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PRODUCTIVITY AND NUTRIENTS UPTAKE OF WHEAT AND FABA BEAN GROWN ON CALCAREOUS SOIL AS AFFECTED BY ORGANIC MANURE AND SALINE IRRIGATION WATER

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ABSTRACT: *A pot experiment was conducted under greenhouse conditions to investigate the effects of irrigation with saline water, organic manure and their combinations on wheat and faba bean yield and nutrients uptake, as well as some chemical properties of a calcareous soil. Results showed that, increasing salinity of irrigation water decreased the values of soil pH but increased EC, SAR and ESP and soluble ions, as well as Na/K or Na/Ca ratios. Increasing salinity level of irrigation water clearly decreased the yield of both straw and grains of wheat and faba bean plants. The uptake of N, P, K, Ca, Mg, Fe, Mn, Zn and Cu was markedly decreased with increasing salinity level of irrigation water. The organic manure decreased the figures of soil pH, EC, SAR, ESP, Na/K and Na/Ca. In general, soluble anions in soil were decreased as a result of organic manure addition. Addition of chicken and farmyard manures led to a significant increase in the straw and grain yield, as well as macro- and micronutrients uptake of both crops, as compared with the control treatment. Application of chicken manure, at the low level of salinity, obviously increased the uptake of such nutrients indicating the beneficial effect of such manure. This study revealed that addition of organic amendments with saline water improved the soil chemical properties.*

Key words: *Salty water, Organic manure, Wheat, Faba bean, Yield, Nutrients uptake, Calcareous soil.*

INTRODUCTION

Under Egyptian conditions, shortage of fresh water resources for agricultural expansion in the newly cultivated and reclaimed lands is an important problem. Thus, an urgent need for using low quality water for this purpose is of a vital importance. However, the use of saline waters for irrigation affects many soil properties such as those related to pH, ion exchange equilibrium and salt concentration (El-Kouny, 2002). These soil properties are considered as important factors controlling most of soil conditions and soil-plant relationships, especially in salt-affected soils (Wassif *et al.*, 1997).

In the last two decades, the use of organic manure has been suggested to facilitate crop growth and nutrients uptake in newly reclaimed lands, salt affected soils and in soils irrigated with saline water. Avoiding the risk of soil

and/or water salinity, a fair number of investigators indicated the advantages of using organic manure in this respect (Wasslf *et al.*, 1991, El- Maghraby *et al.*, 1996 and El- Maghraby *et al.*, 1997).

With the intensification of poultry farming in Egypt, chicken excreta is continuously produced and accumulated. Unless it is properly disposed of or utilized, it poses a potential pollution hazard. But if properly managed and utilized, chicken manure could be a valuable agricultural resource. With the cost of chemical fertilizers as agricultural inputs, chicken manure may be utilized as a valuable source of plant nutrients (Abdel Magid *et al.*, 1998 and El-Koumey, 1999).

The objective of this study was to investigate the effect of using organic manure for reducing the hazardous effect of saline water for irrigation on some chemical properties of a calcareous soil, as well as wheat and faba bean yields and nutrients uptake.

MATERIALS AND METHODS

A greenhouse pot experiments were carried out in 30-cm diameter and 30-cm height plastic pots, with a hole in the bottom, each was filled with 10 kg calcareous soil (collected from El-Nobaria Farm, El-Beheira Governorate). Some physical and chemical properties of the soil are shown in Table (1). The soil samples were air-dried, ground and passed through a 2-mm sieve. Under such conditions, two successive winter crops were carried out, on wheat (*Triticum aestivum*, cv. Sakha 69) and faba bean (*Vicia faba*, cv. Giza 461), representing wheat crop was selected as a moderately salt tolerant, meanwhile, faba bean was selected as a sensitive crop to salinization.

Chicken manure and farmyard manure were used at rates of 3 and 6% (w/w) for each, besides a treatment without organic amendment as a control. The organic manure was mixed before cultivation with the upper 15 cm of the soil in each pot. The chemical properties of the organic manures are shown in Table (2).

Wheat gains (20) and faba bean seeds (15) were planted in each pot. After two weeks of sowing, the seedlings were thinned to 10 per pot for wheat and 5 for faba bean. The plants were irrigated with tap water, equal to field capacity every 3 days up to 14 days, then irrigated with different saline waters. Four saline water treatments were used by adding a mixture of $NaCl_2$ and $CaCl_2$ (1 : 1 w/w) at rates of EC 2, 4 and 8 dSm^{-1}, besides tap water as a control (EC = 0.5 dSm^{-1}). Twenty treatments were arranged in a completely randomized block design with five replicates per treatment. The traditional agricultural practices for both crops were separately made and the recommended rates of N, P and K were applied.

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

Property	Value	Property	Value
C. sand, %	6.5	Soluble ions, meq/100 g soil	
F. sand, %	50.3	Ca^{2+}	11.6
Silt, %	20.5	Mg^{2+}	6.4
Clay, %	22.7	Na^{+}	14.3
Texture class	sandy clay	K^{+}	1.0
OM, %	0.33	HCO^{-}_{3}	6.9
pH (1 : 2.5)*	8.2	Cl^{-}	20.2
$CaCO_3$, %	30.6	SO^{2-}_{4}	6.2
EC, dSm^{-1} **	4.18		

* Soil-water suspension. ** Soil-water paste.

Table (2): Some chemical properties of the applied organic manures.

Property	Chicken manure	Farmyard manure
OM, %	60.00	13.6
pH (1 : 2.5)*	7.00	7.10
Total N, %	2.50	0.54
Available P, %	0.22	0.11
Available K, %	0.92	0.65
Fe, ppm	320	200
Mn, ppm	125	60
Cu, ppm	40	9
Zn, ppm	100	30

* Soil-water suspension.

Plants were harvested at maturity stage and yields of wheat and faba bean per pot were weighed after the separation of foliage and grains. The plant samples were oven-dried at 70°C, weighed, ground and analyzed for

N, P, K, Ca, Mg, Fe, Mn, Zn and Cu. The elemental content of the plant materials was determined after wet digested using the H_2SO_4 and H_2O_2 (Chapman and Pratt, 1971). Total N was determined by modified micro-Kjeldahl procedure. Phosphorus was determined spectrophotometrically using the molybdenum method (Jackson 1973). Potassium was estimated using flamephotometer. Ca and Mg were determined using atomic absorption spectrophotometer. Available Fe, Mn, Zn and Cu were determined by atomic adsorption spectrophotometer (Cottenie, 1980). Soil samples, after harvesting, were analyzed for pH, EC, SAR, ESP and soluble ions according to standard methods of Page *et al.* (1982). Statistical analysis for crop yields was carried out according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

1. Soil Chemical Properties

Data presented in Table (3) show, in general, that soil pH values were decreased with increasing the salinity of irrigation water. This result may be attributed to that H^+ ions are released from the exchange complex by the effect of the other soluble cations in the used saline water. These findings are in a good agreement with those obtained by Abd El-Nour (1989) and Abou Hussien and Barsoom (2002) who reported that increasing salinity of irrigation water decreased soil pH. It is clear that, the values of EC, SAR and ESP greatly increased with increasing salinity levels as compared with control treatment. In this concern, Abd El-Nour (1989) noted that EC, and SAR values of soil were increased as a result of rising salinity of irrigation water up to 4 dSm^{-1}. The recorded data in Table (3) show that chloride (Cl^-) content in the calcareous soil irrigated with saline water was increased. Similar trend was found with sulphate ($SO^=_4$) and bicarbonate (HCO^-_3). This is in fact due to the irrigation with saline water having high amounts of such ions. This result was in agreement with those obtained by Wassif *et al.* (1997). The highest content of HCO^-_3 was found when the salinity level of irrigation water was 4 dSm^{-1}, whereas it was decreased at the level of 8 dSm^{-1}. This effect may be due to that the high salinity level (8 dSm^{-1}) of saline irrigation water inhibits the dissociation of non-soluble forms of carbonate compounds. The effect of saline water of irrigation on soluble Na^+ is recorded in Table (3), where it was similar to that of soluble Cl^-.

Table (3): Effect of organic manures and saline water irrigation on chemical properties of the calcareous soil after crop harvest.

Salinity level "EC" (dSm^{-1})	Organic manure (%)	pH (1 : 2.5)*	Soil EC (dSm^{-1}) (25°C)**	SAR	ESP	Soluble ions (meq / L)							Na^+/K^+	Na^+/Ca^{2+}
						Cations				Anions				
						Ca^{+2}	Mg^{2+}	Na^+	K^+	HCO_3^-	Cl^-	SO^{2-}_4		
Control	Control	8.04	0.74	1.60	2.20	2.50	2.36	6.70	0.56	2.60	6.70	3.83	12.00	2.70
	Chicken 3	7.73	0.48	1.53	2.12	2.78	2.52	6.60	0.63	2.53	6.30	3.78	11.00	2.40
	Chicken 6	7.58	0.42	1.40	1.83	2.83	2.68	6.24	0.68	2.42	6.36	3.33	9.00	2.19
	FYM 3	7.86	0.63	1.62	2.10	2.86	2.48	6.86	0.58	2.62	6.52	3.61	11.80	2.40
	FYM6	7.82	0.57	1.49	1.98	2.85	2.59	6.93	0.63	2.53	6.68	3.55	11.00	2.40
	Mean	7.80	0.57	1.53	2.05	2.80	2.60	6.70	0.62	2.54	6.51	3.62	11.00	2.40
2	Control	7.93	1.21	8.22	7.87	3.82	2.43	13.33	0.65	2.56	12.90	4.65	20.50	3.50
	Chicken 3	7.75	1.05	4.96	6.82	3.86	2.89	12.82	0.78	2.60	10.20	4.52	16.40	3.30
	Chicken 6	7.68	0.95	4.31	6.31	3.80	2.93	12.60	0.86	2.45	10.33	4.46	14.70	3.30
	FYM 3	7.80	1.32	5.18	7.02	3.78	2.74	12.80	0.73	2.53	11.96	4.58	17.60	3.40
	FYM 6	7.73	1.28	5.97	6.70	3.85	2.86	12.73	0.81	2.48	12.23	4.42	15.70	3.30
	Mean	7.78	1.16	5.73	6.94	3.80	2.80	12.90	0.77	2.52	11.52	4.53	17.00	3.40
4	Control	7.85	2.15	9.20	10.42	4.31	2.76	18.21	0.71	2.82	13.60	8.64	23.30	4.20
	Chicken 3	7.71	2.90	8.43	9.33	4.75	3.20	17.67	0.81	2.75	13.24	8.61	21.80	3.70
	Chicken 6	7.65	2.95	7.72	9.13	4.78	3.31	17.20	0.80	2.58	13.27	8.55	21.50	3.67
	FYM 3	7.73	2.60	8.33	9.63	4.75	3.13	17.82	0.81	2.78	13.36	8.61	22.00	3.75
	FYM 6	7.68	2.75	8.58	9.41	4.80	3.26	17.70	0.79	2.65	13.30	8.65	22.40	3.80
	Mean	7.72	2.67	7.65	9.58	4.70	3.10	17.60	0.78	2.72	13.35	8.61	22.20	3.80
8	Control	7.89	3.35	10.34	11.43	4.55	3.53	19.50	0.83	2.43	13.82	8.80	23.50	4.30
	Chicken 3	7.68	3.15	9.83	10.10	4.85	3.68	18.50	0.95	2.30	12.71	8.62	19.00	3.80
	Chicken 6	7.82	3.20	9.61	9.73	4.95	3.74	18.42	0.98	1.83	12.63	8.43	18.80	3.66
	FYM 3	7.85	3.00	9.85	10.51	4.90	3.48	18.83	1.10	2.21	12.83	8.52	17.00	3.80
	FYM 6	7.81	2.95	9.67	9.82	4.91	3.53	18.75	1.12	1.97	12.58	8.63	16.70	3.80
	Mean	7.81	3.13	9.86	10.32	4.80	3.60	18.90	1.00	2.15	12.91	8.60	19.00	3.90

* Soil-water suspension.
** Soil-water paste.

These results are in agreement with those obtained by Marschner (1995) who found that soil content of soluble Na^+ was increased with increasing the salinity of irrigation water. On the other hand, data in the same table show that increasing the salinity level of irrigation water led to increase the soil content of soluble K^+. This effect may be due to that, the saline solution contained high amounts of soluble Ca^{2+} ions. This result is in harmony with that found by Abou Hussien and Barsoom (2002) who found that, increasing salt concentrations in irrigation water increased Na^+, K^+, Ca^{2+}, Mg^{2+} and Cl^- in soil. The ratios of Na^+/K^+ and Na^+/Ca^{2+} in the calcareous soil were increased with increasing the salinity of irrigation water, such values being increased at higher doses, indicated that Na^+ was more absorbed. Imbalance of Na^+/K^+ or Na^+/Ca^{2+} could result in physiological disorders affecting membrane integrity and displacement of Ca^{2+} from plasma membranes by Na^+ (Amberger, 1997).

In regard to the effect of organic manure application, data in the same table indicate that the addition of organic manure decreased soil pH. This results may be due to the formation of CO_2 and the other organic acids during decomposition of the organic fertilizers (El-Leboudi *et al.,* 1976 and Sakr *et al.,* 1995). It is clear that, the values of EC, SAR and ESP were decreased with addition of organic manures. These results are in a good agreement with those obtained by Ibrahim *et al.* (1987) and Awadalla *et al.* (1990).

With respect to the combined effect of manures and water salinity on soil pH, it was found that the lowest pH values were obtained in the soil treated with chicken manure at the rate of 6% and irrigated with water having salinity level of 4 dSm^{-1}. With regard to the soluble ion contents in soil, the data revealed that Na^+ ions in soil treated with organic manure and saline irrigation water was increased. As for K^+ and Ca^{2+} ions they were increased when the soil was fertilized with manure treatments and irrigated with saline water. Whereas, Mg^{2+} ions were increased when soil was irrigated with saline water and fertilized with chicken manure as compared with that irrigated with tap water. The addition of organic manure to soil under saline irrigation water gave the lowest values of Na^+/K^+ and Na^+/Ca^{2+} ratios. These results were in agreement with those found by El-Aasser *et al.* (1996) who attributed the effect of organic manure on reducing the soil salinity to the effects of organic matter on improving the physical properties of calcareous soil, which in turn facilitates the leaching of salts outside the root zone.

2. Crop Yields

Data presented in Tables (4 and 5) indicate that the yields of straw and grains of wheat and faba bean were clearly decreased with increasing salinity

Table (4): Effect of organic manures on yield of wheat crop grown on calcareous soil irrigated with saline water.

Organic manure	Salinity level, "EC" (dSm^{-1})				
	Control	2	4	8	Mean
	Straw (g / pot)				
Control	19.0	17.4	13.0	8.6	14.5
Chicken m. 3%	20.5	18.5	13.5	10.4	15.7
Chicken m. 6%	22.5	19.3	14.2	10.8	16.7
FYM 3%	19.1	17.5	12.9	9.6	14.8
FYM 6%	21.2	18.3	13.3	10.3	15.8
Mean	20.5	18.2	13.4	9.9	
	Grains (g / pot)				
Control	12.3	10.5	10.1	5.1	9.5
Chicken m. 3%	14.6	11.5	10.2	6.0	10.7
Chicken m. 6%	15.3	13.3	10.8	6.5	11.5
FYM 3%	14.2	12.0	8.4	5.3	10.0
FYM 6%	14.2	12.6	9.7	5.9	10.6
Mean	14.1	12.0	9.8	5.8	

L.S.D. at 5%	straw	grains
Salinity	2.0	2.1
OM	1.1	1.5
Salinity × OM	3.4	3.8

Table (5): Effect of organic manures on yield of faba bean crop grown on calcareous soil irrigated with saline water.

Organic manure	Salinity level, "EC" (dSm^{-1})				
	Control	2	4	8	Mean
	Straw (g / pot)				
Control	71.7	63.8	35.3	12.8	45.9
Chicken 3%	85.9	76.0	40.2	16.7	54.7
Chicken 6%	88.2	71.5	42.4	18.9	55.3
FYM 3%	79.5	67.2	39.2	14.0	50.0
FYM 6%	81.9	70.3	40.8	15.8	52.2
Mean	81.4	69.8	39.6	15.6	
	Seeds (g / pot)				
Control	61.2	51.2	20.0	10.8	35.8
Chicken 3%	72.8	60.1	24.7	12.5	41.8
Chicken 6%	82.8	63.7	27.3	13.5	46.8
FYM 3%	69.2	53.5	21.3	10.9	38.7
FYM 6%	73.7	57.5	24.5	12.0	41.9
Mean	71.9	57.2	23.0	11.9	

L.S.D. at 5%	straw	seeds
Salinity	10.2	12.4
OM	4.3	2.5
Salinity × OM	12.4	14.5

of the irrigation water compared to the control treatment. This could be attributed to the deleterious effect on the growth and physiological processes of the growing plants as affected by soil moisture stress and nutrients balance disorder in root medium. Also, the reduction in dry weight of plant organs may be due to suppressing cell enlargement and division and also to the inhibition of enzyme activities by salts, especially sodium ions (Marschner, 1995). Moreover, increasing salinity of the soil solution around roots results in a general retardation of the enzymatic and photosynthetic processes (Amberger, 1997 and El- Sharawy *et al.*, 1997).

It is clear that application of manures caused significant increases of both straw and grain yields of wheat and faba bean plants. The yield values of both crops were increased with increasing the manure rates. Chicken manure was more effective than farmyard manure on the yield of either crop. The positive action of organic manure may be due to increasing the soil water retention which affects the pore size distribution, i.e., water-holding pores and improves the dynamic soil-water characteristic, (decreasing the downward water movement via evaporation) and contribution of organic manure to the physico-chemical properties and nutritional status of soils. Beside that the decomposition of organic manure in calcareous soil might have induced a slow release of nutrients supply for the growing plants (Salem *et al.*, 1990, Hashem *et al.*, 1995, El- Maghraby *et al.*, 1997, El-Morsy 1997, and Hashem *et al.*, 1997). Thereby wheat and faba bean plants would have a favorable environmental condition for a better growth and higher yields (Khalil *et al.*, 2000).

The combined application of organic manure and salinity of the irrigation water gave significant differences in yields of wheat and faba bean crops. Adding chicken manure at the rate of 6% under saline water irrigation having EC 2 and without salinization of irrigation water gave the highest yield of both crops among all combined treatments. Meanwhile, the farmyard manure at the rate of 3% with the saline irrigation water of EC 8 gave the lowest yield of both crops. The favorable effect of organic manure on increasing crop yields could be rendered to reducing the soil salinity and/or the increase in the availability of certain plant nutrients due to the application of such materials. Accordingly, the growing plants will have better environmental conditions with a relatively low stress on growth. Such results are in a good harmony with those reported by Wassif *et al.* (1988), Ashour (1992), Sakr *et al.* (1995), Wassif *et al.* (1995), El-Maghraby *et al.* (1996) and El- Maghraby *et. al.* (1997).

Data illustrated in Fig (1) revealed that the chicken manure is useful in reducing the harmful effect of salinity in wheat and faba bean behaviour udern saline condition. Moreover chicken manure recorded better results than farmyard manure in this concern.

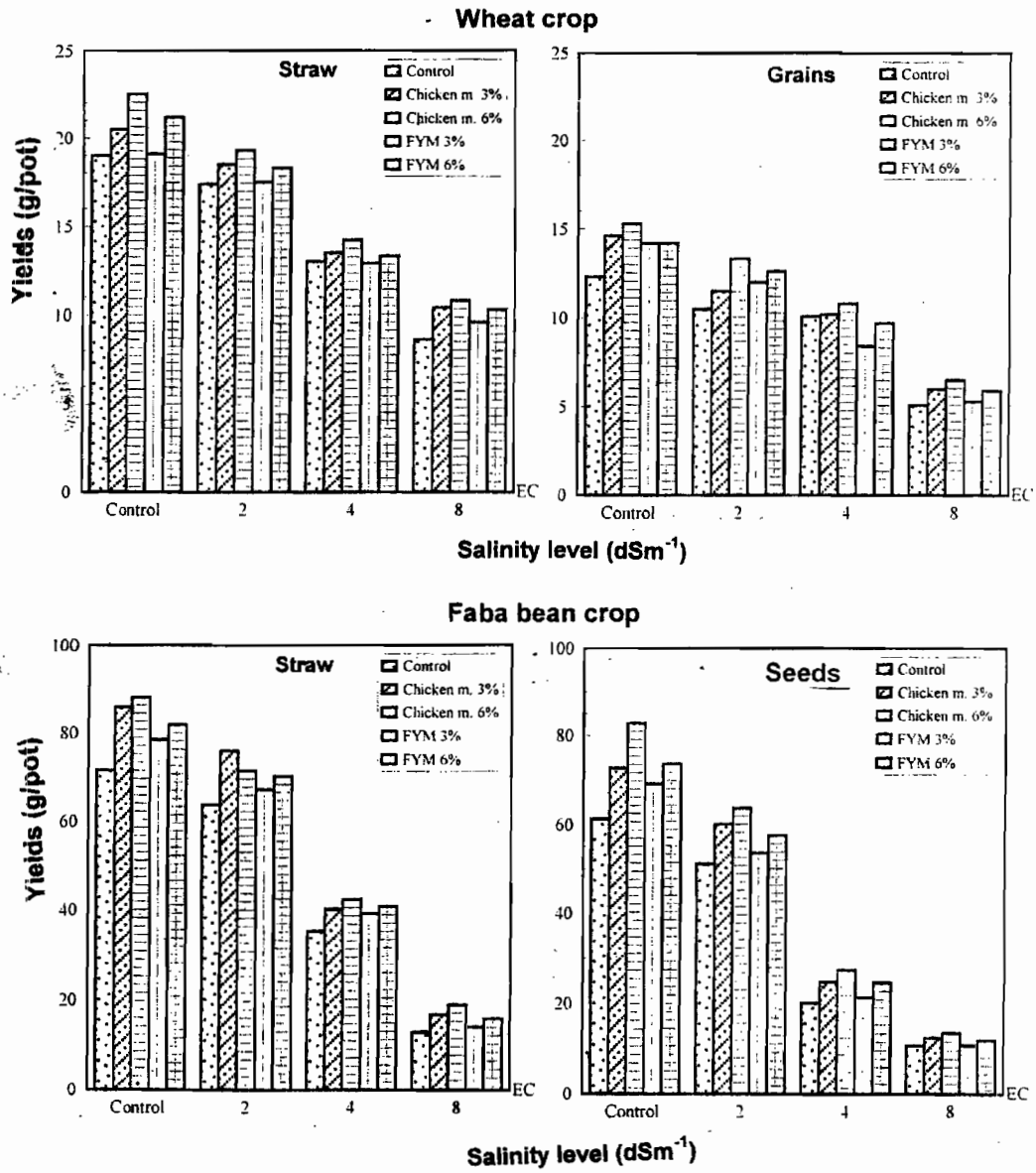

Fig. 1. Effect of organic manures on **crop yields** *on calcareous soil irrigated with saline water.*

3. Macronutrients Uptake

Data presented in Tables (6, 7, 8 and 9) reveal that increasing the salinity levels of irrigation water inversely affected the macronutrients concentration and uptake in straw and grains of both wheat and faba bean crops. The concerned elements under study were decreased as the salinity level of irrigation water increased. The diminishing values of nutrients uptake by plants irrigated with saline water were mainly due to the depressive effect of salinity on plant dry weight. Similar findings were also found by El-Gala *et al.* (1989) and Sakr *et al.* (1992), who reported that K concentration and uptake were reduced due to composition of saline irrigation water used which tended to encourage the accumulation of Na and, in turn, depressed concentration of K in barley plants. Mansour *et al.* (1993) reported that K, Ca and Mg contents for shoots and roots of wheat plants decreased with increasing NaCl up to 100 mM/L. The reduction in P uptake could be referred to decreasing the solubility and available P in soils irrigated with saline water. Beside salinity effect, it is worthy to mention that the harmful effect could be considered. The Na may affect uptake of K, Ca and Mg as a result to an antagonistic state between Na and one or more of the tested nutrients present in the growth medium. Similar result was also reported by Abu El-Defan (1990). The present findings agree with those reported by Marschner (1995),who stated that the major constraints for plant growth on saline substrates are: (1) water deficit arising from the low water potential of the rooting medium, (2) ion toxicity associated with the excessive uptake mainly of Cl and Na^+, (3) nutrients imbalance by depression in uptake, translocation and distribution of mineral nutrients.

The results in Tables (6, 7, 8 and 9) illustrate that a positive effect of organic fertilizers occurred on N, P, K, Ca and Mg concentration and uptake in wheat and faba bean plants, as compared with the control treatment. Chicken manure was superior to farmyard manure on macronutient contents in both crops. This emphasizes the role of the organic manure in terms of increasing the grains and straw of both crop contents of N, P, K, Ca and Mg, via enhancing the availability of plant nutrients, which is rendered to its role in improving some physical and microbiological properties of the calcareous soil. Such results came along with those reported by Radwan *et al.* (1993), El-Maghraby *et al.* (1995), El-Maghraby *et al.* (1996), El-Morsy (1997) and Badran *et al.* (2000).

The interaction among the experimental variables pointed out that, the chicken manure at the rate of 6% under irrigation with saline water of EC 2 gave the highest values of macronutrients uptake. Meanwhile, farmyard manure at the rate of 3% with saline irrigation water of EC 8 gave the lowest values.

Table (6): Effect of organic manures on macronutrients concentration and uptake in grains of wheat crop grown on calcareous soils irrigated with saline water.

Salinity levels "EC" (dSm^{-1})	Organic manure (%)	Macronutrients concentration (%) and uptake (mg / pot)									
		N		P		K		Ca		Mg	
		%	mg/ pot	%	mg/ pot	%	mg/ pot	%	mg/ pot	%	mg/ pot
Control	Control	1.3	160.0	0.35	43.1	0.65	78.0	0.65	80.0	0.60	73.0
	Chicken 3	1.6	233.6	0.38	55.5	0.78	113.9	0.73	106.6	0.63	92.0
	Chicken 6	1.8	275.4	0.45	68.9	0.83	127.0	0.86	131.6	0.66	101.0
	FYM 3	1.5	213.0	0.36	51.1	0.74	105.1	0.68	96.6	0.61	86.6
	FYM 6	1.7	241.4	0.40	56.8	0.81	115.0	0.71	100.8	0.64	90.9
	Mean		224.7		55.1		107.8		103.1		88.7
2	Control	1.25	131.3	0.30	31.5	0.58	61.0	0.61	64.1	0.57	59.9
	Chicken 3	1.53	180.5	0.34	40.1	0.65	76.7	0.70	82.6	0.60	70.8
	Chicken 6	1.60	212.8	0.40	53.2	0.73	97.1	0.81	107.7	0.64	85.1
	FYM 3	1.48	177.6	0.33	39.6	0.62	74.4	0.65	78.0	0.62	74.4
	FYM 6	1.62	204.1	0.36	45.4	0.68	85.7	0.68	85.7	0.62	78.1
	Mean		181.3		42.0		79.0		83.6		73.7
4	Control	1.20	121.2	0.10	10.1	0.53	53.5	0.60	60.6	0.55	55.6
	Chicken 3	1.48	151.0	0.12	12.2	0.61	62.2	0.71	72.4	0.58	59.2
	Chicken 6	1.57	159.6	0.15	16.2	0.68	73.4	0.78	84.2	0.61	65.9
	FYM 3	1.43	120.1	0.11	9.2	0.58	48.7	0.62	52.1	0.57	47.9
	FYM 6	1.58	153.3	0.14	13.6	0.65	63.1	0.65	63.1	0.60	58.2
	Mean		141.0		12.3		60.2		66.5		57.4
8	Control	1.10	56.1	0.08	4.1	0.50	25.5	0.58	29.6	0.53	27.0
	Chicken 3	1.40	84.0	0.10	6.0	0.55	33.0	0.68	40.8	0.54	32.4
	Chicken 6	1.50	97.5	0.12	6.4	0.62	40.3	0.73	47.5	0.58	37.7
	FYM 3	1.38	73.1	0.09	4.8	0.50	26.5	0.60	31.8	0.52	27.6
	FYM 6	1.47	86.7	0.11	6.5	0.58	34.2	0.61	36.0	0.58	34.2
	Mean		79.5		5.6		31.9		37.1		31.8

Table (7): Effect of organic manures on macronutrients concentration and uptake in straw of wheat crop grown on calcareous soils irrigated with saline water.

Salinity levels "EC" (dSm^{-1})	Organic manure (%)	Macronutrients concentration (%) and uptake (mg / pot)									
		N		P		K		Ca		Mg	
		%	mg/ pot	%	mg/ pot	%	mg/ pot	%	mg/ pot	%	mg/ pot
Control	Control	0.65	123.5	0.18	34.2	2.90	551.0	0.56	95.0	0.43	81.7
	Chicken 3	0.74	151.7	0.22	45.1	2.96	606.8	0.62	127.1	0.50	102.5
	Chicken 6	0.87	195.8	0.25	56.3	3.22	724.5	0.65	146.3	0.52	117.0
	FYM 3	0.69	131.8	0.24	45.8	2.92	557.7	0.60	114.6	0.45	86.0
	FYM 6	0.71	150.5	0.27	57.2	3.12	661.4	0.62	131.4	0.48	101.8
	Mean		150.7		47.7		620.3		122.9		97.8
2	Control	0.61	106.1	0.15	26.1	2.79	485.5	0.55	95.7	0.48	83.5
	Chicken 3	0.65	120.3	0.18	33.3	2.86	529.1	0.58	107.3	0.51	94.4
	Chicken 6	0.78	150.5	0.21	40.5	2.93	565.5	0.61	117.7	0.55	106.2
	FYM 3	0.63	110.3	0.20	35.0	2.81	491.8	0.57	99.8	0.48	84.0
	FYM 6	0.68	124.4	0.22	40.3	2.81	514.2	0.60	109.8	0.51	93.3
	Mean		122.3		35.0		517.2		106.1		92.3
4	Control	0.58	75.4	0.08	10.4	2.73	355.0	0.58	75.4	0.50	65.0
	Chicken 3	0.62	83.7	0.05	6.8	2.78	375.3	0.61	82.4	0.53	71.6
	Chicken 6	0.71	100.8	0.08	11.4	2.82	400.4	0.65	92.3	0.57	80.9
	FYM 3	0.59	76.11	0.08	10.3	2.75	354.8	0.58	74.8	0.51	65.8
	FYM 6	0.65	86.5	0.10	13.3	2.81	373.7	0.62	82.5	0.54	71.8
	Mean		84.5		10.4		371.8		81.5		71.0
8	Control	0.55	47.3	0.04	3.44	2.65	227.9	0.60	51.6	0.52	44.7
	Chicken 3	0.59	61.4	0.05	5.20	2.69	279.8	0.63	65.5	0.55	57.2
	Chicken 6	0.68	73.4	0.06	6.50	2.78	300.2	0.68	73.4	0.59	63.7
	FYM 3	0.53	50.9	0.05	4.80	2.68	257.3	0.61	58.6	0.53	50.9
	FYM 6	0.61	62.8	0.08	8.24	2.73	281.2	0.65	67.0	0.56	57.7
	Mean		59.2		5.6		269.3		63.2		52.8

Table (8): Effect of organic manures on macronutrients concentration and uptake in seeds of faba bean crop grown on calcareous soil irrigated with saline water.

Salinity levels "EC" (dSm^{-1})	Organic manure (%)	Macronutrients concentration (%) and uptake (mg / pot)									
		N		P		K		Ca		Mg	
		%	mg/ pot	%	mg/ pot	%	mg/ pot	%	mg/ pot	%	mg/ pot
Control	Control	3.85	2356	0.45	275	2.75	1683	0.80	490	1.42	869
	Chicken 3	4.05	2948	0.48	349	2.92	2126	0.95	492	1.45	1056
	Chicken 6	4.20	3478	0.55	455	2.96	2451	1.10	911	1.55	1283
	FYM 3	4.00	2768	0.45	311	2.90	2007	0.96	664	1.46	1010
	FYM 6	4.12	3036	0.52	383	3.01	2218	1.05	774	1.56	1150
	Mean		2917		355		2097		666		872
2	Control	3.65	1869	0.35	179	2.55	1306	0.68	348	0.55	282
	Chicken 3	3.85	2314	0.32	192	2.75	1653	0.65	391	0.52	313
	Chicken 6	3.92	2497	0.38	242	2.80	1784	0.75	478	0.58	369
	FYM 3	3,90	2087	0.30	161	2.85	1667	0.60	321	0.56	300
	FYM 6	4.00	2300	0.35	201	2.90	1668	0.70	403	0.55	316
	Mean		2213		195		1616		388		316
4	Control	2.96	592	0.25	50	1.50	300	0.50	100	0.45	90
	Chicken 3	3.15	778	0.20	49	1.45	358	0.42	104	0.45	111
	Chicken 6	3.28	895	0.28	76	1.55	423	0.55	120	0.36	98
	FYM 3	3.20	682	0.20	43	1.40	298	0.44	94	0.32	68
	FYM 6	3.30	809	0.25	61	1.60	392	0.50	123	0.35	86
	Mean		751		56		354		108		91
8	Control	1.20	130	0.08	8.6	1.10	118.8	0.15	16	0.08	9
	Chicken 3	1.35	169	0.07	8.8	1.25	156.3	0.12	15	0.06	8
	Chicken 6	1.62	219	0.09	12.2	1.52	205.2	0.20	27	0.09	12
	FYM 3	1.30	142	0.08	8.7	1.20	130.8	0.15	16	0.07	8
	FYM 6	1.70	204	0.10	12.0	1.60	190.0	0.20	24	0.10	12
	Mean		173		10.0		160.0		20		10

Table (9): Effect of organic manures on macronutrients concentration and uptake in straw of faba bean crop grown on calcareous soil irrigated with saline water.

Salinity levels "EC" (dSm^{-1})	Organic manure (%)	Macronutrients concentration (%) and uptake (mg / pot)									
		N		P		K		Ca		Mg	
		%	mg/ pot	%	mg/ pot	%	mg/ pot	%	mg/ pot	%	mg/ pot
Control	Control	1.40	1004	0.11	78.9	1.65	1183	0.48	344	0.82	588
	Chicken 3	1.65	1417	0.18	155.0	1.70	1460	0.55	472	0.80	687
	Chicken 6	1.72	1429	0.20	176.0	1.78	1570	0.72	635	0.85	750
	FYM 3	1.62	1288	0.12	95.4	1.67	1328	0.52	413	0.78	620
	FYM 6	1.69	1384	0.15	123.0	1.70	1392	0.68	557	0.81	663
	Mean		1304		126		1387		487		662
2	Control	1.15	734	0.10	63.8	1.43	912	0.39	249	0.60	383
	Chicken 3	1.25	950	0.14	106.4	1.52	1155	0.42	319	0.72	547
	Chicken 6	1.36	972	0.18	129.0	1.69	1208	0.48	343	0.78	558
	FYM 3	1.20	806	0.12	80.6	1.50	1008	0.40	269	0.65	437
	FYM 6	1.30	914	0.16	112.5	1.64	1153	0.40	281	0.73	513
	Mean		875		98.0		1087		292		488
4	Control	1.08	381	0.08	28.2	1.21	427	0.30	106	0.50	177
	Chicken 3	1.20	482	0.13	52.3	1.33	535	0.38	153	0.55	221
	Chicken 6	1.28	543	0.16	67.8	1.42	602	0.42	178	0.69	293
	FYM 3	1.18	463	0.11	73.9	1.30	510	0.36	141	0.52	204
	FYM 6	1.25	510	0.14	57.1	1.58	645	0.41	167	0.60	245
	Mean		476		55.9		544		149		228
8	Control	0.55	70	0.06	7.7	0.90	115.0	0.28	35.8	0.45	57.6
	Chicken 3	0.70	117	0.12	20.0	1.05	175.4	0.35	58.5	0.48	80.2
	Chicken 6	0.82	155	0.15	28.4	1.12	211.7	0.42	79.4	0.52	98.0
	FYM 3	0.68	95	0.09	12.6	1.03	144.0	0.33	46.2	0.45	63.0
	FYM 6	0.76	120	0.11	17.4	1.09	172.2	0.40	63.2	0.50	79.0
	Mean		112		17.2		163.7		56.6		75.6

4. Micronutrients Uptake

The effect of saline irrigation water on micronutrients concentration and uptake in wheat and faba bean plants is reported in Tables (10, 11, 12 and 13). Results reveal that increasing the salinity level of irrigation water usually led to a pronounced decrease in Fe, Mn, Zn and Cu uptake by the plants of concern. This was true for both straw and grains (or seeds). These results confirm those obtained by El-Sharawy *et al.* (1997) who found a negative correlation between soil salinity and the uptake of Fe, Mn, Zn and Cu by wheat plants.

Application of organic manure enhanced the concentration and uptake of micronutrients in straw and grains (or seeds) of wheat and faba bean crops, compared with control treatment. Most of organic manures are bulky in nature, contain small amount of nutrients and their main value lies in the supply of organic matter to the soil. Unless applied in large amounts, they do not contribute much to the nutrient supply to plants. Nevertheless, the organic matter added in the form of manure performs certain other essential functions. It promotes microbial activity in the soil, as well as, improves soil structure leading to enhanced aeration and water-holding capacity. Chicken manure treatment came superior to farmyard manure treatment on elevating the plant content of micronutrients. This may be confirmed by the continuous biodegradation of chicken manure throughout the growth period, providing such elements in easily absorbable forms. Also, improving the soil structure with chicken manure application encourages micronutrients availability to the growing plants. These results agreed with those obtained by Eissa (1996) and El-Koumey (1999).

Effect of combinations between organic manures and saline irrigation water on micronutrients uptake by both crops of concern (Tables 10, 11, 12 and 13) exhibited that the soil amended with either chicken manure or farmyard manure at the highest rate(6%) accompanied with saline water irrigation of EC 2 was the most favorable variable for all recorded micronutrients uptake by wheat and faba bean plants. Meanwhile, the application of 3% organic manure under 8 dSm^{-1} salinity of irrigation water gave the lowest rate of micronutrients uptake.

Finally, it could be concluded that, the data presented in this work demonstrate the great importance of the appropriate role of organic manures, i.e. chicken and farmyard manures in improving calcareous soil properties and enhancing its productivity, as well as promotes the uptake of macro- and micronutrients by wheat and faba bean plants under the conditions of saline irrigation water. It is of a great significance to point out that the use of organic manures in general is of a minimum or no polluting effect on soil environment, comparing to the chemical fertilizers.

Table (10): Effect of organic manures on micronutrients concentration and uptake in grains of wheat crop grown on calcareous soil irrigated with saline water.

Salinity levels "EC" (dSm^{-1})	Organic manure (%)	Micronutrients concentration (ppm) and uptake (µg / pot)							
		Fe		Mn		Zn		Cu	
		ppm	µg/ pot	ppm	µg/ pot	ppm	µg/ pot	ppm	µg/ pot
Control	Control	145.5	1786.7	25.0	307.5	17.0	209.1	4.2	21.9
	Chicken 3	156.0	2277.6	37.8	551.9	19.0	277.4	4.6	64.2
	Chicken 6	166.5	2547.5	50.8	777.2	19.3	295.3	5.0	76.5
	FYM 3	150.3	2134.3	25.0	355.0	16.6	235.7	5.6	79.5
	FYM 6	156.0	2215.0	45.0	639.0	18.2	258.4	4.8	68.2
	Mean		2192.2		526.1		255.2		62.1
2	Control	159.0	1669.5	40.0	420.0	19.5	204.8	4.3	45.2
	Chicken 3	165.5	1952.9	46.3	546.3	21.5	253.7	4.7	55.5
	Chicken 6	193.5	2573.6	67.5	897.8	26.8	356.4	5.1	67.8
	FYM 3	165.0	1980.0	47.5	570.0	22.1	265.2	4.7	56.4
	FYM 6	186.6	2351.2	36.0	705.6	22.5	283.5	5.0	63.0
	Mean		2105.4		627.9		272.7		57.6
4	Control	184.5	1863.5	57.5	580.8	18.2	183.8	4.2	42.4
	Chicken 3	104.6	1066.9	69.0	703.8	25.6	261.1	5.0	51.0
	Chicken 6	210.5	2274.5	87.0	939.6	31.5	340.0	5.3	57.2
	FYM 3	195.0	1638.0	60.0	504.0	20.7	173.9	5.0	42.0
	FYM 6	204.0	1978.8	92.8	900.2	26.5	257.1	5.2	50.4
	Mean		1764.3		725.6		243.2		48.6
8	Control	166.8	850.7	60.3	307.5	18.5	94.4	4.2	21.4
	Chicken 3	212.4	1274.0	82.0	492.0	28.5	171.0	5.3	31.8
	Chicken 6	226.5	1472.3	96.0	624.0	36.0	234.0	6.1	39.7
	FYM 3	196.5	1041.5	93.3	494.5	30.0	159.0	5.6	29.70
	FYM 6	210.0	1239.0	112.5	663.8	32.8	193.5	5.9	34.8
	Mean		1176.0		516.4		170.4		31.5

Table (11): Effect of organic manures on micronutrients concentration and uptake in straw of wheat crop grown on calcareous soil irrigated with saline water.

Salinity levels "EC" (dSm^{-1})	Organic manure (%)	Micronutrients concentration (ppm) and uptake (µg / pot)							
		Fe		Mn		Zn		Cu	
		ppm	µg/ pot	ppm	µg/ pot	ppm	µg/ pot	ppm	µg/ pot
Control	Control	164	3116	120.0	2280	30.5	580	2.18	41
	Chicken 3	200	4100	120.4	2468	33.6	689	2.35	58
	Chicken 6	220	4950	126.0	2835	39.5	889	2.50	56
	FYM 3	204	3896	114.6	2189	36.5	697	2.20	42
	FYM6	210	4452	114.6	2430	38.5	816	2.45	52
	Mean		4103		2440		734		49.8
2	Control	172	2993	126.0	2192	33.0	626	2.12	36.9
	Chicken 3	222	4107	132.4	2449	38.5	712	2.32	42.9
	Chicken 6	234	4516	136.4	2633	42.9	828	2.50	48.3
	FYM 3	220	3850	131.0	2293	36.3	635	2.40	42.0
	FYM 6	240	4392	134.0	2452	41.0	750	2.85	52.2
	Mean		3972		2404		710		44.5
4	Control	201	2613	114.0	1482	39.0	507	2.18	28.3
	Chicken 3	240	3240	150.4	2030	42.5	574	2.30	31.1
	Chicken 6	253	3593	186.0	2641	46.8	665	2.95	41.9
	FYM 3	246	3173	126.6	1633	41.5	535	2.50	32.3
	FYM 6	256	3392	162.2	2157	48.5	645	2.60	34.6
	Mean		3202		1989		585		33.6
8	Control	216	1858	90.8	780	42.2	363	2.12	18.2
	Chicken 3	270	2808	174.0	1810	48.2	501	2.90	30.2
	Chicken 6	283	3056	185.0	1998	66.5	718	3.12	33.7
	FYM 3	268	2573	186.0	1786	41.5	398	2.30	22.1
	FYM 6	268	2760	234.0	2410	57.5	592	2.95	30.4
	Mean		2611		1757		514		26.9

Table (12): Effect of organic manures on micronutrients concentration and uptake in seeds of faba bean crop grown on calcareous soil irrigated with saline water.

Salinity levels "EC" (dSm^{-1})	Organic manure (%)	Micronutrients concentration (ppm) and uptake (µg / pot)							
		Fe		Mn		Zn		Cu	
		ppm	µg/ pot	ppm	µg/ pot	ppm	µg/ pot	ppm	µg/ pot
Control	Control	84	5141	60	3072	35.0	2142	5.5	337
	Chicken 3	91	6625	68	3726	38.0	2766	6.9	502
	Chicken 6	96	7949	71	4523	42.5	3519	7.2	592
	FYM 3	89	6159	72	4982	40.0	2768	8.1	562
	FYM6	104	7665	77	5675	44.5	3280	9.2	677
	Mean		6708		4396		2895		534
2	Control	96	4915	65	3328	38.0	1946	7.6	389
	Chicken 3	115	6912	68	4087	41.0	2464	8.5	511
	Chicken 6	110	7007	77	4905	45.0	2867	9.8	624
	FYM 3	117	6260	81	4334	44.0	2354	9.5	556
	FYM 6	120	6900	83	4773	47.0	2703	11.5	661
	Mean		6399		4285		2469		456
4	Control	111	2220	67	1340	48.5	970	10.6	212
	Chicken 3	116	2865	84	2075	51.5	1272	11.3	279
	Chicken 6	121	3303	86	2348	53.3	1455	13.5	369
	FYM 3	132	2812	83	1768	52.9	1167	12.2	260
	FYM 6	136	3332	93	2279	56.8	1392	14.5	355
	Mean		2906		1962		1251		295
8	Control	131	1415	71	767	52.6	568	15.6	168
	Chicken 3	141	1763	90	1125	55.5	694	17.5	219
	Chicken 6	145	1958	101	1364	58.6	791	18.8	254
	FYM 3	154	1679	92	1003	56.8	619	17.3	189
	FYM 6	156	1872	103	1236	61.5	730	18.2	218
	Mean		1737		1099		680		210

Table (13): Effect of organic manures on micronutrients concentration and uptake in straw of faba bean crop grown on calcareous soil irrigated with saline water.

Salinity levels "EC" (dSm^{-1})	Organic manure (%)	Micronutrients concentration (ppm) and uptake (µg / pot)							
		Fe		Mn		Zn		Cu	
		ppm	µg/ pot	ppm	µg/ pot	ppm	µg/ pot	ppm	µg/ pot
Control	Control	185	13265	160	11472	55	3944	5.1	366
	Chicken 3	190	16321	170	14603	58	4982	5.2	447
	Chicken 6	220	19404	180	15876	60	5292	5.3	467
	FYM 3	250	19875	196	15582	63	5009	5.2	413
	FYM6	280	22932	205	16790	65	5324	5.4	442
	Mean		18340		14865		4910		427
2	Control	205	13079	190	12120	60	3828	5.1	327
	Chicken 3	235	17860	200	15200	61	4636	5.4	410
	Chicken 6	255	18233	205	14658	65	4648	5.4	386
	FYM 3	280	18816	212	14246	68	4570	5.4	363
	FYM 6	290	20387	236	16591	70	4921	5.4	380
	Mean		17675		14563		4521		373
4	Control	260	9178	202	7131	62	2189	5.3	187
	Chicken 3	280	11256	230	9246	65	2613	5.5	221
	Chicken 6	285	12084	232	9837	70	2968	5.6	237
	FYM 3	255	9996	240	9408	73	2862	5.6	219
	FYM 6	310	12648	280	11424	75	3060	5.8	237
	Mean		11032		9409		2738		220
8	Control	285	3648	240	3072	70	896	5.8	74
	Chicken 3	310	5177	270	4509	73	1219	5.9	99
	Chicken 6	330	6237	286	5405	75	1418	5.9	112
	FYM 3	289	4046	250	3500	71	994	6.0	84
	FYM 6	320	5056	300	4740	80	1264	6.3	100
	Mean		4833		4245		1158		94

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إنتاجية نباتات القمح والفول البلدى النامية فى أرض جيرية وامتصاصهما للمغذيات تحت تأثير التسميد العضوى والرى بالمياه الملحية

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الملخص العربى

أجريت تجربة أصص تحت ظروف الصوبة لدراسة تأثير الرى بالمياه الملحية والتسميد العضوى وكذلك الإرتباط بينهما على محصول القمح والفول البلدى وإمتصاص العناصر الغذائية الكبرى والصغرى وكذلك بعض الخواص الكيميائية للأرض الجيرية المستخدمة .

وقد أوضحت النتائج المتحصل عليها أن زيادة ملوحة مياه الرى أدت إلى تقليل محصول القش والحبوب فى كلا القمح والفول كما إنخفض إمتصاص كل من النيتروجين ، الفوسفور ، البوتاسيوم ، الكالسيوم ، الماغنسيوم ، الحديد ، المنجنيز ، الزنك ، والنحاس بزيادة تركيز ملوحة مياه الرى . وإنخفض رقم حموضة الأرض ، كما حدثت زيادة فى كل من درجة التوصيل الكهربى ونسبة الصوديوم المدمص ونسبة الصوديوم المتبادل بزيادة ملوحة مياه الرى .

وأدت إضافة السماد العضوى (مخلفات الدواجن – السماد البلدى) إلى زيادة معنوية فى كميات القش والحبوب فى المحصولين . وكذلك إزداد إمتصاص العناصر الكبرى والصغرى ، وقل كل من رقم حموضة التربة ودرجة التوصيل الكهربائى ونسبة الصوديوم المدمص والمتبادل للتربة ، ونسبة الصوديوم إلى كل من البوتاسيوم والكالسيوم .

ووجد أن إضافة السماد العضوى تحت الرى بتركيزات قليلة من الملوحة (EC 2) أدت إلى زيادة فى إمتصاص العناصر الغذائية وتحسين الخواص الكيميائية للتربة ، وهو ما يرجع إلى التأثير المفيد للأسمدة العضوية فى هذا الشأن . كما لوحظ أن مخلفات الدواجن كانت أكثر كفاءة من السماد البلدى . ومن هذه النتائج يُمكن النصح بإستخدام التسميد العضوى من أجل تقليل الأثر الضار للملوحة فى الأرض الجيرية .