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EFFECT OF NITROGEN FERTILIZATION AND IRRIGATION WATER QUALITY ON SOME SOIL CHARACTERISTICS, GROWTH AND YIELD OF SUNFLOWER

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Abstract

The present study was conducted with the aim of demonstrating the effect of nitrogen fertilization and irrigation water quality on some soil properties and the growth and yield of sunflower. A field experiment was conducted on agricultural land in the oases in Karbala governorate as the soil was prepared and three water types were used (river water, puncture water and Different levels of nitrogen (0, 50, 100, 150, 200, 250) kg (e) were used with experimental plates with dimensions (x43) meters, leaving a separation between each sector and also a separation between the experimental units. To avoid interference. It was found that there was a significant difference in terms of the effect of salinity in soil and plant characteristics and did not find that there was a significant effect with increasing the addition of water well and drainage. The salinity rate of the soil after harvest due to increased salinity of irrigation water was (5, 7.12) ds.m^{-1}.

***Keywords*:** Water quality, nitrogen fertilization, sunflower, soil properties.

Introduction

The world's water resources have become a scarce and economical resource in many regions of the world, especially in arid and semi-arid regions. Increased competition for water among agricultural, industrial and urban consumers creates the need for continuous improvements in irrigation uses in agricultural and commercial production (Todorovic, 2016). Effective irrigation management strategies can help improve crop water productivity through timely application of irrigation water and the use of modern irrigation systems. Therefore, effective use of limited freshwater resources in agriculture necessitates the use of modern irrigation systems such as surface and subsurface drip irrigation systems to increase the quantity and quality of agricultural crops.

Colak *et al*. (2018). Therefore, it became necessary to search for water sources of various types, such as water taps and rivers in addition to the water of the river (Hassan, 2019). Hammadi *et al*. (2002) (AlJanabi, 2019). Also reached the possibility of using puncture water after mixing it with fresh water in certain proportions in the cultivation of some tolerant crops. Salinity such as barley, wheat, and maize, and the process of mixing the puncture water with fresh water by 45% water: 55 fresh water gave wheat yield equal to the river treatment at the same time and provided 50% of fresh water (Fezzani *et al*., 1990) found that the content of seeds Sunflower oil was not affected by increased nitrogen levels Sunflower (*Helianthus annuus* L.). It is one of the most important oil crops in the world. It occupies the third place after soybeans and slag in production (Al-Rawi, 1983 and Oraha, 2002). In Iraq, it occupies the first place in extracting processed oils despite the limited cultivated areas. Therefore, the sunflower crop occupies a special place in the cultivation of oil crops to contain high seeds of oil up to 50% is a source of many food industries and oils, the area planted in Iraq in 2002 about 25.31 thousand hectares and production) Arab Organization for Agricultural Development, 2003. Al-Jubouri (1999), Al-Mukhtar and Jamal (2000) and Al-Zahedi (2005) indicated that the addition of organic matter (cattle and poultry residues) resulted in a significant increase in yield, plant height and dry matter weight for many crops compared to non-addition of fertilizers. Organic Sunflower Crop.

Materials and Methods

A field experiment was carried out during the autumn season (August, 2017) in the field of experiments, which is located in the holy province of Karbala, Al-Jadwal Al-Gharbi district, in a soil with a texture (clay mix).

Soils were prepared and three different types of water (river water, drainage water and borehole water) were used. Different levels of nitrogen (0, 50, 100, 150, 200, 250) kg were used. (x43) meters leaving a break between each sector and another and also a break between the experimental units to avoid interference.

The seeds of sunflower were planted in August 2017 and placed in each jar three seeds and eased after two weeks to one plant, nitrogen fertilizers were added as recommended and both phosphorus and potassium.

Table 2 : Soil properties of the experimental study

Property	EC	pH	$CaCO_3$	$CaSO_4$	O.M	Bulk density	Particle density	Hydraulic conductivity
Unit	ds.m^{-1}		g.kg^{-1}	g.kg^{-1}	g.kg^{-1}	Mg.m^{-3}	Mg.m^{-3}	cm.h^{-1}
Value	2.7	7.63	280	1.10	12.3	1.39	2.65	1.90

Table 2 : Water properties of the experimental study

Property	EC	pH	Ca^{+2}	Mg^{+2}	K^{+}	Na^{+}	SO_4^{-2}	HCO_3^{-}	Cl^{-}	Water quality
Unit	$ds.m^{-1}$		$Meq.l^{-1}$	$Meq.l^{-1}$	$Meq.l^{-1}$	$Meq.l^{-1}$	$Meq.l^{-1}$	$Meq.l^{-1}$	$Meq.l^{-1}$	
River (w1)	1.28	7.40	9.4	4.6	0.7	6.2	5.8	1.3	8.9	C3S1
Drainage(w2)	3.92	7.16	17.9	13.1	1.5	18.9	16.3	6.0	21.5	C4S1
Well (w3)	6.15	6.88	32.5	17.7	1.3	27.0	31.1	6.1	45.1	C4S1

After the end of the experiment, some soil characteristics were measured (soil salinity, reaction rate, organic matter, bulk density and total nitrogen). Some measurements were made for plants (plant height, disk area, 500 seed weight and bio-yield).

Results and Discussion

Effect of irrigation water quality and nitrogen fertilizer level on soil chemical properties

(i) Soil pH

The results showed in Table (3) that the irrigation with drainage water led to a decrease in the values of soil pH where the rate of decline (7.40) compared to the river water which was (7.30), also note from the same table that well irrigation led to a decrease in the values of soil pH after harvest at a rate of (7.21) for irrigation with river water. This may be due to the fact that the soil reactivity values of most common salts are neutral and slightly acidic and that increasing the concentration of these salts may lower the soil reactivity values to lower levels (and others). Increased salt concentration may also affect the increase in the value of contact fluid voltage, which is assumed to be zero when measuring pH (Christan, 1980).

Shukri (2002) pointed out that the low soil pH in saline irrigation was due to the accumulation of neutral salts which reduced the degree of soil reaction towards neutralization.

As for the levels of nitrogen fertilization and its effect on soil pH, we note from the same table that there is a decrease in the values of the soil pH when the application of nitrogen fertilizer, where the rate of decline (7.45, 7.38, 7.28, 7.21, 7.17) and the levels (50, 100, 150, 200 and 250) kg^{-1}, respectively, compared with the absence of nitrogen fertilizer at which the reaction value was (7.52). It may be attributed to the release of hydrogen ions resulting from the conversion of ammonium to nitrate, which reduced the soil pH towards neutralization (Prism 2006) Mohammed 2018.

(ii) Soil salinity

The results of Table (4) showed that there was an increase in the salinity of the soil after harvest as a result of increasing the salinity of the irrigation water and the rates were (5, 7.12) dec. These results are consistent with Abboud (1998 Al-Musawi *et al*. (2002), who obtained an increase in soil salinity by increasing the salinity of irrigation water the river.

As for the added nitrogen levels, the same table shows a decrease in soil salinity by (5.56, 5.27, 5.13, 5.0, 5.07, 4.91) for additives (250, 200, 150, 100, 50) kg^{-1}, respectively, compared with zero level which was (5.97).

The low salinity of the soil by increasing the levels of nitrogen fertilizer may be attributed to the increase of plant growth and absorption of relatively larger amount of ions dissolved in the soil, which led to its decrease, as well as urea fertilizer is a non-saline organic compound.

Interference between irrigation water quality and nitrogen fertilizer levels indicated that the treatment (well with zero nitrogen level) gave the highest level of soil salinity which was (8.96) dec. Liters-1 compared with treatment (river water with 250 nitrogen) which was (2.61) Liters-1.

(iii) Organic matter

Table (5) indicates that there is no increase in the organic matter content in soil when irrigating with puncture and well water compared to irrigation with river water. The results were (15.08, 15.39) g for puncture and well and (14.96) when irrigating with river water. Increase in organic matter content (14.21, 14.45, 15.42, 15.92 and 16.96) kg in soil when nitrogen fertilizer was added and all treatments (250, 200, 150, 100, 50) kg^{-1}, respectively, as for the zero level of addition It was an average of (14.06) kg.

This increase may be attributed to the improvement of vegetative and root growth of the plant and hence the increase of plant root residues, which was reflected in the increase of organic matter in the soil after harvest. The addition of fertilizers increases the biological growth which in turn increases the organic matter content in the soil. Prism (2006) mohammed 2019.

As for the overlap between the levels of nitrogen fertilizer addition and irrigation water types, the treatment gave river water and fertilization of 250 kg. (17.1) the highest content of organic matter while the treatment did not add fertilizer and river water the lowest organic content (13.8) the lowest content of organic matter.

Table 3 : Show effect of irrigation water quality and nitrogen fertilizer level on soil pH

Water Quality	Nitrogen level						
	0	50	100	150	200	250	
River	7.68	7.6	7.51	7.35	7.3	7.22	7.40
Drainage	7.5	7.46	7.38	7.28	7.2	7.18	7.30
Well	7.38	7.3	7.26	7.21	7.15	7.13	7.21
	7.52	7.45	7.38	7.28	7.21	7.17	7.30

Table 4 : Show effect of irrigation water quality and nitrogen fertilizer level on soil salinity

Water Quality	Nitrogen level						
	0	50	100	150	200	250	
River	3.1	3	2.9	2.7	2.7	2.61	2.61
Drainage	5.85	5.6	5.33	5.3	5.2	5	5
Well	8.96	8.1	7.59	7.4	7.31	7.12	7.12
	5.97	5.56	5.27	5.13	5.07	4.91	4.91

Table 5 : Show effect of irrigation water quality and nitrogen fertilizer level on soil organic matter.

Water Quality	Nitrogen level						
	0	50	100	150	200	250	
River	13.8	14.1	14.2	14.9	15.66	17.1	14.96
Drainage	14.1	14	14.35	15.25	16	16.8	15.08
Well	14.3	14.55	14.8	15.59	16.1	17	15.39
	14.06	14.21	14.45	15.24	15.92	16.96	

References

Abboud, H.Y. (1998). Effect of salinity and magnesium - calcium ratio in irrigation water on some soil properties and readiness of some nutrients. Doctoral dissertation. College of Agriculture - University of Baghdad.

AlJanabi, A.Z.; Ameer, A.J.; Israa, H. and Al-Hassan, A.H.A. (2019). Effect of adding different levels of organic manure and potassium fertilizer in the yield growth of wheat (*Triticum aestivum* L.). Plant archives Vol. 19, Special Issue, January, 2019.

Al-Musawi, A.S.; Ali, A.F.; Mahmoud, S.M. and Al-Saadi, N.A.J. (2002). Effect of washing requirements for different saline irrigation water on soil properties and plant yield. Journal of Iraqi Agriculture. Volume 7. Number 2.

AlRawi, W.J.M. (1983). Effect of Nitrogen Levels and Plant Density on Field, Specific, Productive and Ingredients of Sunflower Crop (*Helianthus annuus* L.). Master Thesis Department of Field Crop Science, College of Agriculture, University of Baghdad.

Prism, T.H. (2006). Effect of sludge levels and irrigation water quality on the behavior of some elements in soil and maize yield. Ph.D. dissertation, College of Agriculture, University of Baghdad.

Çolak, Y.B.; Yazar, A.; Gönen, E. and Eroğlu, E.Ç. (2018). Yield and quality response of surface and subsurface drip-irrigated eggplant and comparison of net returns. Agricultural water Management, 206: 165-175.

Faizani, K.G.M.; Satyanarayana, V.; Latchanna, A.; Shaik, M. and Ramaiah, N.V. (1990). Response of sunflower genotypes to nitrogen levels J. Res. APAU, 18: 57-9.

Hammadi, K.B.; Nayef, M.F. and Walid, M.M. (2002). Effect of mixing puncture and fresh water on wheat and maize yield and salt accumulation in soil. Journal of Iraqi Agriculture. Vol. 7. Number 2

Hassan, D.F.; Jafaar, A.A. and Mohamm, R.J. (2019). Effect of irrigation water salinity and tillage systems on some physical soil properties. The Iraqi Journal of Agricultural Science, 50: 42-47.

Mohammed, R.J. (2018). The spatial variability of some chemical properties of Gypsiferous soils by using GIS. International Journal of Agricultural and Statistical Sciences, 14(1): 303-312.

Mohammed, R.J.; Abdulkadhim, K.A.; Hassan, D.F. and Kadhim, T.F. (2019). Effect of wheat straw as organic matter and different water quality on some chemical soil properties and growth of pepper (*Capsicum annuum*). In *IOP Conference Series:* Earth and Environmental Science 344(1): 012034.