The effect of magnetic salt water on some physical properties of soil in drip irrigation under sunflower plant

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Abstract: In order to study the effect of magnetic salt water on some physical parameters of soil in drip irrigation under sunflower cultivation, six treatments including irrigation water treatment (W factor), magnetic water and non-magnetic water were the main factors, and three levels of salinity (Factor S) included Karoon River water, saline water 4 and salinity water 6 ds / m as a sub-factor. The experimental design was factorial in a completely randomized block with three replications. The research was carried out at the Faculty of Water Engineering, Shahid Chamran University of Ahwaz, Iran. The results showed that saline water had no significant effect on porosity, bulk density and soil moisture content (field capacity).

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1. Introduction

Today, the importance of water and its shortage have led to the use of optimal water use in countries around the world, especially in developing countries and in arid and semi-arid regions. The studies show that the flow of water from a magnetic field, with an effect on the overall behavior of water molecules, leads to changes in water properties (including increasing the solubility of certain compounds and reducing the surface tension of water).

The water magnetization can be used to correct water and soil. By applying magnetic energy, simple water can be converted into a liquid with specific chemical effects, such that the physical properties of the magnetic water, such as refractive index, acidity, dielectric constant, surface tension, viscosity and electrical conductivity, are changed (Pang and Deng, 2008) (Ghori and Ansari, 2006). Due to the increase in the number of water molecules per unit volume, the solubility of water increases. The magnetic field changes them regularly by changing the charge of water molecules (cations and anions), which results in the formation of smaller water molecules and the increase in the number of water molecules per unit volume. In addition to the absorption of cations and enzymes, Increases water solubility (Kiani, 2007). Zangeneh Yousef Abadi (2009) Investigating the effect of using magnetic water on the salinity of saline soils was investigated. The results showed that the residual sodium content in the soil was less than that in the control group. The amount of calcium and magnesium remaining in the soil was higher in magnetic treatments than the control treatment, and the amount of potassium in the soil in the control treatment was higher than that of magnetic grains. According to the results, he said that magnetic water can be effective in correcting the sodium soils. The results of the research (Khoshravesh and Kiani, 2015) showed that magnetic water increased the permeability and also increased the penetration rate of water in different soil tissues and also in all saline treatments and this effect was significant at 1% probability level. Also, the use of magnetized water significantly reduced the electrical conductivity at different depths of the soil and this effect was significant at 1% probability level. Magnetic water has a greater effect on the permeability and electrical conductivity of soil in clay soils and sandy loam, respectively. By increasing the amount of soil permeability due to the use of magnetic water, the evaporation of the soil decreases, which will increase the efficiency of irrigation.

2. Material and Methods

This research was carried out at the research farm of the Faculty of Water Engineering, Shahid Chamran University of Ahwaz. Factorial experiment was conducted in a completely randomized design with two water type factors (W) and salinity (S) in three replications (R). The water type factor as the main factor consists of two levels, magnetic water (W1) and non-magnetic (W2) and salinity factor as a sub-factor in three levels including salinity of Karun river (S1) and water with salinity of 4 dS / m (S2) and water with a salinity of 6 dS / m (S3). It should be noted that the salinity of Karun river water with a mean salinity of 2. 2 dS / m was considered as a control treatment. In order to provide magnetic water, the Aqua Correct device was used in a field with a field strength of 6500 Gauss. The method of preparation of saline water was provided by the fact that the first drainage water with salinity of 13.6 dS / m from the farm No. 2 of the Faculty of Agriculture, Shahid Chamran University of Ahvaz was prepared and then by mixing with the water of the river Karun river to salinity. Sampling was carried out vertically from each bar in three depths of 0-30, 30-60 and 60-90. To measure the bulk density and porosity of soil samples after sampling, they were transferred to the laboratory. First, the ends of the cylinders were sealed with filter paper and placed for 24 hours to saturate in a distilled water container, and after being sealed Samples were weighed (cylinder weight + saturation sample). Subsequently, the samples were placed in an oven at 110 ° C for 24 hours. The samples were then weighted repeatedly (MS + cylinder weight). The total volume of soil was also calculated using internal dimensions of the cylindrical sampling (Vt). The weight of all dishes was also measured before sampling. To measure porosity, the moisture content of the specimen was calculated from the density of the container and the sample, from the container weight and dry soil sample, and the yield was calculated from the following equation:

$$n = \frac{(Va+Vw)}{Va+Vw+Vs} * 100 = \frac{Vf}{Vt}*100$$

Then, using the following equation, the bulk density of soil samples was calculated.

$$\rho_b = \frac{Ms}{Vt}$$

In the above relationship (n،ρb V_s ،V_a ،V_w ،V_t) respectively, porosity in percent, bulk density (gr / cm3), volume of available water, air volume, solids volume and total soil volume per cubic centimeter.

To measure the agronomic capacity (FC), we placed the samples after saturation of the pressure plates inside the machine. After the samples were subjected to suction at 0.33 times, the samples were removed from the device and immediately weighed when the water outflow stopped (indicating the equilibrium of moisture in the suction). The specimens were then placed in an oven for 24 hours at 110 ° C to dry completely and then weighed again after exiting. The crop capacity was then calculated using the following equation.

$$\theta m = \frac{w1 - w2}{w2} \times 100$$

θm = Percentage of moisture content

W_1= The sample weight after applying pressure is 0.33 bar

W_2 = Sample weight after oven placement (dry weight)

Statistical analysis of data was done using SPSS22 software and comparison of the meanings by Duncan's multi-domain test.

3. Results and Discussion

In this study, the effect of magnetic salt water on some physical properties of soil including porosity, bulk density and moisture content was investigated. As Table V analysis (Table 1) shows the effect of water type (w) and salinity (s) and soil depth (H) and their interaction (w * s) on any of the physical traits of the soil mentioned At 5% probability level ($p<0.05$) is not significant. Ashrafi (2011), in his research on the effect of magnetic water on the hydraulic conductivity of soil saturation, concluded that magnetic water at a probability level of 1% ($p<0.01$) had a significant effect on reducing the hydraulic conductivity of soil saturation. He also concluded that magnetic water had a greater impact on the physical properties of the specimen and its effects on soil chemical properties were less.

Table 2 shows the comparison of the mean of the studied attributes calculated by the Duncan test. As can be seen in the table, the mean of the groups was not significantly different at the probability level of 5% ($p<0.05$). In this study, the magnetic water and different levels of salinity did not have a significant effect on the studied properties, probably due to the low intensity of the magnetic field or the low duration of the test. The greater the intensity of the magnetic field, the greater its impact on irrigation water and soil. Also, the longer the test period is and the more soil is irrigated by magnetic water, its characteristics are most affected by the magnetic field and show better results.

Table 1: Analysis of variance of evaluated traits

sources Change	df	Porosity (%)	Bulk density (gr/cm^3)	Field Capacity (%)
w	1	1.792ns	$6.173*10^{-7}$ ns	2.122ns
S	2	41.931ns	0.033ns	14.303ns
H	2	23.746ns	0.007ns	6.784ns
W×S	2	106.332ns	0.012ns	4.201ns
Error	108	35.437	0.019	15.141

ns: is not statistically significant, **: significant at the one percent level, *: significant at the five percent level

Table 2: Comparison of the mean of the evaluated traits

Treatment	Porosity (%)	Bulk density (gr/cm^3)	Field Capacity (%)
W_1	44.23a	1.38a	20.38a
W_2	44.02a	1.38a	20.61a
S_1	45.08a	1.38a	20.88a
S_2	43.96a	1.37a	20.69a
S_3	43.34a	1.39a	19.91a
H_1	44.39a	1.38a	20.78a
H_2	43.37a	1.39a	20.09a
H_3	44.62a	1.37a	20.60a

The columns with common letters do not differ significantly from the Duncan test at the 5% level.

4. Conclusion

According to the results of this study, spirometric water had no significant effect on porosity, bulk density and soil moisture content.

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