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# IMPACT OF COMPOST ON THE AVAILABILITY AND NUTRIENTS CONTENT OF *Vicia faba* GROWN ON SALINE WATER-IRRIGATED SOIL

**Nieven O. Fathi**

**Soil Salinity and Alkalinity Research Laboratory, Ministry of Agriculture, Cairo, Egypt**

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**ABSTRACT**: ***A pot experiment was conducted in the greenhouse of Salinity and Alkalinity Soils Research Laboratory, Ministry of Agriculture with Faba bean (Vicia faba c.v.Giza 20) as a test plant .The sandy clay loam soil was treated with four application rates of compost (0,10, 15, and 20 $m^3.fed^{-1}$ and these are equivalent to 0, 6, 9, and 12 $g.kg^{-1}$ soil) and four salinity levels (tap water(0.59), 1.8, 2, and 4.5 $dsm^{-1}$ ).These represent 100, 90, 75, 50 % , respectively from the faba bean yield. The effectiveness of compost as soil conditioner to alleviate the increasingly soil degradation due to salinization was investigated. The results indicated that at harvest, the EC of the soil was significantly ($P<0.05$) changed by the compost application with respect to the control soil. In general, the salinity was significantly increased with increasing the application rate of compost. Soluble salts, K, Cl, $HCO_3$, Na, Ca, and Mg were significantly increased with the organic treatments. However, SAR was significantly affected with salinity levels added to the soil, it showed a slight response to the compost application. The organic carbon content was highly significant ($P<0.05$) affected by the organic amendment at all application rates of compost. The maximum value 28.20 $g.kg^{-1}$ was recorded at 20 $m^3.fed^{-1}$ and salinity level 4.50 $dsm^{-1}$,but the minimum value 12 $g.kg^{-1}$ was observed at control treatment. For faba bean, compost produced remarkable increases in shoot dry matter production. The maximum dry matter production (61.12 $g.pot^{-1}$) occurred with 20 $m^3.fed^{-1}$ and normal irrigation water, whilst the minimum one (20.86 $g.pot^{-1)}$ occurred with no addition of compost (0 $m^3.fed^{-1)}$ and salinity level 4.50 $dsm^{-1.}$***

**Key Words**: ***Vicia faba spp.; compost; Plant mineral nutrition; Soil salinity***

## INTRODUCTION

**Soil salinization and nutrients poorness are a severe world wide problem throughout and around 20% of the world's cultivated land and 50% of cropland are affected (Flowers, and Yeo 1995). In addition, the increasingly uses of low quality water and conventional agriculture practice continue on worsening the problem (Darwish *et al*., 2005). The excessive amounts of salt adversely affect soil physical and chemical properties, as well as the microbiological processes. Tejada and Gonzalez (2006) showed that increasing electrical conductivity in saline soil decreases structural stability**

and bulk density. Excessive exchangeable sodium and high pH favours swelling and dispersion of clays as well as slaking of soil aggregates through the decrease soil permeability, available water capacity and infiltration rate (Lauchli, and Epstein,1990). In addition, in the arid zones the intense evaporation tends to accumulate salts in the upper soil profile, especially when it is associated with an insufficient leaching or where soluble salts move upward in the soil profile from a water table instead of downward (Isabelo, and Jack, 2002) These modifications may further compromise the yield of crops growing on such soils via toxicity and perturbation in water nutrients balance (Munns,2002; Hafsi *et al*.,2007). Plants growing in saline media generally exhibit tissue accumulation of Na and Cl, and inhibition of uptake of mineral nutrients, especially Ca, K, N and P. The resulting mechanisms of growth inhibition include effects on gas exchange, photosynthesis and protein synthesis, in addition to the disturbance of plant water relations caused by the high osmotic potential of the external medium (Marschner, 1995; Carvajal *et al*., 2000; Romero-Aranda *et al*., 2001; Ghoulam *et al*., 2002). For saline or sodic soils, the addition of organic matter (OM) can accelerate the leaching of Na, decrease the ESP and the electrical conductivity (EC) and increase water infiltration, water-holding capacity and aggregate stability (Lax *et al*., 1994; Qadir *et al*., 2001). This is particularly important for agricultural soils deficient in OM, such as those in the Egypt region (1–3% OM). Also, by supplying nutrients, particularly N, P and K+, organic amendments can improve the mineral nutrient status and growth of plants grown in such soils (Lax *et al*., 1994; Qadir *et al*., 2001).

In Egypt, the use of compost animal manures as soil amendments represents a strategy for the management of the high production of these materials, in which their plant nutrients and OM are returned to the soil. Input of organic matter conditioner becomes common practices in such salt affected area the last decades and according to Melero *et al*., (2007) constitutes an important way of soil regeneration and the enhancement of fertility. Studying the effects of organic fertilization on chemical and biochemical properties of a Mediterranean soil under dry land agriculture, these authors showed that compost amended soil exhibited increases in quantity and quality of total organic carbon, nitrogen and phosphorus nutrients, microbial biomass and enzymatic activities. In the same way such amendment use have two principal beneficial effects on reclamation of saline soil: improvement of soil structure and permeability thus enhancing salt leaching, reducing surface evaporation and inhibition of salt accumulation in surface soils, and release of carbon dioxide during respiration and decomposition (Raychev *et al*., 2001). However, irrational or low quality uses of compost may causes potential threat thereby release of organic and inorganic pollutant in the soil which can adversely affect organisms and ecosystems (Cai *et al*., 2007). Therefore, it is of the most importance to have stringent quality requirements for the materials to be applied in order to achieve the expected beneficial effects that these amendments create for the long term. In the work described here, the effects of organic amendments, compost, on a highly saline soil were investigated. The changes in soil chemical conditions were determined, as were effects on the growth and tissue levels of mineral nutrients (K, N, and P) and potentially toxic elements (Na and Cl) for plants cultivated in this soil. This paper focuses the effectiveness of compost as valuable soil conditioner to alleviate the increasingly soil degradation due to salinization.

## MATERIALS AND METHODS

### Soil and compost

The selected soil (the top 20 cm) was collected from a farm at Almowazafeen, in the region of Abees, Alexandria, Egypt. It was air-dried and sieved through a 2-mm sieve, before using it in the pot experiment, and soil analysis. Sub-samples of the air-dried soil were used for the following chemical parameters: pH and electrical conductivity (EC) was determined in soil-paste extract (Richard, 1954). The organic matter content was determined by dichromate oxidation method (Nelson and Sommers, 1982). Cation exchange capacity (CEC) was determined by IM NaOAC method (Rhoades, 1982). The particle size distribution was determined by the hydrometer method (Day, 1965). Calcium carbonate content was determined using calcimeter (Nelson, 1982). The main properties of the soil are shown in Table (1).

The compost consists of animal wastes and plant residues and was obtained from the Soil Salinity and Alkalinity Research Laboratory, Elsabahia, Alexandria, Egypt. The characteristics of the used compost were determined according to the standard procedures described by Bertran-Kehres and Andreas (1994) and El-Kouny (1999). Some chemical and physical properties of the used compost are shown in Table (2).

### Experimental Set-up:

A pot experiment was conducted with Faba bean (*Vicia faba* c.v.Giza 20) as a test plant in polyethylene pots, each containing 10 kg of sandy clay loam soil. The soil was treated with four rates of compost (0,10, 15, and 20 $m^3.fed^{-1}$ which are equivalent to 0, 6, 9, and 12 $g.kg^{-1}$ soil) and four salinity levels (tap water(0.59), 1.8, 2, and 4.5 $dsm^{-1}$).The salinity level were selected to represent 100, 90, 75, 50 % from the faba bean yield respectively ( FAO,1976) in all possible combinations. Compost was well-mixed with the soil two weeks before cultivation. Pots then left in a greenhouse, receiving only natural light, for 16 weeks and watered weekly with tap water (EC 0.59 $dS\ m^{-1}$) and saline water levels .The maximum and minimum temperatures were 28 and 15°C, respectively. Five seeds of faba bean were sown per pot that thinned to three after germination. The experimental design was a split plot design with four replicates of each treatment. The above-ground plants material was

**harvested after 16 weeks of sowing. At harvest, the soil in each pot was mixed and a sample was taken for analysis of EC, soluble cations, soluble anions, and organic carbon content.**

## Analysis of Plant Material

**The above-ground parts of plants material was harvested, and immediately were triple rinsed in distilled water to remove the adhering particles. Plants were then oven dried at 65°C for 48 h and the dry matter yield was recorded. Plant tissues were ground in a stainless steel mill and subsamples were dry-ashed in a muffle furnace at 450°C for 6h. The ash was dissolved in 5 ml of $HNO_3$ (1: 1), diluted to a constant volume with distilled water and analyzed for K, P, Na, and Cl (Jones, 2001). Another sub-sample of plant material was ashed and dissolved in hydrochloric acid solution (1:1, v/v), diluted to a certain volume with double-distilled water, and analyzed for N (Jones, 2001) by Kjeldahl method (Bremner and Mulvaney, 1982). The dry matter production and Plant nutrient concentrations are expressed on dry weight basis.**

**Table (1): The main chemical and physical properties of the studied soil (means ± SD). #**

| EC | pH | $CaCO_3$ | CEC, | Clay | Silt | Sand | Texture ¶ | O.M† |
|---|---|---|---|---|---|---|---|---|
| $dSm^{-1}$ | | $gkg^{-1}$ | $Cmol(+).kg^{-1}$ | $gkg^{-1}$ | | | | $gkg^{-1}$ |
| 3.35±0.12 | 7.58 | 33.50±2.18 | 28.95±1.28 | 341.20±6.00 | 104.90±5.69 | 553.90±6.16 | S.C.L | 20.60±1.53 |

**# Means of three samples ± SD.**
**† O.M: organic matter**
**¶ S.C.L: Sandy Clay Loam**

**Table (2): The main characteristics of the used compost(means ± SD). #**

| EC | $D_b$ | CEC, | T.N | T.P | T.K | C/N | Ash | O.M† |
|---|---|---|---|---|---|---|---|---|
| $dSm^{-1}$ | $kgm^{-3}$ | $Cmol(+).kg^{-1}$ | $gkg^{-1}$ | | | | $gkg^{-1}$ | |
| 7.24±0.58 | 590±8.65 | 190.00±1.28 | 27.50±1.00 | 17.50±1.69 | 19.00±.0.56 | 14.64 | 812.50±.1.22 | 693.90±5.98 |

**# Means of three samples ± SD.**
**† O.M: organic matter**

## STATISTICAL ANALYSIS

**The treatment effects on plant dry matter yield and nutrients concentrations were evaluated by analysis of variance (ANOVA) and also by the least significant difference (LSD) mean separation procedure at the 0.05 level of significance (SAS Institute, 1994).**

# RESULTS AND DISCUSSION

## Characterisation of soils and compost

The soil is a sandy clay loam (*Typic torrifluvents*), with a low OM and calcium carbonate contents (Table 1).The soil is a moderately alkaline (pH=7.58) and classified as non saline soil (EC< 4 dSm$^{-1}$).The cation exchange capacity (CEC) is 28.95 Cmol(+).kg$^{-1}$.

The compost has an EC value of 7.24 dsm$^{-1}$ and CEC value of 190 Cmol. kg$^{-1}$ .The EC of compost is well below the10 dSm$^{-1}$ and the CEC of the compost indicates its ability to supply cationic nutrients for plant growth. In addition, the available amounts of macronutrients (N, P, and K) and organic matter are high. The ash of the used compost is high (812.50 g.kg$^{-1}$).In addition the C/N ration was below 20 indicating that more released of nutrients will be available during the experiment(FAO,2008). So; the compost used in this study is a good ameliorating agent to soil and a potential plant growth medium (Table 2).

## Effects of compost on soil parameters

At harvest, the EC of the soil was significantly($P<0.05$) changed due to compost treatments with respect to the control soil (Table 3).The higher value of EC 4.20 dsm$^{-1}$ was observed with applying 20 m$^{3}$.fed$^{-1}$ and salinity level 4.50 dsm$^{-1}$,but the minimum one 1.49 dsm$^{-1}$ was recorded with the control treatment. In general, the salinity was significantly increased with increasing the application rate of compost (Table 3). The soluble ions, K, Cl, and $HCO_3$ were significantly affected by the organic treatments (Table 3). The higher rates of compost treatments with respect to the control may reflect the amounts of soluble salts supplied through the amendments to the soil (Table 3). Continuous flooding or frequent inundation can change these results. However, the maximum value of bicarbonate in soil was 4.54 mmol.l$^{-1}$ ,no adverse effects on faba bean growth was observed during season. The soluble Na, Ca, and Mg were significantly changed with the organic treatments. However the sodium adsorption ratio (SAR, Table 3) was greater in the compost treatment , no significant differences were found between the compost treatments . Slightly lower SAR values were found in soils irrigated with low level salts-water. While, the higher SAR values were found in soils irrigated with high level salts-water at each compost application rate. The greater amount of salts in irrigation water supplied to soil may have increased Na concentrations in soils. However, the SAR values were far below the limit (>15) established to define saline–sodic soils (US Salinity Laboratory Staff, 1954). The two main risks of high sodium levels in soil water are toxic effects and impacts on plant growth as reflection of changes in soil structure. Excess sodium present in soil water can cause soil dispersal, especially in soils with high clay contents. Soil dispersal causes loss of soil structure and surface crusting. Surface crusting leads to reduced hydraulic conductivity, reduced water infiltration, and increased water runoff.

**These conditions can make seedling establishment very difficult, unless not impossible. Decreased drainage as a result of sodium-induced soil dispersal can also increase the sodicity in the root zone. If water containing salts is not allowed to drain below the root zone, the salt concentration of soil water will increase as plants take up water by transpiration and as evaporation occurs.**

**Table (3): concentrations of soluble ions in the soil extracts after faba bean harvest at different treatments of compost and salinity.**

| Compost rate, m$^{3}$.fed$^{-1}$ | Salinity level, dSm$^{-1}$ | Soil Characteristics | | | | | |
|---|---|---|---|---|---|---|---|
| | | dSm$^{-1}$ | mmol.l$^{-1}$ | | | | g.kg$^{-1}$ |
| | | EC | $K^{+}$ | $Cl^{-}$ | $HCO_3^{-}$ | SAR | O.C |
| 0 | 0 | 3.35(0.17) | 0.31(0.04) | 13.00(1.43) | 2.50(0.33) | 5.27(0.90) | 12.00(1.33) |
| | 1.80 | 5.15(0.56) | 0.38(0.06) | 14.50(1.67) | 2.75(0.55) | 5.76(0.56) | 12.10(1.44) |
| | 2.00 | 8.17(1.33) | 0.42(0.10) | 19.30(2.09) | 2.95(0.54) | 6.62(0.76) | 12.50(0.99) |
| | 4.50 | 10.00(2.15) | 0.48(0.11) | 26.12(2.12) | 3.10(0.54) | 8.17(0.80) | 12.30(1.55) |
| | Mean | 6.67d | 0.39d | 18.23d | 2.82d | 6.45a | 12.22d |
| 10 | 0 | 4.13(0.44) | 0.35(0.05) | 12.50(1.13) | 2.78(0.77) | 5.39(0.54) | 16.00(1.54) |
| | 1.80 | 6.00(1.66) | 0.41(0.12) | 15.90(0.98) | 2.95(0.44) | 6.04(0.65) | 16.10(1.48) |
| | 2.00 | 8.89(1.65) | 0.46(0.15) | 21.00(1.54) | 3.10(0.43) | 6.39(0.44) | 16.30(2.01) |
| | 4.50 | 10.67(2.05) | 0.53(0.18) | 26.95(2.33) | 3.56(0.76) | 7.83(0.55) | 16.20(1.77) |
| | Mean | 7.42c | 0.44c | 19.09c | 3.10c | 6.41a | 16.15c |
| 15 | 0 | 6.16(1.03) | 0.45(0.11) | 14.17(1.54) | 3.12(0.55) | 5.78(0.76) | 20.10(1.84) |
| | 1.80 | 8.82(1.90) | 0.48(0.13) | 18.50(0.98) | 3.45(0.43) | 6.23(0.56) | 19.90(2.33) |
| | 2.00 | 10.08(0.98) | 0.59(0.16) | 23.00(2.43) | 3.60(0.81) | 6.55(0.45) | 20.30(1.98) |
| | 4.50 | 11.58(1.76) | 0.62(0.17) | 30.50(3.13) | 4.01(0.60) | 8.13(0.98) | 20.20(1.66) |
| | Mean | 9.16b | 0.54b | 21.54b | 3.55b | 6.67a | 20.12b |
| 20 | 0 | 8.89(1.87) | 0.51(0.08) | 15.66(1.65) | 3.50(0.65) | 5.97(0.76) | 28.11(3.12) |
| | 1.80 | 10.51(2.00) | 0.59(0.18) | 22.00(2.08) | 3.80(0.76) | 6.82(0.76) | 28.00(2.56) |
| | 2.00 | 11.13(1.53) | 0.70(0.23) | 26.12(3.04) | 3.99(0.77) | 7.02(0.71) | 27.95(1.87) |
| | 4.50 | 13.12(1.98) | 0.89(0.17) | 30.15(2.87) | 4.54(0.55) | 8.26(0.63) | 28.20(2.45) |
| | Mean | 10.91a | 0.67a | 23.48a | 3.71a | 7.02a | 28.06a |
| Mean | 0 | 5.63d | 0.41d | 13.83d | 2.98d | 5.60c | 19.05a |
| | 1.80 | 7.62c | 0.47c | 17.73c | 3.23c | 6.21b | 19.03a |
| | 2.00 | 9.57b | 0.54b | 22.35b | 3.41b | 6.65b | 19.26a |
| | 4.50 | 11.34a | 0.63a | 28.43a | 3.80a | 8.10a | 19.23a |
| LSD $_{0.05}$ (compost) | | 0.19 | 0.04 | 0.39 | 0.12 | 0.75 | 0.62 |
| LSD $_{0.05}$ (salinity) | | 0.12 | 0.03 | 0.35 | 0.12 | 0.62 | 0.47 |
| ANOVA | | F-test | | | | | |
| Compost | | *** | *** | *** | *** | ns | *** |
| Salinity | | *** | *** | *** | *** | *** | ns |
| Salinity x Compost | | *** | *** | *** | ns | * | ns |

**Data are the average (n=3).**
**Numbers in parenthesis indicate the standard deviation.**
***,*** are significant at the 0.05 and 0.001 probability levels respectively.**
**ns: not significant**

**Sodium-induced dispersal also makes it difficult for plant roots to get the water and nutrients they need to survive. This occurs because sodic soils are likely to become and remain water logged, resulting in anaerobic conditions. If anaerobic conditions persist for more than a few days, roots fail to obtain sufficient oxygen, which reduces plant growth and can cause plant injury and eventually death. The organic carbon contents increased significantly ($P<0.05$) with increasing the application rates of compost. The maximum value (28.20 g.kg$^{-1}$) was recorded at 20 m$^{3}$.fed$^{-1}$ and salinity level of 4.50 dsm$^{-1}$,**

while the minimum value (12 g.kg$^{-1}$) was recorded at control treatment. This is due to the higher concentration of inorganic and organic nutrients in compost, which is easily mineralized after soil addition .These results agree with those found by Lax *et al*.,(1994); Komor,(1997);Smith *et al*,(2001);Walker and Bernal (2004). Lax *et al*. (1994); Munns, (2002); Tóth *et al*., (2008) mentioned that the biological amelioration methods using living or dead organic matter (crops, stems, straw, green manure, barnyard manure, compost, sewage sludge) have two principal beneficial effects on reclamation of saline and alkaline soils: improvement of soil structure and permeability thus enhancing salt leaching, reducing surface evaporation and inhibition of salt accumulation in surface soils, and release of carbon dioxide during respiration and decomposition. In the latter methods large amounts of organic matter should be applied in a long term treatment. It seems that by amending a saline soil with a chemically stable organic material, being a permanent source of the organic matter of a high humification degree, the positive amelioration effects mentioned earlier can be reached in a single reclamation step. Such material of high CEC can adsorb a part of soluble salts, decrease the pH and promote aggregation.

## Effects of compost on plant growth and mineral nutrition

Fig. (1) shows that compost application produced high increases in shoot dry matter production. The maximum dry matter production of faba bean was 61.12 g. pot$^{-1}$ at 20 m$^{3}$. fed$^{-1}$ and normal irrigation water, whilst the minimum value was 20.86 g.pot$^{-1}$ at no addition of compost (0 m$^{3}$.fed$^{-1}$) and salinity level 4.50 dsm$^{-1}$ .The growth-enhancing effects of the compost may be related to their relative effects on the shoot mineral nutrients concentrations (Fig. 2). A significant increases in faba bean shoot content of K, N and P were observed with additions of compost material (Fig.2). The relatively high shoot $NO_3$ values may be attributed to increase its availability in the tested soil occurred by compost application .Similarly, significant increases in the shoot concentration of Na and Cl may be ascribed to the increase in soil soluble K and Cl, Fig.(2) and Table (3).The increases in shoot P, N, and K may have contributed to the growth stimulation, since P supplied by the compost (Table 2) was probably responsible in saline and alkaline soils where P solubility is very low (Grattan and Grieve, 1992). These results agreed with the results of Rao and Terry (1995) who found that the leaf P concentration of P-sufficient B. vulgaris plants was in the range 200–220 mmol kg$^{-1}$, indicating that the increased tissue P levels, brought about by the compost contributed to the growth stimulation. Although Faba bean is moderately salt-tolerant, it can substitute Na for K in its tissues to a great extent. The decreases in shoot levels of Na and Cl brought about by the compost were proportional to their growth. The relative increase in soluble K caused a reduction of Na concentration with a concomitant increase in K concentration in faba bean. The Na concentration in the growing shoot tissue of the control plants (1.3%)

**probably did not inhibit plant growth (Romero-Aranda *et al*., 2001), whilst the control K level (1.98%) was in excess of growth requirements (Carvajal *et al*., 2000; Kaya *et al*., 2001). So it is unlikely that the amendments impacted growth via effects on these parameters.**

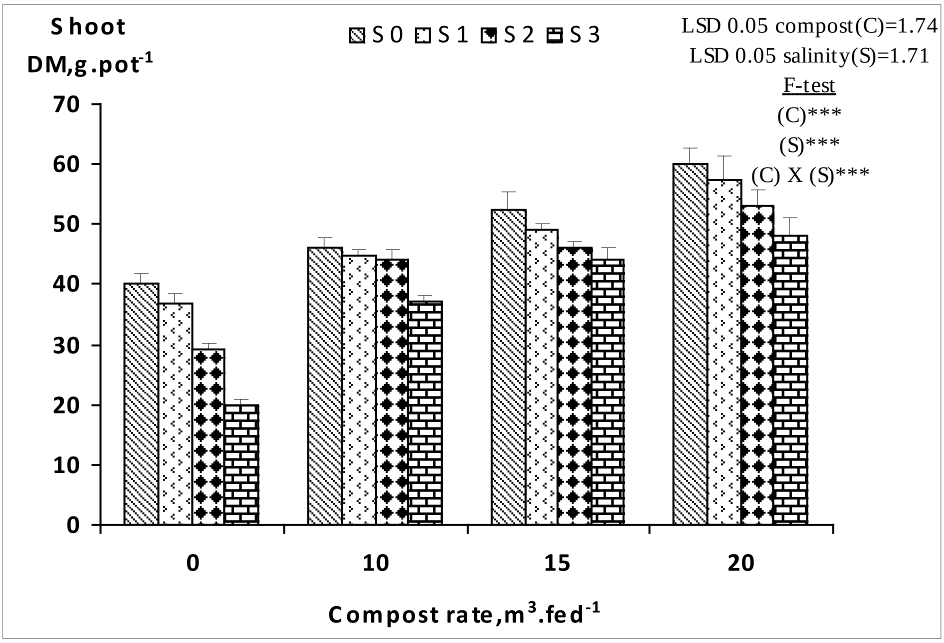

**Fig. (1): Shoot dry matter production for *Vicia faba* grown on compost-treated Soil irrigated with different levels of saline water ($S_0$,$S_1$,$S_2$ and $S_3$) Error bars on all figures represent the standard error of the mean, where no error bars are present, the standard error was too small to be represented as the scale of the diagram.**

***** Significant at the 0.001 probability level.**

**These data suggest that the growth of faba bean was not restricted by phytotoxic of Na and Cl accumulated in the shoot, whereas K was always sufficient and non-toxicin the plant. By supplying nutrients, particularly N, P and K, OM can improve the mineral nutrient status and growth of plants in saline soils (Lax *et al*., 1994; Qadir *et al*., 2001;Walker and Bernal, 2004). However, this depends upon the salt tolerance of the plant species concerned and the initial salinity and nutrient status of the soil since, when the salinity stress is more severe than any nutrient deficiency, increasing the nutrient supply may not improve growth(Grattan and Grieve, 1992).The faba bean spp. chosen for this work, is moderately salt-sensitive to moderately salt-tolerant (Lehr, 1953; Katerji *et al*., 2000; Niazi *et al*., 2000; Bor *et al*.,**

**2003), which means that increasing the supply of mineral nutrients in this highly saline irrigation water should promote their growth (Grattan and Grieve, 1992).**

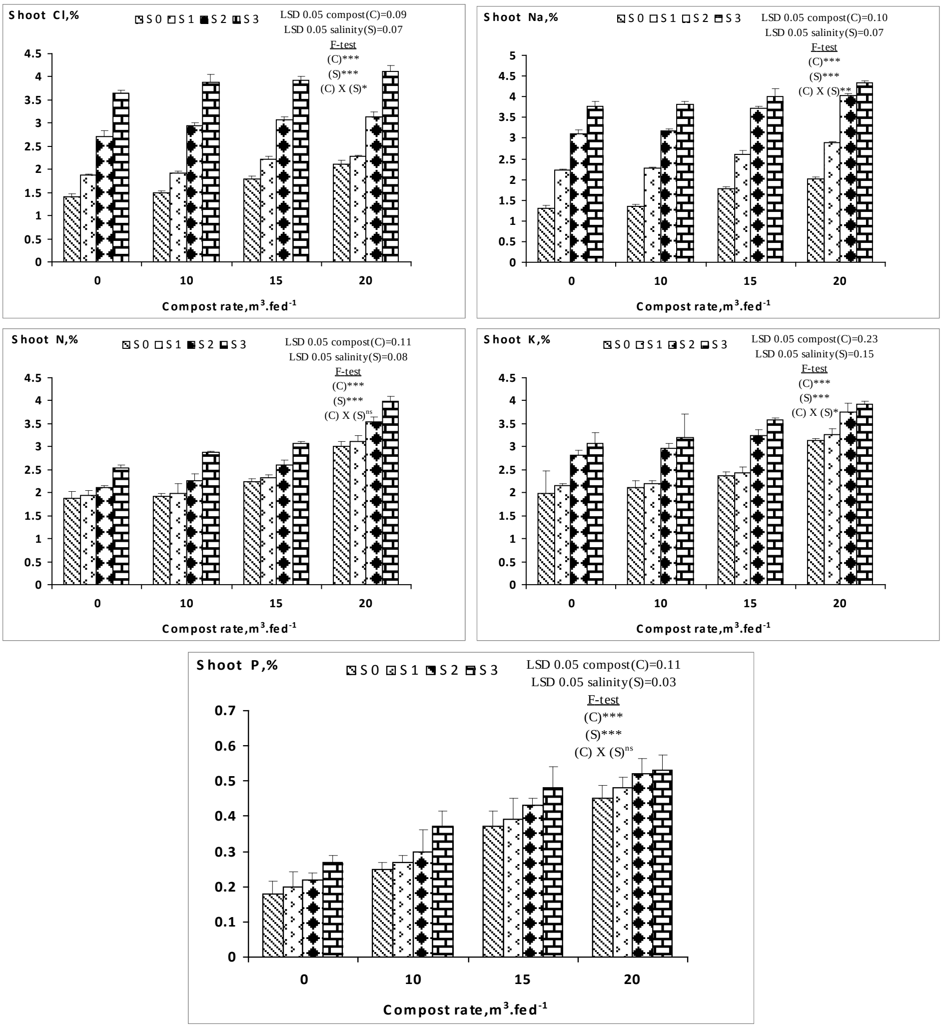

**Fig. (2): Shoot dry matter cations and anions concentrations for *Vicia faba* grown in compost-treated soil irrigated with different levels of saline water. Error bars on all figures represent the standard error of the mean. Where no error bars are present, The standard error was too small to be represented as the scale of the diagram.**

***, *** Significant at the 0.05 and 0.001 probability levels respectively**

## CONCLUSIONS

**This work shows that the application of compost to a saline water-irrigated soil can improve significantly the soil chemical environment by increasing the soluble cations and anions in addition to organic carbon. These materials improved crop nutrition and growth in a highly saline water-irrigated soil. The K, N and P supplied by the compost may have been responsible for the improvement of plant growth. Application of compost to a highly saline water-irrigated soil produced marked increases in shoot dry matter production. The maximum dry matter production was recorded at compost rate of 20 $m^3$. $fed^{-1}$ and normal irrigation water, whilst the minimum value was recorded at no addition of compost (0 $m^3$.$fed^{-1)}$ and salinity level 4.50 $dsm^{-1}$. The growth-enhancing effects of the compost may be related to their relative effects on enhancing shoot nutrient content as result of promoting its availability in the tested soil.**

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# تأثير إضافة الكمبوست على صلاحية وامتصاص المغذيات فى الاراضى المروية بماء ملحى

**نيفين عمر فتحى**

معمل بحوث الاراضى الملحية والقلوية - معهد بحوث الأراضى والمياة والبيئة -
مركز البحوث الزراعية- وزارة الزراعة-القاهرة.

## الملخص العربي

الهدف من هذه الدراسة هو إستخدام الكمبوست (السماد العضوى المكموربمعدلات مختلفة) لتقليل الأثر الضار للرى بماء ذو مستويات مختلفة من الملوحة على إنتاج محصول المادة الجافة لنبات الفول (جيزة ٢٠ ) و صلاحية وامتصاص المغذيات لذلك أجريت هذه الدراسة فى الصوبة الزراعية بمعمل بحوث الاراضى الملحية والقلوية فى فصل الشتاء ٢٠٠٩-٢٠١٠ وتمت الزراعة فى أصص بلاستيكية وضع بها ١٠ كجم من الارض وتمت معاملتها باربعة معدلات من الكمبوست بما يعادل (صفر، ١٠، ١٥، ٢٠م٣/فدان) والرى بماء ملحى ذو مستويات مختلفة وهى (ماء صنبور، ماء ذو ملوحة ١.٨-٢-٤.٥ ديسيسيمنز/م) تمثل ١٠٠، ٩٠ ، ٧٥، ٥٠% من إنتاج الفول على الترتيب (FAO 1976) و أوضحت النتائج أن التغيرات التى حدثت فى ملوحة الارض EC والكربون العضوى نتيجة إضافة المعدلات المختلفة من الكمبوست كانت معنوية وبلغت أعلى قيمة للكربون العضوى ٢٨.٢ جم /كجم عند معدل إضافة ٢٠م٣/فدان ومستوى ماء ملحى ٤.٥ ديسيسيمنز /م ونجد ان اقل قيمة كانت ١٢ جم/كجم سجلت عند الكنترول و قد أدى إضافة الكمبوست إلى زيادة معنوية فى المادة الجافة وبلغت أعلى قيمة ( ٦١.٢جم/ أصيص ) عند معدل إضافة ٢٠م$^{٣}$/فدان والرى بماء عادى بينما نجد ان اقل قيمة( ٢٠.٨٦ جم/ أصيص ) عند عدم إضافة الكمبوست ومستوى ماء ملحى ٤.٥ ديسيسيمنز /م .

الكلمات الكشافة: نبات الفول - السماد العضوى - ملوحة الاراضى- صلاحية المغذيات