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Response of Two Wheat Varieties to Salt Stress of Newly Reclaimed Soil in Upper Egypt

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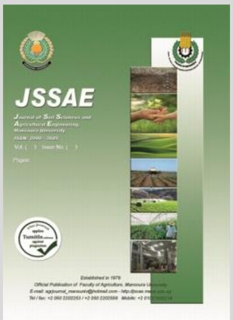

ABSTRACT

This study was conducted at was conducted on a private farm located at Southeast of Sohag Governorate, during two successive seasons of 2017/2018 and 2018/2019.Experiment were carried out to examine the capability of two varieties different kinds, Relatively Salt- tolerant, wheat variety (Sids1) and. relatively Salt- sensitive, wheat variety (Giza 168) as a winter crop. in the studied soil under stress condition. Use application different amelioration techniques with organic amendment,(mixture1and mixture 2) as well as Bio-organic treatments (soil, foliar spray and soil+ foliar application) Results showed that increased fresh, dry and water content for both shoot and root, while increased plant length of shoot. Show that different amelioration techniques with organic amendment under tow varieties differed in respectively salt tolerant, at 80th) in the media was, as expected, associated with a marked improvement in the Na content and Na uptake status for both shoots and roots. Comparing the studied three methods of bioorganic amelioration (s, f and s + f) showed that application (s + f) significant effect application together, compared with the other with respect to varietal responses to salinity, reported that tolerant plants were associated with greater net transport of Na^+ from roots to shoots.

Keywords: Amelioration, stress conditions, organic amendment, Bioorganic, wheat, Salt- tolerant, Salt- sensitive.

INTRODUCTION

According to the successive increase in population the higher needs for agricultural products require maximum yields form the whole area including those salt-affected soils. The problem of salinity assumes special importance in ARE both for the old cultivated area as well as for the newly reclaimed lands. This may be mainly attributed to the continuous rise in the ground water table following irrigation in the absence of adequate drainage, using the relatively low-quality waters for irrigation being other possibility. salinity has a great role in the definition of the absorption features of plants roots which should be reflected on the behavior of any particular crop with respect to physiological and metabolic activities. Under saline condition stunted growth, nutrient imbalance and deep bluish-green foliage of followed by low crop production are common observations. Wheat is the world's most important and most widely grown cereal crop through many properties and uses of its grains and straw. Increasing grain yield of wheat is an important national goal to face the continuous increasing food needs of Egyptian population. According to the Egyptian Ministry of Agriculture EMA, (2007), wheat production in Egypt increased from 2.08 in 1983 to 7.37 million ton in 2007. This increase was achieved by increasing wheat area from 1.83 to 2.71 million fed year^{-1} and grain yield from 1.50 to 2.71 tonfed^{-1}. Wheat (Triticum aestivum L.) is one of the most important and the most grown cereal crop. It is the staple food of many countries including Egypt. It importance is derived from many properties and uses of its kernels, which make it a staple food for more than one third of world's population. Moreover, its straw is used as animal feed and also in manufacturing paper Milad, *et al*., (2013).

MATERIALS AND METHODS

Experimental design

The experimental design was a split- split plot design with three replicates. The main plots were randomly assigned with the different crop varieties, whereas the amelioration techniques treatments for both soil and plant were randomly distributed in sub and sup – sup plots.

Main plots varieties treatments i.e.

v1- Relatively Salt- tolerant, wheat variety (Sids1) as a winter crop .

v2 - Relatively Salt- sensitive, wheat variety (Giza 168)

Sub plots (Organic amendment treatments):

MX0- Control (without addition organic amendment).

MX1-Soil application with a mixture1 (filter mud + Vinasse) (3: 1) at a rate of 2 ton fed^{-1}).

MX2- Soil application with a mixture1 (filter mud + Vinasse) (3: 1) at a rate of 5 ton fed^{-1}).

The three soil organic amendment treatments were added to the soil before two months of cultivation.

Sub- Sub (Bioorganic compound treatments):

Control - Without the soil application or foliar application to plants with a Bio-organic compound.

Soil application with a Bio-organic compound at the rate of 5L fed-1In addition with drip irrigation at the last of 10 minutes from the irrigation periods.

Foliar application with a Bio-organic compound of the rate of 5L300L-1 fed-1 after 30, 45 and 60 days of sowing for both two wheat and sorghum plants.

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S+F - Soil and foliar spray treatment plants with a Bio-organic compound as a previously mentioned with S and F treatments.

- Field experiments

The soil was prepared for cultivation on for both the wheat crop for two consecutive seasons, the area of each plot was 3 x 3.5 (1/400 fed). Wheat grains at a rate of 70 kg fed^{-1} (*Triticum aestivum*) under drip irrigation system. Cv i.e Sids1, which showed a relative resistance and Giza 168 which showed a relative sensitivity to salinity stress were sown at 15^{th} November 2017 and 13^{th} November 2018, and harvested at 5^{th} May 2018 and 10^{th} May 2019

All the cultural operations for wheat crop, like field preparation, fertilization, irrigation; weeding, plant protection etc. were carried out as recommended by the Ministry of Agriculture.

Table 1. Some physio-chemical properties of the experimental soil (before plant).

Soil properties and units	Value
Sand (%)	72.67
Silt (%)	21.03
clay (%)	6.30
Texture class	Sandy Loam
pH (1:2.5)	7.86
EC (dS. m^{-1})	6.8
SP %	32.5
O.M%	0.44

Table 2. Chemical composition of filter mud, Vinasse and Bio-organic compound used as on amelioration of both soil and plant.

Characteristics	Filter mud	Vinasse	Bio-organic compound
Density (Mg m^{-3})	0.74	1.14	0.63
pH (1:2.5)	7.17	4.8	4.7
EC (dSm^{-1})	4.3	7.0	1.25
Total elements (%)			
Nitrogen %	2.35	0.20	0.98
Phosphorus %	4.55	0.21	0.45
Potassium %	0.68	0.71	1.36
Calcium %	2.08	0.65	4.51
Manganese %	0.06	0.60	0.17
Iron %	0. 75	0.0006	0.007
Copper %	0.10	0.0073	0.96
Zinc %	0.11	0.0024	0.17
Some bacterial strains i.e.	-	-	(PGPR)

Table 3. Composition and chemical properties of the mixtures of soil amendments used.

Mixtures of amendments	Mixtures composition percent		Chemical properties		
	F. M.C	V	pH	EC dS m^1	CaCO %
(MX)	3	1	7.11	2.11	14.3

F. M.C: filter mud V: Vinasse

Yield Components:

Measurements of growth and yield as well as its composition:

- At 80^{th} day of wheat day 10 plants were taken randomly respectively,theen the plants registered shoot length in cm, shoot fresh and dray weight $gplant^{-1}$, root fresh and dray weight $gplant^{-1}$, and water content ($gplant^{-1}$) in both shoot and root.Then the data were recoded.

K and Na contents in the studied plants:

- At 80^{th} day, of wheat day from sowing, shoot and root fresh or dry weights were measured using digital balance. Half of the plant samples were air dried and finally kept in oven at 70 ºC till constant dry weights were obtained, while the other half plant material was digested by using root and shoot samples (0.1 g DW) with sulfuric acid and hydrogen peroxide mixture (2 ml) according to the Wolf method (Wolf, 1982),to measure Na^+ and K^+ concentrations using a flame photometer Corning M-410, Ciba Corning Diagnostics Scientific Instruments Corp., Halstead, Essex, UK).
- 3- Potassium and sodium content was determined by using flame photometer (Jackson 1967).

RESULTS AND DISCUSSION

Behavior of wheat varieties to amelioration techniques.

Vegetative growth of the studied plant:

An approach for evaluating the growth of wheat plants as affected by different amelioration techniques with organic amendment, (mixture1 and mixture 2) as well as Bio-organic treatments (soil, foliar spray and soil+ foliar application) under two varieties differed in relatively salt tolerant, at 80^{th} of cultivation was performed through the determination of fresh weights, dray weights and water content as well as shoot length in the studied soil under stress condition in the first and the second season.

Data in table (4). Generally, showed that with organic amendment treatments i.e., mixture 1 and mixture 2 under bioorganic amelioration techniques (soil, foliar spray and soil+ foliar application) have been increased fresh, dry weigh and or water content for both shoot and root, while increased plant length of shoot for all the studied varieties compared with control treatments. These results in line with those of Oo *et al*., (2015) investigated the effectiveness of compos as soil amendments on reducing soluble salts from salt affected soils and enhancing maize yield. Their Results showed that the height of plant and dry matter yield of maize was maximized due to applying compost as compared with the control. Nqueira *et al*., (2009)The use of vinasse in fertigation systems has advantages because it can contribute substantial amounts of water and mineral nutrients, support soil quality and crop productivity.

Comparing the studied three methods of bioorganic amelioration showed that a stimulatory effect for (soil + foliar) application together, compared with the other alone. Similar results were obtained by Negrao *et al*., (2017). An evident reduction in plant growth parameters through reducing the plant height, number of leaves, shoots which considered high responsive to salinity. Addition of organic acids with irrigation water led to a significant increase in all plant growth parametes. This reflects the importance the role of organic acids for increasing plant growth and ameliorating the adverse effects of salt stress. The above results agree with those obtained by Jarosova *et al*., (2014). Also, on the other hand Shaban and Omar (2009) revealed that the values of soil salinity EC (dSm^{-1}) decreased significantly by bio fertilizer because probably *Azospirillum spp*. produce several phytohormones such as indoleactic acid and cytokinins, which promote plant growth and reduce the salinity stress.

It was also observed that application organic amelioration techniques particularly 5 ton fed^{-1} from the mixture2 (FMC: Vinasse) 3:1 was more effective than that the other one, while, the treatments of (soil + foliar) application integrated with 5 ton fed^{-1} soil application from organic amendment were more effective compared with control and other treatments, especially in the second season . These results in line with by Utami, *et al*., (2012).Who revealed that the growth of Maize plants increased with increasing the rate of filter mud addition, receiving the largest amounts of filter mud comparable to those receiving chemical fertilizers treatment (control).

Data, Also, Revealed that the salt – tolerant plants (Sids1) were more by the different amelioration techniques in studied soil under salinity stress conditions. mainly due to avoid Na toxicity of salinity particularly what concerning effects on metabolic processes, as well as ionic imbalance which reflected on water balance causing "physiological drought " Alqahtani, *et al*., (2019). Differences exist between plant species in their tolerance of salinity can be related to the salt content in the soil and/or water which causes an initial decline in growth (yield), and also to the rate of yield decline that occurs with increasing salinity. Gorham, *et al*., (1990) and Hussain, *et al*., (2003). In wheat, one of the major mechanisms conferring salt tolerance is sodium exclusion from the leaves.

Table 4. Effect of different amelioration techniques on fresh, dry weights and water content of both shoots and roots, as well as shoot length at 80th day of wheat plant after the both seasons under stress condition respectively.

Different amelioration techniques			Wheat (Season1)							Wheat (Season2)						
			Shoot				Root			Shoot				Root		
varieties treatments	Organic amendment treatments	Bioorganic compound treatments	F.W (gplant-1)	D.W (gplant-1)	Water Content (gplant-1)	shoot length (cm)	F.W (gplant-1)	D.W (gplant-1)	Water Content (gplant-1)	F.W (gplant-1)	D.W (gplant-1)	Water Content (gplant-1)	shoot length (cm)	F.W (gplant-1)	D.W (gplant-1)	Water Content (gplant-1)
V1	Without	Without	1.49	0.62	0.87	50.4	1.30	0.58	0.72	1.87	0.70	1.17	56.4	1.85	0.68	1.17
		F	2.95	1.13	1.82	62.3	1.79	0.69	1.10	3.33	1.21	2.12	68.3	2.34	0.79	1.55
		S	2.19	0.93	1.26	58.7	1.13	0.61	0.52	2.57	1.01	1.56	64.7	1.68	0.71	0.97
		F+S	3.74	1.36	2.38	65.3	2.08	0.76	1.32	4.12	1.44	2.68	71.3	2.63	0.86	1.77
	MX1	Without	2.42	1.04	1.38	59.2	1.75	0.61	1.14	2.80	1.12	1.68	65.2	2.30	0.71	1.59
		F	4.08	1.79	2.29	67.1	2.47	0.72	1.75	4.46	1.87	2.59	73.1	3.02	0.82	2.20
		S	3.18	1.47	1.71	63.7	2.19	0.67	1.52	3.56	1.55	2.01	69.7	2.74	0.77	1.97
		F+S	4.70	2.06	2.64	70.3	2.80	0.78	2.02	5.08	2.14	2.94	76.3	3.35	0.88	2.47
	MX2	Without	3.13	1.44	1.69	64.3	2.58	0.74	1.84	3.51	1.52	1.99	70.3	3.13	0.84	2.29
		F	4.70	2.02	2.68	72.3	3.05	0.82	2.23	5.08	2.10	2.98	78.3	3.60	0.92	2.68
		S	4.00	1.79	2.21	67.9	2.81	0.77	2.04	4.38	1.87	2.51	73.9	3.36	0.87	2.49
		F+S	5.47	2.55	2.92	77.5	3.52	0.88	2.64	5.85	2.63	3.22	83.5	4.07	0.98	3.09
V2	Without	Without	0.82	0.37	0.45	37.2	0.77	0.33	0.44	1.20	0.45	0.75	43.2	1.21	0.42	0.79
		F	1.32	0.51	0.81	43.5	1.07	0.38	0.69	1.70	0.59	1.11	49.5	1.51	0.47	1.04
		S	0.98	0.43	0.55	39.3	0.88	0.34	0.54	1.36	0.51	0.85	45.3	1.32	0.43	0.89
		F+S	1.57	0.62	0.95	50.8	1.18	0.4	0.78	1.95	0.70	1.25	56.8	1.62	0.49	1.13
	MX1	Without	1.50	0.75	0.75	39.6	1.10	0.43	0.67	1.88	0.83	1.05	45.6	1.54	0.52	1.02
		F	2.10	1.00	1.10	50.1	1.40	0.41	0.99	2.48	1.08	1.4	56.1	1.84	0.5	1.34
		S	1.69	0.73	0.96	43.4	1.28	0.42	0.86	2.07	0.81	1.26	49.4	1.72	0.51	1.21
		F+S	2.40	1.11	1.29	54.3	1.57	0.45	1.12	2.78	1.19	1.59	60.3	2.01	0.54	1.47
	MX2	Without	2.04	0.99	1.05	45.3	1.41	0.43	0.98	2.42	1.07	1.35	51.3	1.85	0.52	1.33
		F	2.54	1.18	1.36	57.1	1.73	0.45	1.28	2.92	1.26	1.66	63.1	2.17	0.54	1.63
		S	2.09	1.01	1.08	49.2	1.66	0.44	1.22	2.47	1.09	1.38	55.2	2.10	0.53	1.57
		F+S	2.97	1.50	1.47	58.1	1.82	0.47	1.35	3.35	1.58	1.77	64.1	2.26	0.56	1.70
LSD at 5%																
A			0.05	0.07	0.02	0.001	0.09	0.02	0.07	0.12	0.08	0.03	NS	0.06	0.02	0.08
B			0.08	0.04	0.07	2.35	0.07	0.04	0.08	0.06	0.03	0.04	0.05	0.09	0.05	0.07
AB			0.11	0.05	0.09	NS	0.10	NS	0.11	0.09	0.04	0.06	0.07	0.13	NS	0.10
C			0.15	0.09	0.09	4.37	0.10	NS	0.13	0.10	0.08	0.08	0.09	0.11	NS	0.13
AC			0.21	0.13	0.13	NS	0.14	NS	0.18	0.14	0.11	0.12	0.12	0.16	NS	0.18
BC			NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.15	NS	NS	NS
ABC			NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.21	NS	NS	NS

On the other hand, Variations in responses of the studied Varieties are in agreement with those found Acosta-Motos, *et al*., (2017) who showed that dry matter yield of relatively salt –resistant plants was less affected by salinity than relatively salt-sensitive ones .such responses were reported by Zörb, *et al*., (2019) to be mainly due to genetic and biochemical makeup of the species as salt tolerance ability is ultimately attributed to genetic and biochemical characteristics. Most species, including crops, activate tolerance mechanisms only after exposure to salt stress. Activation of the tolerance program drives plants to acclimatize under the saline condition and involves altered physiological responses, redirection of metabolism, reinforcement of defense and repair, and changes in developmental programs to adapt morphological and anatomical characteristics Zörb, *et al*., (2019) and Acosta-Motos, *et al*., (2017).

Status and Translocation of both Na^+ and K^+ in the studied plants.

1- Sodium:

Presence of salinity in growth media is well known to have effects on sodium status in plants. Data in Tables (5 and 6) generally showed that different amelioration techniques with organic amendment, mixture(1) and mixture (2) as well as Bio-organic treatments (soil, Foliar and soil+ Foliar application) under two varieties differed in respectively salt tolerant, at 80th day) in the media was, as expected, associated with a marked improvement in the Na content and Na uptake status for both shoots and roots, being with less response mainly due to some sort of antagonistic effect between k,Ca and Na uptake Alqahtani,et, al., (2019). (These results are in agreement with those reported by most species, including crops, activate tolerance mechanisms only after exposure to salt stress. Activation of the tolerance program drives plants to acclimatize under the saline condition and involves altered physiological responses, redirection of metabolism, reinforcement of defense and repair, and changes in developmental programs to adapt morphological and anatomical characteristics Zörb, *et al*., (2019) and Acosta-Motos, *et al*., (2017).

It may be worth to mention that more response was generally obtained for sodium status in shoots receiving in studied soil , particularly Na, compared to that encountered with roots, responses of (Sids1) (relatively salt–resistant variety) being more obvious. Variations in the obtained responses may be attributed to the high rate of Na-translocation from roots to shoots, as clear from calculations presented in Table (3,4,5 and 6). This may be confirmed by comparing translocation efficiency obtained for the

Mx2 (soil+ Foliar) application treatments with that obtained from other ones; This mains that, one of the major mechanisms conferring salt tolerance is sodium exclusion from the leaves of wheat plants. These results agrees with those of Gorham, *et al*., (1990) and Hussain, *et al*., (2003). Who suggested an efficient mechanism for sodium mobility twoards the shoots of grown plants particularly at progressed stage of growth. Munns and Tester (2008) added that osmotic adjustment of halophytic chenopdiaceae was achieved mainly by accumulation of high levels of Na^+ in the shoots. Also, reported that both active and passive transport operating via both apoplast and symplast systems should be acting as to finally have an efficient Na^+ translocation to shoots, thus pushing plant tissues to relatively tolerate salt stress.

Comparing the studied varieties' under organic and bioorganic ameliorations showed that a stimulatory effect of 5 ton fed^{-1} from the mixture2 (FM: Vinasse) 3:1 application together with soil + foliar application of bioorganic treatment , compared with the other treatment With respect to varietal responses to salinity, reported that tolerant plants were associated with greater net transport of Na^+ from roots to shoots, mainly due to osmotic adjustment Finally, it may be worth to mention Alqahtani, *et al*., (2019). reported that plants of maize cultivars which had lower Na^+ concentrations were found to be more salt sensitive and had sificantly lower amounts of dry matter production than those of cultivars having higher Na^+ concentrations. The authors added that it is possible that maize cultivars with higher Na^+ in the shoots may sequest the Na in specific. tissues or / cell compartments more efficiently than maize cultivars with lower Na content, and thus avoid Na^+.

Table 5. Effect of different amelioration techniques on Na^+ and K^+ content and K^+/Na^+ percent at 80th day after the both seasons of wheat under stress condition respectively.

Different amelioration techniques			Wheat (Season1)						Wheat (Season2)					
			Shoot			Root			Shoot			Root		
varieties treatments	Organic amendment treatments	Bioorganic compound treatments	Na^+ (%)	K^+ (%)	Na^+/K^+	Na^+ (%)	K^+ (%)	Na^+/K^+	Na^+ (%)	K^+ (%)	Na^+/K^+	Na^+ (%)	K^+ (%)	Na^+/K^+
V1	Without	Without	6.75	2.86	2.36	3.99	1.86	2.14	6.55	3.06	2.14	3.79	2.06	1.84
		F	6.15	3.23	1.90	3.55	2.09	1.70	5.95	3.35	1.78	3.35	2.29	1.46
		S	5.37	3.16	1.70	3.60	2.20	1.64	5.18	3.43	1.51	3.40	2.40	1.42
		F+S	5.17	3.25	1.59	3.47	2.31	1.50	4.97	3.45	1.44	3.26	2.52	1.29
	MX1	Without	5.31	3.02	1.76	3.30	1.03	1.63	5.11	3.22	1.59	3.10	1.23	2.52
		F	5.04	3.33	1.51	2.71	2.15	1.20	4.85	3.49	1.39	2.51	2.35	1.07
		S	4.61	3.29	1.40	2.66	2.27	1.17	4.41	3.53	1.25	2.45	2.47	0.99
		F+S	4.51	3.41	1.32	2.66	2.34	1.13	4.31	3.61	1.19	2.46	2.54	0.97
	MX2	Without	4.27	3.19	1.34	2.64	2.23	1.18	3.97	3.29	1.21	2.34	2.33	1.00
		F	4.10	3.40	1.20	2.51	2.30	1.09	3.80	3.40	1.12	2.21	2.40	0.92
		S	3.82	3.30	1.15	2.41	2.39	1.03	3.53	3.50	1.01	2.12	2.49	0.85
		F+S	3.55	3.45	1.03	2.36	2.44	1.03	3.25	3.55	0.92	2.10	2.10	1.00
V2	Without	Without	4.59	2.42	1.90	4.05	1.17	3.47	4.29	2.52	1.70	3.75	1.27	2.95
		F	4.29	2.73	1.57	3.96	1.31	3.02	3.99	2.83	1.41	3.66	1.41	2.60
		S	3.91	2.66	1.47	3.73	1.42	2.63	3.66	2.76	1.33	3.43	1.52	2.26
		F+S	3.89	2.60	1.50	3.75	1.39	2.70	3.59	2.70	1.33	3.45	1.49	2.32
	MX1	Without	3.66	2.64	1.39	3.25	1.25	1.60	3.36	2.74	1.23	2.95	1.35	2.19
		F	3.30	2.83	1.20	2.89	1.20	2.41	3.00	2.93	1.02	2.59	1.30	1.99
		S	3.28	2.79	1.18	2.80	1.27	2.21	2.99	2.89	1.03	2.50	1.37	1.82
		F+S	3.27	2.70	1.21	2.81	1.39	2.02	2.97	2.80	1.06	2.51	1.49	1.68
	MX2	Without	3.39	2.90	1.17	2.69	1.38	1.95	3.09	3.00	1.03	2.39	1.48	1.61
		F	3.68	3.01	1.01	2.59	1.56	1.66	3.36	3.11	1.08	2.29	1.66	1.38
		S	3.99	2.98	1.00	2.27	1.49	1.52	3.69	3.08	1.20	1.97	1.59	1.24
		F+S	2.95	2.98	0.99	2.36	1.57	1.50	2.63	3.08	0.85	2.06	1.67	1.23
LSD at 5%														
A			0.01	0.11	0.04	NS	0.14	0.03	0.021	0.14	NS	NS	0.05	0.02
B			0.13	0.08	0.11	0.10	0.09	0.08	0.13	0.09	NS	0.13	0.15	0.10
AB			0.18	NS	NS	NS	NS	0.11	0.18	NS	0.12	NS	NS	0.15
C			0.15	0.15	0.15	0.15	0.15	0.16	0.14	0.16	0.16	0.13	0.20	0.14
AC			0.21	NS	NS	NS	NS	NS	0.20	NS	NS	NS	NS	NS
BC			0.26	NS	NS	NS	NS	NS	0.24	NS	NS	NS	NS	0.25
ABC			NS	NS	NS	NS	NS	0.39	NS	NS	NS	NS	0.49	0.35

2-Potassium:

As known, potassium is an essential plant nutrient which plays special roles in membrane transport processes along with establishment for the cell inonic and osmotic equilibria particularly under saline conditions, k-status was thought to be evaluated and shown in Tables (5 and 6) data indicated general depressive responses for salinity particularly for roots, espichaly in control with at amelioration techniques treatments, this result agree with Reda, *et al*., (2011).

Comparing k-status for different amelioration techniques with organic treatments, data showed that 5 ton fed^{-1} from the mixture2 (FM: Vinasse) 3:1 was more effective than that of the other one. This may be confirmed with those results reported by Asik, *et al*.,(2009).Who shawed that soil and Foliar application with organic amendments increased uptake of k. While, Dinardo-mirnda, *et al* ., (2008) reported that the mein benefit of filter mud is a source of organic matter and nutrient elements, espichaly k and ca. Also, Resend, *et al*., (2006) revealed that vinasse is a asoure of nutrients k and ca and organic matter. This may be attributed to antagonistic phenomenon which is known to frequently take place between Na ions and both k and Ca ones Reda, *et al*., (2011).

It was also observed that soil application with organic amendment,(mixture 2) as well as bio-organic treatments (soil+ Foliar application) under two varieties differed in respectively salt tolerant, at 80th day being more effective, particularly in the scorned season. Raafat and Tharwat (2011) reported that the combination of FYM and Foliar application increased K in wheat crop.

3- Plant Translocation:

Data tables (6) data also showed that indicated responses for k concentration were more obvious in roots of relatively salt sensitive plants (Giza 168) but shoots of relatively salt tolerant plants (Sids1) and whose uptake was however inferior, while, opsite trend was noticed with Na-status This may reflect differences obtained in translocation between the two varieties under consideration which agrees with results obtained by Reda,,*et al*., (2011). reported that higher k translocation by salt - sensitive of barley plants may result in an increase of the influx of k ions to the guard cells which , in turn, may affect the rapid change of osmotic potential in these cells thus contributing to the maintenance of stomatal opening and consequently increases in transpiration rate accompanied with injury to plants exposed to salinity. The plants response to the salinity effects that may harm the plant due to the presence of salts in the growth environment or in the water can be classified into two main categories.; a rapid response to the increase in external osmotic pressure and a slow response due to the accumulation of Na^+ in leaves that was confirmed by Munns and Tester (2008).It may be worth to mention that more response was generally obtained for sodium status in shoots receiving.

Table 6. Effect of different amelioration techniques on Na^+ and K^+ uptake and translocation at 800th day after the both seasons of wheat under stress condition respectively.

Different amelioration techniques			Wheat (Season1)						Wheat (Season2)					
varieties treatments	Organic amendment treatments	Bioorganic compound treatments	Shoot		Translocation		Root		Shoot		Translocation		Root	
			Na^+ (mgplant^{-1})	K^+ (mgplant^{-1})	Na^+ %	K^+ %	Na^+ (mgplant^{-1})	K^+ (mgplant^{-1})	Na^+ (gplant^{-1})	K^+ (gplant^{-1})	T.L Na^+%	T.L K^+ %	Na (gplant^{-1})	K^+ (gplant^{-1})
V1	Without	Without	41.9	17.7	64.4	62.2	23.1	10.79	72.0	40.5	73.1	69.1	26.5	18.1
		F	69.5	36.5	73.9	71.7	24.5	14.42	52.3	34.6	68.4	67.0	24.1	17.0
		S	49.9	29.4	69.5	68.7	22.0	13.42	71.6	49.7	71.9	69.6	28.0	21.7
		F+S	70.3	44.2	72.7	71.6	26.4	17.56	57.2	36.1	72.2	80.5	22.0	8.7
	MX1	Without	55.2	31.4	73.3	83.3	20.1	6.28	90.7	65.3	81.5	77.2	20.6	19.3
		F	90.2	59.6	82.2	79.4	19.5	15.48	68.4	54.7	78.4	74.2	18.9	19.0
		S	67.8	48.4	79.2	76.1	17.8	15.21	92.2	77.3	81.0	77.6	21.6	22.4
		F+S	92.9	70.2	81.7	79.4	20.7	18.25	60.3	50.0	75.4	71.9	19.7	19.6
	MX2	Without	61.5	45.9	75.9	73.6	19.5	16.50	79.8	71.4	79.7	76.4	20.3	22.1
		F	82.8	68.7	80.1	78.5	20.6	18.86	66.0	65.5	78.2	75.1	18.4	21.7
		S	68.4	59.1	78.7	76.2	18.6	18.40	85.5	93.4	80.6	81.9	20.6	20.6
		F+S	90.5	88.0	81.3	80.4	20.8	21.47	19.3	11.3	55.1	68.0	15.8	5.33
V2	Without	Without	17.0	9.0	56.0	69.9	13.4	3.86	23.5	16.7	57.8	71.6	17.2	6.63
		F	21.9	13.9	59.2	73.7	15.0	4.98	18.7	14.1	55.9	68.3	14.7	6.54
		S	16.8	11.4	57.0	70.3	12.7	4.83	25.1	18.9	59.8	72.1	16.9	7.30
		F+S	24.1	16.1	61.7	74.4	15.0	5.56	27.9	22.7	64.5	76.4	15.3	7.02
	MX1	Without	27.5	19.8	66.3	78.6	14.0	5.38	32.4	31.6	71.4	83.0	13.0	6.50
		F	33.0	28.3	73.6	85.2	11.8	4.92	24.2	23.4	65.5	77.0	12.8	6.99
		S	23.9	20.4	67.1	79.2	11.8	5.33	35.3	33.3	72.3	80.5	13.6	8.05
		F+S	36.3	30.0	74.2	82.7	12.6	6.26	33.1	32.1	72.7	80.7	12.4	7.70
	MX2	Without	33.6	28.7	74.4	82.9	11.6	5.93	42.3	39.2	77.4	81.4	12.4	8.96
		F	43.4	35.5	78.8	83.5	11.7	7.02	40.2	33.6	79.4	79.9	10.4	8.43
		S	40.3	30.1	80.1	82.1	10.0	6.56	41.6	48.7	78.3	83.9	11.5	9.35
		F+S	44.3	44.7	80.0	85.8	11.1	7.38	72.0	40.5	73.1	69.1	16.5	18.1
LSD at 5%														
A			3.09	1.45	2.21	NS	0.001	0.001	0.95	5.56	1.04	0.001	NS	0.001
B			1.42	3.25	3.89	1.97	1.97	0.05	2.11	3.39	1.57	1.20	0.05	0.05
AB			2.01	4.60	5.50	NS	0.07	0.01	2.98	4.80	2.22	1.70	0.07	0.07
C			2.73	3.28	4.90	NS	0.10	0.01	2.36	3.00	2.56	2.23	0.09	0.09
AC			5.17	0.13	NS	NS	0.13	0.02	3.34	4.24	3.62	NS	0.12	0.12
BC			NS	5.68	NS	NS	0.16	0.02	4.09	5.19	4.44	3.86	0.15	0.15
ABC			NS	NS	NS	NS	0.23	0.04	5.78	7.34	NS	NS	0.21	0.21

In the studied soil conditions, particularly Na, compared to that encountered with roots, responses of relatively salt–resistant variety (Sids1) being more obvious. Variations in the obtained responses may be attributed to the high rate of Na-translocation from roots to shoots, as clear from calculations presented in the data. This may be confirmed by comparing translocation efficiency obtained for the (soil+ Foliar) application treatments with that obtained from other ones; This agrees with results in wheat, one of the major mechanisms conferring salt tolerance is sodium exclusion from the leaves Hussain, *et al*., (2003).

4- Na^+/ K^+ Ratio:

An approach for evaluating the nutrient balance within plant tissues was thought to be performed through calculating the of Na^+ / k^+ ratio in both shoots and roots for both relatively salt –sensitive and relatively salt –resistant plants. Calculated values shown in Table (5) indicated that the concerned ratio was less than at control under the different amelioration techniques treatments, such values being decreased to be iessthan 1 at higher doses of organic amendments (5ton fed^{-1}) integrated with bioorganic treatment (soil+foliar) application indicating that Na was less absorbed.

Comparing the two studied varieties, the ratio of Na^+ / k^+ was always higher in shoots of relatively salt tolerant verities (Sids1) but generally lower in relatively salt sensitive verities (Giza 168).While the apposite trend was noticed in oots. These results agree with Maha, *et al*., (2017) found that study was to determine salinity stress tolerance of sixteen Egyptian local wheat cultivars, using three salinity levels. These cultivars were grown in pots under greenhouse conditions, and subjected to three salinity levels (tap water or control, 4000 ppm and 8000 ppm). Sids1 had the lowest Na^+ raise percent (70.23%) and the highest K^+/Na^+ ratio (0.46) with 8000 ppm, incontrast, the cultivar Giza 168 were the most sensitive cultivars. K^+/Na^+ ratio and SSI.

CONCLUSION

1- It is recommended to use phytoremediation, which is effective, especially with spraying with the bio-organic compound on the vegetative system of the plant and injecting it with irrigation water.

2 - Phytoremediation works on the lack of sodium in the soil through the accumulation of high concentrations of sodium within the shoots and roots of plants grown in wheat.

3- It is recommended to use a special (treatment of soil with a mixture of (1:3) FM + vinas at a rate of 5 tons fed^{-1}) with bio-spray and injection with irrigation water.

4- It is recommended to use salinity-resistant varieties (Sids1) wheat and sorghum in salt-affected lands under conditions of salt stress.

REFERENCES

Acosta-Motos, J.R., M.F. Ortuño., A. Bernal-Vicente., P. Diaz-Vivancos., M.J. Sanchez-Blanco and J.A. Hernandez., (2017) Plant responses tosalt stress: Adaptive mechanisms. Agronomy,7, 18.

Alqahtani, M., S. Bajracharya., K. P. Katuri., M. Ali., A. Ragab., G.Michoud., D. Daffonchio and P. E. Saikaly., (2019). Enrichment of *Marinobacter sp.* and *Halophilic Homoacetogens* at the Biocathode of Microbial Electrosynthesis System Inoculated With Red Sea Brine

Asik. B.B., M. A. Turan., H. Celik and V. A. Katkat., (2009). Effect of humic substances on plant growth and mineral nutrients uptake of wheat (Triticum durum Salihli) under conditions of salinity. Asian J. of crop Sci.,1,:87-95.

Dinardo-miranda, L.L., A.C.Mde., M.G. Landell and D.E. Andrade., (2008) Cana-deaçúcar. Campinas: Instituto Agronômico, 88. (Abstract.).

EMA., (2007). Agricultural Economic Report Ministry of Agriculture, Cairo, Egypt.

Gorham, J., E. Budrewicz and R.C. Wyuejones., (1990). Salt tolerance in the iceae: Growth of solute accumulation in the leaves of thinopyrum baddarabicm.J. Exp. Bot., 36,:1021-1031.

Hussain, N., A.Ali., G.Sarwar., F.Mujeeb and M.Tahir., (2003). Mechanism of salt tolerance in rice. Pedophere, 13: 3, 233-238.

Jackson, M. L., (1967). Soil Chemical Analysis. "Advanced course", Dept. of Soils, Univ. of Wise. Madison 6, Wishensin, U.S.A

Jarosova, M, B., J. Klejdus., J. Kovacik and Y. Hedbavn., (2014). The impact of humic substances on oxidative stress and plant growth of spring barley exposed to NaCl. Mendel University in Brno. MENDELNET.

Milad, S. I., M. N. El-Banna., M. H. El-Sheikh and M. E. Ebaid., (2013). Effect of genotypes and medium protocols on callus formation and plant regeneration from mature embryos of Egyptian wheat (Triticum aestivum L.) varieties. J. Adv. Agric. Res., 18,: 874-889.

Munns, R and M.Tester., (2008). Mechanisms of salinity tolerance. Annaul Review in Plant Biology, 59,: 651- 681.

Neeraja, G., I. P. Reddy and B. Gautham., (2009). Effect of growth promoters on growth and yield of tomato cv. Marutham. Journal-of-Research-ANGRAU.; 33,: 68-70

Negrao, S., S. M. Schmöckel and M. Tester., (2017) .Evaluating traits contributing to salinity tolerance. Annals of Botany, 119,: 13-26.

Oo, A.N., C.B. Iwai and P. Saenjan., (2015). Soil properties and maize growth in saline and nonsaline soils using cassava-industrial waste compost and vermi-compost with or without earthworms. Land Degrad. Develop 26,: 300-310.

Raafat, N.Z and E.E. Tharwat., (2011). Improving wheat grain yield and its quality under salinity conditions at a newly reclaimed soil by using different organic sources as soil or foliar applications. J. Appl. Sci. Res., 7,: 42-55.

Reda, M., M. Migocka and G. Kłobus., (2011). Effect of short-term salinity on the nitrate reductase activity in cucumber roots. Plant Science, 180,: 783–788.

Resende, A. S., A. Santos and R. P. Xavier., (2006). "Efeito da queima da palhada da cana-de-ac¸´ucar e de aplicac¸˜oes de vinhac¸a e adubo nitrogenado emcaracter´ısticas tecnol´ogicas da cultura," *Revista Brasileira de Ci´encia do Solo*, 30,: 937–941.

Shaban, Kh.A.H and M.N.A. Omar., (2009).Improvement of maize yield and some soilproperties by using nitrogen mineral and PGPR group fertilization in newly cultivated saline soils. Egypt. J. Soil Sci. 46: 329-342.

Utami, S. R., S. Kurniawan., B. Situmorang and N. D. Rositasari., (2012) Increasing P-availability and P-uptake using sugarcane filtercake and rice husk ash to improve chinesse cabbage (*BrassicaSp*) growth inAndisol, East Java, *Journal of Agricultural Science*,4,: 153–160.

Wolf., (1982). Acomprehensive system of leaf analysis and it is use for diagnosing crop nutrient status.Communic Soil Sci. and plant Analysis.13:1035-1059.

Zörb, C., C.M. Geilfus and K.J. Dietz., (2019). Salinity and crop yield.Plant Biol. 21:31–38.

استجابة صنفين من القمح للإجهاد الملحي للتربة المستصلحة حديثًا في صعيد مصر

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اجريت هذه الدراسة في مزرعة خاصة تقع جنوب شرق محافظة سوهاج خلال موسمين متتالين من 2018/2017 و 2019/2018.باستخدام معالجات التربة والنبات (معالجة التربة بمخلوط (1:3) طينة المرشحات + الفيناس بمعدل 2 طن / فدان) (MX1) و(معالجة التربة بمخلوط (1:3) طينة المرشحات + الفيناس بمعدل 5 طن / فدان) (MX2) ومعالجة النبات باستخدام مركب عضوي حيوي ارضي منفردا (S) ورشا علي المجموع الخضري للنبات منفردا (F) واستخدامها معا (S+F) ذلك تحت استخدام صنفين من القمح احادهما مقاوم نسبيا للأملاح والاخر حساس نسبيا. 1- نمو النبات : زاد كل من الوزن الطازج والجاف للمجموع الجذري الخضري وكذلك المحتوي المائي لكل من المجموع الجذري والخضري عند 80 يومًا من الزراعة وزاد طول النبات للأصناف المدروسة مقارنة بالكنترول وكانت اعلي زياده عند استخدام معالجة التربة والنبات بمخلوط2 (MX2) مع رش المركب العضوي الحيوي وذلك في كلا الموسمين وكانت الموسم الثاني اعلي من الموسم الاول. أوضحت الدراسة أن النباتات المقاومة للملوحة (سدس1) قد زاد كل من الوزن الطازج والجاف للمجموع الجذري والخضري وكذلك المحتوي المائي كانت أكثر بمقارنة بالصنف الحساسة للملوحة (جيزة 168) باستخدام تقنيات التحسين المختلفة في التربة المدروسة تحت ظروف الإجهاد الملحي. 2 – صوديوم: أوضحت الدراسة أن النباتات المقاومة للملوحة (سدس1) قد حدث تحسن ملحوظ في محتوى Na وحالة امتصاص Na لكل من المجموع الخضري والجذري كان المجموع الخضري أعلى تراكم من الجذري في محتواه من الصوديوم بمقارنة بالصنف الحساسة للملوحة وأظهر الدراسة أن تقنيات التحسين المختلفة مع المركب العضوي (MX1 و MX2) وكذلك المعالجات الحيوية العضوية للتربة والنبات (التربة S والرش F والتربة + الرشS+F) تحت الاصناف المدروسة في مقاومة الملح على التوالي ، عند 80 يومًا) عند مقارنة الطرق الثلاث المدروسة للتحسين الحيوي العضوي وجدا أن تأثيرًا استخدام مقدار 5 طن فدان من الخليط 2 (MX2) مع إضافه المركب الحيوي العضوي للتربة ورشا للنبات S+F، مقارنة بالطريقة الأخرى وحدها يقوم النبات بنقل صافٍ أكبر لـ Na من الجذور إلى المجموع الخضري وكانت أعلي في الموسم الثاني عن الاول. 3- البوتاسيوم : أوضحت الدراسة أن النباتات الحساسة للملوحة (جيزة 168) قد حدث تحسن ملحوظ في محتوى K وحالة امتصاص K لكل من المجموع الجذري و الخضري كان المجموع الخضري اكبر من الجذري في محتواه من البوتاسيوم بمقارنة الأصناف المقاومة للملوحة (سدس1) قد وجد أن محتوي المجموع الجذري اكبر من المجموع الخضري في محتواه من البوتاسيوم باستخدام تقنيات التحسين المختلفة في التربة المدروسة تحت ظروف الإجهاد الملحي. 4 - الانتقال في النبات : وجد أن النباتات المقاومة نسبيًا للملوحة (سدس1) قد حدث انتقال اكبر ل Na لكل من المجموع الجذري الي المجموع الخضري. وكان محتوي الجذور من الصوديوم اقل بمقارنة الاصناف الحساسة نسبيًا للملوحة (جيزة 168) وقد وجد أن محتوي المجموع الجذري أكبر من المجموع الخضري في محتواه من الصوديوم باستخدام تقنيات التحسين المختلفة في التربة المدروسة تحت ظروف الإجهاد الملحي. 5- نسبة Na / k : بمقارنة الصنفين المدروسين ، كانت نسبة Na / k دائمًا أعلى في المجموع الخضري للصنف المقاوم نسبيًا للملوحة (سدس1) ولكنها كانت أقل بشكل عام في الصنف الحساس نسبيًا للملوحة (الجيزة 168) .