالة النقع فى ماء مقطر.

زاد امتصاص الحبوب والقش للنتروجين والعناصر الصغرى للحبوب المعاملة بمحـــاليل النقع عن تلك المعاملة بالماء المقطر أو المزروعة بدون نقع.

زاد امتصاص الفوسفور والبوتاسيوم فى بعض المعاملات وقل فى البعض الاخر.

ويوصى هذا البحث بأهمية نقع البذور بصفة عامة تحت ظروف الرى بماء ترتفع نسبه ملوحتـــه كماء البحر عند تخفيفة.