The use of saline water in the irrigation of Triticale fodder crop, and its effect on growth, productivity and soil properties

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INTRODUCTION

Saline water is one of the unconventional resources of irrigation used in conditions of available water resources scarcity, especially for some crops of special economic value and relatively tolerant for salinity of irrigation water. Studies carried out by some researchers (Hamdy, 1998 and Miles, 1987) referred to the possibility of using saline water in irrigation, especially with rainfall more than 200 mm and proper drainage system installation, moreover Abdel Gawad and Ghaibah, (2001) confirmed that agricultural drainage water can be used by mixing with fresh water in a proportion that maintains irrigation water in a practically acceptable manner and below the salinity threshold of the cultivated crop. The Concept the of alternating irrigations using salt water for a number of irrigations and fresh water for irrigation at the beginning and end of the agricultural season was developed to ensure soil washing and achieve better germination. FAO (1989). Therefore, the experiment aimed to clear up the effect of saline water used in alternative manner of irrigation on growth the production of Triticale crop and some soil properties in particular salt dynamics and its relation to water salinity in Deir Ezzor Governorate - Lower Euphrates Basin under semi-arid conditions. The study was conducted during the cultivation seasons of 2018-2019 at the Saalo Research Station of the General Commission for Scientific Agricultural Research.

METHODOLOGY

This experiments were conducted in complete random block design with three replications, with the following treatments, the first (I_1) was fresh water of the Euphrates, the second (I_2) saline well water with EC of 19.61 dS/m, and the third (I_3) was alternative irrigation of fresh and saline water with salinity of water of 8.44 dS/m. The following parameters of pH, EC and cations and anions in water before each of irrigation portion, pH, EC, cations and anions, NPK in the 3 depth of 0 – 30, 30 – 60 and 60 – 90 cm in the beginning, middle and the end of the seasons; moreover particles sizes, bulk density once in the beginning of each experiment, using the methods certified in the GCSAR laboratories.

Table 1. Soil properties in the experimental site before concting experiements

RESULTS AND DISCUSSION

Fig 1. The feature of the Triticale crop under different treatments. (*Source, Authors*)

The results showed that the first treatment (I1) excelled over the treatments (I2) and (I3) significantly with the differences of 5% for dry weight (grain+ straw) and weight of grain, where the yield of dry weight of grain + straw were 13.26 ,11.59, 11.29 T/ha, and the grain weight (4.17, 3.48, 3.17) T/ha for each treatment respectively (Table, 2 and 3).

Water treatments	Yield, T/ha	Comparison	Observed differences	$LSD_{0.05}$	The results
I_1	13.26	$I_1 - I_2$	1.97	1.83	A
I_2	11.29	$I_3 - I_2$	0.30		C
I_3	11.59	$I_1 - I_3$	1.67		BC
CV = 12.17 %					

Table 2. Dry yeild wieght (grain and strew) of Triticale crops for different treatements.

Water treatments	Yield, T/ha	Comparison	Observed differences	$LSD_{0.05}$	The results
I_1	4.17	$I_1 - I_2$	1.00	0.996	A
I_2	3.17	I_2 - I_3	0.31		C
I_3	3.48	$I_1 - I_3$	0.69		BC
CV = 6.71 %					

Table 3. Dry yeild wieght (grain) of Triticale crops for different treatements

Zeng and Vonshak (1988) attribute the decline in the biological yield (plant dry weight) at higher salinity levels to the increase in the concentration of soluble salts in the root zone, which leads to decrease the water potential of the soil solution, so the gradient difference in the water potential between the soil and the cells of the soil decreases. It was also found as it is shown in the fig. 2 that there was an accumulation of salts in the soil by about (450%) when irrigating with saline water (EC = 19.61 dS/m), however the accumulation of salts with alternating irrigation of fresh and saline water of (EC = 8.4 dS/m) was around (88%), this referred to role of fresh water in leaching some of the salt given with saline water.

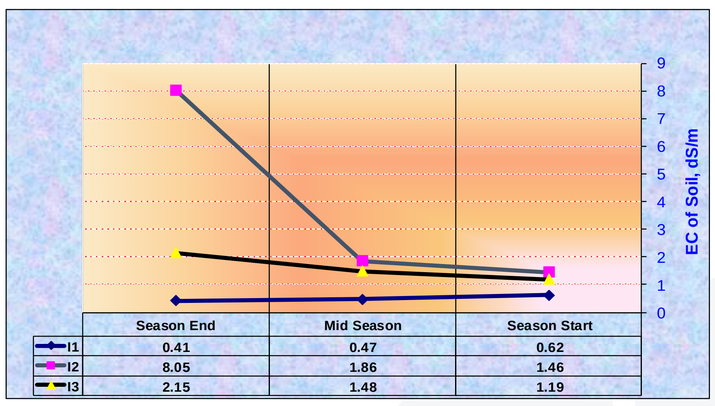

Fig 2. Soil properties in the experimental site before concting experiements

This is consistent with the findings of many researchers, where Arslan and colleagues (2010) mentioned that the irrigation with high salinity water (ECiw=12 dS/m), large amounts of salts accumulated, as ECe rose at the end of the Triticale and millet seasons and reached ECe=11.24 ds/m. Goral and others (1999) also mentioned that Triticale is a medium tolerant crop of salinity and can tolerate up to 7 dS/m.

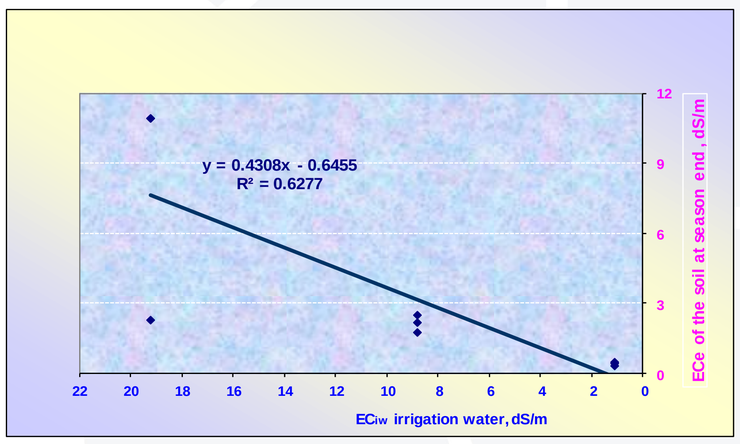

Fig 3 The relationship between season end soil salinity ECe and irrigation water salinity ECiw.

The fig. 3 also shows the relationship between soil salinity ECe and the salinity of irrigation water ECiw, where it appears that there is a positive correlation and that the value of the Square R2 coefficient of determination is approximately (0.63), which means that about 62% of the changes that occur in the values of soil salinity can be explained by the changes that occur in the salinity of irrigation water and by calculating the value of the R Correlation coefficient that measures the strength of the relationship (the correlation) between soil salinity and the salinity of irrigation water, we find that it is equal 0.79.

CONCLUSIONS

- Triticale can tolerate the salinity of irrigation water reflected relatively low decrease of biomass with high water salinity of 19.61 dS/m, comparing to the treatment of fresh water.
- Alternative irrigation leaded to less salt accumulation and to leach some of the salt from soil profile, however salt accumulation was recognized during use of saline water for irrigation with 451 % with EC of water equal19.61 dS/m.
- With the use of saline water for irrigation it is crucial to use some leaching portions of fresh water during the cultivation season.

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