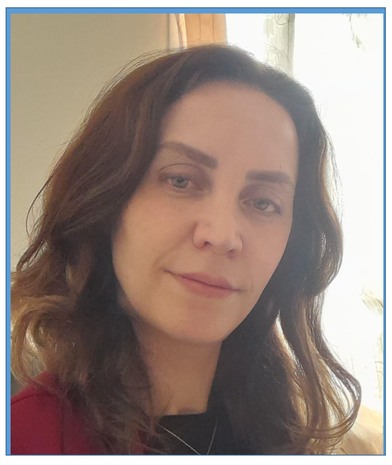

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Reclamation of salt affected soil by municipal solid waste compost (MSWC)

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Introduction

Soil salinity is a globally increasing problem and one of the main obstacles to agricultural productivity, especially in the dry regions where irrigation is vital. In the recent years, the application of municipal solid waste compost to agricultural lands has been increased for the purpose of soil reclamation and an efficient managerial method of using wastes for the degraded saline soils. However, municipal solid waste compost represents a source of nutrients that can improve soil fertility and may restoring the productivity of salt-affected soils (Ibraheem et al. 2024). On the other hand, applying municipal solid waste compost is able to improve soil aggregate stability, hydraulic conductivity and porosity (Meena et al. 2019).

Methodology

Saline soil was collected and thoroughly mixed with MSWC and substrates in the pots amendments and substrates were analyzed (table-1). Certain amounts of NaCl were added to tap water for preparing the 4.5 and 9 dS m^{-1} saline water for irrigation. After one month of incubation at FC moisture contents, 3 seeds sorghum planted and after two month soil samples were taken and Electrical conductivity (EC), Field capacity (FC) and Sodium adsorption ratio (SAR) determined. The experimental treatments were as followed: (1) C= Control, (2) MSWC, (3) S0=Irrigation with tap water, (4) S4.5 = Irrigation with saline water (EC = 4.5 dS m^{-1}), (5) S9 = Irrigation with saline water (EC = 9 dS m^{-1}).

Table 1: Some characteristics of soil, MSWC

Parameter	Texture	EC (dS m^{-1})	pH	OM %	BD (Mg m^{-3})	Na^{+}	Mg^{+}	Ca^{+2}
						Mmol^{-1}		
Soil	Silty clay	12	8	1.1	1.16	121	16	11.6
MSWC	-	5	7.5	8.8	0.52	6.3	4	36.5

Sorghum bicolor seeds planted and tap watered until the germination stage, then the salinity treatments were applied. Irrigation was applied when about 50% of available water consumed. A leaching fraction (LF) of 15% was considered (Alizadeh and Emam Reza 2002).

With this LF ratio, the relationship between soil and irrigation water salinity assumed as: ECe=1.5×ECw; where ECe: is the electrical conductivity of saturated soil extract and ECw: is the electrical conductivity of irrigation water.

Results and Discussion

Statistical analyses of the recorded data were performed based on a completely randomized design with factorial arrangement and three replicates. The means of the experimental treatments were compared using the least significant differences (LSD) test at the 0.01 and 0.05 probability levels. All of the data were analysed using the SAS package.

Electrical Conductivity (EC)

More salt in the irrigation water significantly increased the amounts of soil EC (Figure 1). Non significant deference amounts of soil electrical conductivity between MSWC treatment and control were obsorved could be due to the high EC value in their original soil (14 dS m^{-1}) and (5 dS m^{-1} for MSWC) (Figure 1).

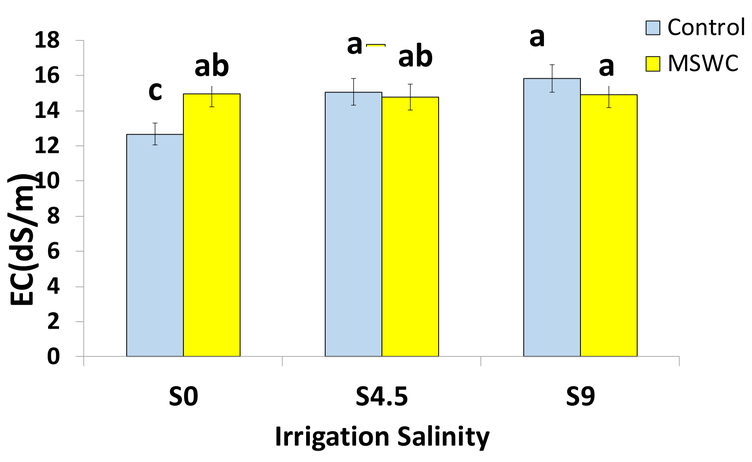

Figure 1: Effects of salinity and MSWC on EC

Field capacity (FC)

As shown in Figure 2, The effects of MSWC and irrigation water salinity on field capacity (FC) were significant (P<.05). MSWC treatment under So irrigation salinity level had the highest values of field capacity. the positive effect of municipal solid waste compost on the water retention might be due to pore size distribution of the natural materials. This result is consistent with the findings of Zamani et al. (2016) which showed that the addition of compost increased the saturated water retention by increasing total soil porosity (Zamani et al. 2016).

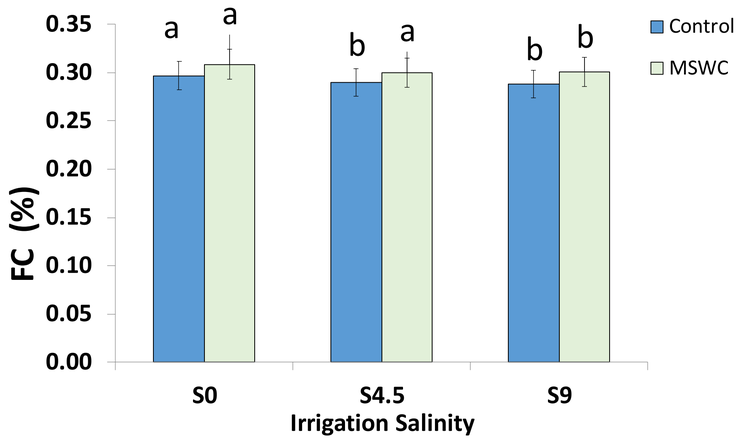

Figure 2: Effects of salinity and MSWC on FC

Sodium adsorption ratio (SAR)

A clear nearly twofold increase in the SAR value was observed under applied saline irrigation water. This is due to the increased concentration of sodium Na^{+} in saline water. However, the amount of SAR showed a significant difference between control and MSWC treatment (Figure 3). Leogrande et al. (2016) reported that addition of municipal solid waste compost into a sodic water irrigated soil, enriched the rhizosphere with nutrient elements, and hence reduced SAR. (Leogrande et al. 2016).

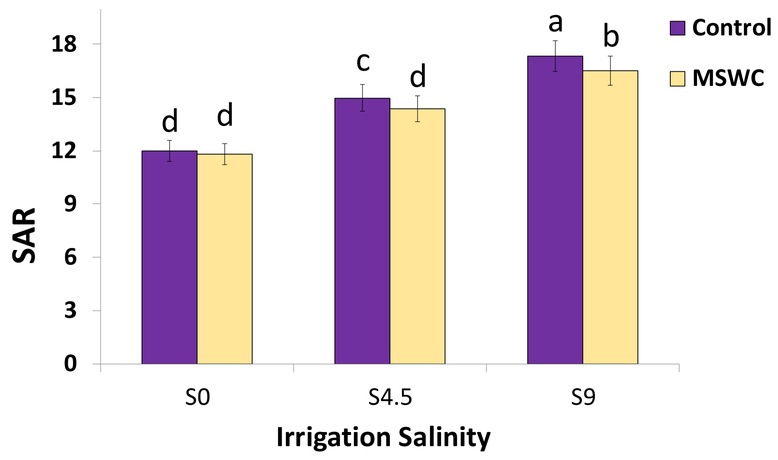

Figure 3: Effects of salinity and MSWC on SAR

Conclusions

Irrigation water salinity had a negative influence on ECe, SAR and FC of soil salinity, whereas application of MSWC had a positive effect and it can helps in reclamation of saline soils.

References

[1] Alizadeh and Emam Reza 2002
[2] Ibraheem et al. 2024
[3] Leogrande et al. 2016
[4] Meena et al. 2019
[5] Zamani et al. 2016

Acknowledgements

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