Effect of bio-fertilization and salinity levels of irrigation water on the growth and yield traits of wheat

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ABSTRACT

A field experiment was conducted for the winter season 2018 in the wire canopy belonging to Al-Furat Al-Awsat Technical University, Al-Mussaib Technical College, in order to study the effect of bio-fertilization and salinity of irrigation water and the effect of their interaction on some chemical traits for clay loam soil and wheat growth, where a Completely Randomized Design (CRD) was used, with three replicates, and the treatments of the experiment were four qualities of saline irrigation water (river water 4, 6 and 8) and the number of experimental units was 24 experimental units. The results of the study showed the following:

1- Irrigation with saline water at electrical conductivity (8 $dS.m^{-1}$) (W3) led to a significant decrease in the height of plants (84.9 cm) and the dry weight of the total vegetative (33.47 $g.pot^{-1}$) compared to the control treatment irrigated with river water (W0) at electrical conductivity (1.3 $dS.m^{-1}$) which their averages amounted to (102.53 cm and 42.33 $g.pot^{-1}$), respectively.
2- The addition of bio-fertilizer led to a significant increase in the height of plants, the dry weight of the total vegetative, the number of spikes, the number of grains per spike and the weight of 1000 grains for wheat, which their averages amounted to (94.05 cm and 39.14 $g.pot^{-1}$, 19.82, 39.50 and 37.24 g), respectively, compared to the control treatment (without the addition of bio-fertilizer), which their averages amounted to (89.29 cm, 34.78 $g.pot^{-1}$, 17.78, 37.37, and 34.22), respectively.

Keywords: wheat, bio-fertilization, salinity, soil traits.

*Research paper from MSc thesis for the first author.

تأثير استعمال التسميد الحيوي ومستويات ملوحة من مياه الري في صفات نمو وحاصل الحنطة

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المستخلص:

نفذت تجربة حقلية للموسم الشتوي 2018 في الظلة السلكية الكلية التقنية / المسيب-جامعة الفرات الاوسط ، بهدف دراسة تأثير السماد الحيوي وملوحة مياه الري وأثر تداخلهما في بعض الصفات الكيميائية لتربة مزيجة طينية ونمو الحنطة, إذ أستخدم فيها التصميم تام التعشية (CRD) بثلاثة مكررات وكانت معاملات التجربة هي أربع نوعيات من مياه الري المالحة (ماء نهرو4 و6 و8) وكانت عدد الوحدات التجريبية 24 وحده أظهرت نتائج الدراسة ما يأتي:

1- الري بمياه مالحة ذات الإيصالية الكهربائية 8 ديسي سيمنز. م$^{-1}$ (W_3) أدت إلى انخفاض معنوي في ارتفاع النباتات(84.9)سم والوزن الجاف للمجموع الخضري(33.47)غم. أصيص$^{-1}$ قياسا بمعاملة المقارنة المروية بمياه النهر (W_0)ذات الإيصالية الكهربائية 1.3ديسي سيمنز. م$^{-1}$ والتي بلغت معدلاتها(102.53)سم و(42.33)غم. أصيص$^{-1}$ على الترتيب.

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2- أدى إضافة السماد الحيوي إلى زيادة معنوية في أرتفاع النباتات والوزن الجاف للمجموع الخضري , وعدد السنابل عدد الحبوب بالسنبلة الواحدة ووزن 1000حبة لنبات الحنطة أذ بلغت معدلات القيم 94.05سم و 39.14غم. أصيص-1 و19.82 و39.50 و37.24على الترتيب قياسا بمعاملة المقارنة (بدون إضافة السماد الحيوي) والتي بلغت القيم 89.29سم و 34.78 غم. أصيص-1 و17.78 و37.37 و34.22على الترتيب.

الكلمات المفتاحية : الحنطة –التسميد الحيوي –الملوحة –صفات التربة

البحث مستل من رسالة ماجستير الباحث الاول

1. INTRODUCTION

Wheat crop (Triticum aestivum L.) is considered one of the most important grain crops in Iraq and the world and it comes at the forefront of field crops in terms of cultivated area and production where it is a staple food for most of the people of the world. Wheat has nutritional importance in providing the individual with the calories that he consumes because it is rich in carbohydrates and protein, which is an alternative to meat proteins, where vegetarians enjoy by low cholesterol in the blood compared to those who eat meat (1). Bio-fertilization is considered one of the most important used life technologies, where it is isolated, purified and characterized different microorganisms added in the form of bio-vaccines to the media in which the plant grows for the purpose of increasing the absorption of nutrients. The success of bio-fertilization depends on the efficiency of the used organism, the extent of the organism's compatibility with the plant host and its competitiveness with the organisms already present in the soil as well as supplying organisms in the rhizosphere region and their ability to survive (2). The effect of bio-fertilization in the plant host is occurred by several different mechanisms such as Nitrogen fixation, producing growth stimulants, increasing the absorption of nutrients, and protecting the plant host from pathogens, where the use of bio-fertilizers is considered an inexpensive and safe method from an applied point of view that is used to reduce added chemical fertilizers at least 25% In addition to its role in reducing the problems of environmental pollution (3). Several studies also showed that the results of bi-interactions with bio-fertilizers (nitrogen fixation and dissolving phosphorous) have a positive effect in stimulating plant growth and improving the nutritional status as well as increasing the yield (quantity and quality)(4). The salts in irrigation water and the soil solution have many effects on plant growth, including direct and indirect effects. Direct effects appear in the absorption of water by the plant, since increasing the salt concentration increases the osmotic pressure in the soil solution. This leads to a lack of water absorption by the plant, in addition to that the salts in the soil solution lead to an imbalance in the absorption of nutrients needed by the plant, where the salts and their components of different ions have a direct impact on the plant through the competition of those ions with some of the necessary nutrients that lead in sometimes to reduce the absorption of important ions needed by the plant. As for the indirect effects, they are mainly related to the soil and change its physical and chemical traits, and then on the growth and productivity of the plant (5). Al-Hamdani, (6) also observed the effect of using three qualities of irrigation water at electrical conductivity (1, 3 and 5 $dS.m^{-1}$), where the salinity of irrigation water exceeds (3 $dS.m^{-1}$) led to a significant decrease in the yield of grains and straw, the total yield and the height of the wheat plant cultivated in the soil with clay loam texture. The study aims to:

The possibility of reducing the harmful effects of water with different levels of salinity in some soil traits and the growth of a wheat plant using bio-fertilization.

2. MATERIALS AND METHODS

A factorial experiment was conducted in the wire canopy belonging to Al-Furat Al-Awsat Technical University, Al-Mussaib Technical College in the winter season of 2018. A clay loam soil was used that brought from the surface horizon with a depth of (0-30 cm) to one of the fields belonging to Al-Mussaib Technical College, dried in air and passed through a sieve with a diameter of (4 mm) and placed in pots with dimensions (50 × 50 cm) and capacity of (20 kg) preceded by the process of placing a filter of gravel and sand in the lower layer of each pot, An opening was made to passing a tube for filtering drainage water. A sample was then taken from the soil before cultivating to analyze some chemical traits on it as shown in Table (1) and according to the methods mentioned in (7, 8) In addition to analyzing the soil filtrations, the experiment was designed with three replicates according to A completely randomized design (CRD). It included two factors: the first factor is bio-fertilization at two levels (F0 without fertilization, F1 with bio-fertilization), while the second factor represented four levels for the salinity of irrigation water (W0: River irrigation water, W1: irrigation water with a salinity of (($4\ dS.m^{-1}$), W2: irrigation water with a salinity of ($6\ dS.m^{-1}$), W3: irrigation water with a salinity of ($8\ dS.m^{-1}$)). The number of experimental units was 24 units. Chemical fertilizers were added to all the treatments, where phosphorous and potassium were added in one batch and mixed with the soil before cultivating with a rate of ($150\ kg.ha^{-1}$ phosphorus) in the form of triple superphosphate (21% p), $100\ kg.ha^{-1}$ potassium in the form of potassium sulfate fertilizer (42% K) and Nitrogen was added with a rate of ($160\ kg.ha^{-1}$) in the form urea fertilizer (46% N) in two batches, The first one after two weeks of cultivating and the second one 30 days after adding the first batch, according to the recommended amount (9). Bio-fertilizer was added, which contains three types of fungal and bacterial vaccine (mycorrhiza fungi, Azotobacter chrococcum bacteria, and Azospirillum bacteria), where the fungus vaccine was placed on the peat moss and 50 g of the vaccine was mixed under the surface layer for the soil of the pot at a depth of (5 cm),. The wheat seeds were then mixed with the bacterial vaccine in a sterile plastic container for half an hour with the addition of Arabic gum to ensure the vaccine adheres to the seeds. The seeds of the Barcelona cultivar were cultivated on 11/11/2018, where 30 seeds for each pot were placed, Taking into account the cultivation of seeds in unvaccinated treatments with bio-fertilizer to avoid contamination, and after a week of germination, the number of plants decreased to 15 plants in each pot. Different salinity irrigation water was prepared in four levels (W0: river water with a salinity of ($1.3\ dS.m^{-1}$), W1: irrigation water with a salinity of ($4\ dS.m^{-1}$), W2: irrigation water with a salinity of ($6\ dS.m^{-1}$), W3: Irrigation water with a salinity of ($8\ dS.m^{-1}$)), It was obtained by mixing the river water with saline drainage water that placed in tanks, and the mixing was done to reach the required salt level. All the experimental units were irrigated with normal water at the beginning of the experiment and for four weeks until the start of the germination stage, the irrigation was conducted with salty water for the treatments of experiments and for several irrigations to reach full maturity. The filtrates were collected from the bottom of the pots after conducting the irrigation process, in order to conduct some of the necessary chemical analyses, such as measuring leachate salinity, pH, and estimating dissolved ions. The harvest was made when the plants reached full maturity on 4/17/2019, The salinity of leachate, positive and negative ions, and the degree of soil reaction was then calculated after harvest.

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Table 1: Some chemical and physical traits for study soil before cultivating.

Trait		**Value**	**Unit**
* Electrical conductivity (ECe)		3.43	$dS.m^{-1}$
* Degree of soil interaction (pH)		7.8	-----
Cation exchange capacity (CEC)		20.33	$cmol.q.\ kg^{-1}$
Dissolved positive ions	Calcium (Ca^{++})	10.22	$mmol.L^{-1}$
	Magnesium (Mg^{++})	7.66	
	Sodium (Na^{+})	16.28	
	Potassium (K^{+})	0.59	
Dissolved negative ions	Carbonate (CO_3^{-})	Nil	
	Bicarbonate (HCO_3^{-})	3.15	
	Sulfate ($SO4^{=}$)	10.53	
	Chloride (Cl^{-})	20.55	
Organic matter		3.27	$g.kg^{-1}$ soil
nitrogen availability N		28.0	$mg.kg^{-1}$ soil
Phosphorous availability P		22.53	
Potassium availability K		332	
Soil separates	Sand	436	$g.kg^{-1}$ soil
	Silt	184	
	Clay	380	
Texture		**Clay loam**	
Apparent density		1.27	$\mu g.m^{-3}$
Sodium adsorption ratio SAR		3.84	$mmol.L^{-1}$
Mycorrhiza fungus		35	$Spore.g^{-1}$ soil
Azotobacter bacteria		5.5×10^{9}	$CFU.g^{-1}$ soil
Azusperlum bacteria		4×10^{5}	

Estimated in a leaching saturated dough

Table 2: Average of some chemical traits for irrigation water used in the experiment.

	W0	**W1**	**W2**	**W3**	
EC	1.3	4	6	8	$dS.m^{-1}$
Ph	7.82	7.69	7.03	7.18	
Ca^{+2}	4.76	6.63	7.52	9.89	$mmol.L^{-1}$
Mg^{+2}	3.49	5.75	6.04	7.06	
Na^{+}	7.84	12.33	16.44	21.38	
K^{+}	0.12	0.16	0.28	0.25	
Cl^{-}	8.49	12.55	13.66	22.64	
SO^{-2}_{4}	5.56	6.77	7.33	9.44	
CO_3^{-2}	Nil	Nil	1.0	Nil	
HCO^{-2}_{3}	2.52	5.44	4.89	6.22	
SAR	2.73	3.50	4.47	5.19	$mmol.L^{-1}$
Quality of irrigation water	**C_3S_1**	**C_4S_1**	**C_4S_1**	**C_4S_1**	

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3. RESULTS AND DISCUSSION

First: Effect of using salinity levels of irrigation water and bio-fertilizer on some growth traits for the wheat crop:

Plant height (cm)

Table (3) shows a significant decrease in the plant height values with increasing salinity levels of the used irrigation water, where the average of plant height amounted its highest value (102.53 cm) when irrigating with river water (w0), and the lowest average of plant height amounted to (84.9 cm) when using irrigation water at the level of (8 $dS.m^{-1}$) (W3). The reason for the decrease in the average of plants height is due to the effect of salinity of irrigation water, where salty water causes harmful effects, including the osmotic pressure, the toxic effect, or the effect on the nutrition balance, as well as the effect on the enzymatic activity that plays an important role in bio-activities for the plant, which negatively affected the average of plant heights (10). These results agree with (Al-Hamdani, 6; Al-Mamouri, 12) who found a significant decrease in the average of plants height irrigated with saltwater. These results also agree with (Al-Dulaimi, 13) who concluded that using high salinity water to irrigate the wheat plant caused a decrease in the plant height. The addition of bio-fertilizer (F1) gave positive significant differences in the plant height amounted to (94.05 cm) compared to the unvaccinated treatment with bio-fertilizer (F0), where their average plant height decreased to (89.29 cm). The reason for this is due to the role of bacterial, fungal, and bio-fertilizers in improving plant growth by increasing the availability of the necessary elements for plant growth such as nitrogen fixation by bacteria and reducing them to the degree of soil reaction (pH), which increases the availability of the micronutrients needed by the plant, as well as the production of growth regulators (14, 15). As for the effect of the interaction between the salinity of irrigation water and bio-fertilizer, the effect was significant on the plant height values. The interaction treatment between the irrigation with river water and using bio-fertilization (F1W0) gave the highest value amounted to (104.33 cm) compared to the interaction treatment between the irrigation with water at a level of (8 $dS.m^{-1}$) and without bio-fertilizer (F0W3) which amounted to (81.13 cm). It is believed that the reason for the increase in plant height is attributed to the role of added bio-fertilizer in reducing the salinity of irrigation water, which reduces the accumulation of salts in the soil and reducing the salinity effect of irrigation water, which is reflected positively on most bio-processes within the plant.

Table 3: Effect of bio-fertilization and irrigation with saline water on plant height (cm).

Bio-fertilization	**The salinity of irrigation water ($dS.m^{-1}$)**				
	W_0	**W_1**	**W_2**	**W_3**	**Average**
F0	100.74	90.29	85.00	81.13	89.29
F1	104.33	96.53	90.44	88.67	94.05
Average	102.53	93.41	87.72	84.9	
L.S.D(0.05)	**F**	**W**	**F*W**		
	0.885	**1.251**	**1.769**		

Weight of dry matter

Table (4) shows a significant decrease in the weight of dry matter with increasing salinity levels for the used irrigation water, where the average weight of dry matter amounted its highest value (42.33 g) when irrigating with river water (w0), and the lowest average weight of dry matter amounted to (33.47 g) when using irrigation water at the level of (8 $dS.m^{-1}$) (W3).

The reason for this reduction in the weight of the dry matter is due to the role of salinity of irrigation water in the accumulation of some ions inside the plant to the limits of toxicity, especially the sodium component, and this leads to a weakness in the activity of meristematic tissues and elongation of cells, which causes weak growth of the total vegetative. These results agree with (4, 19) that the addition of bio-fertilizer gave significant differences in the weight of dry matter amounted to (39.14 g) compared to the unvaccinated treatment with bio-fertilizer, which gave an average value amounted to (34.78 g). The reason for the increase in the weight of the dry matter when adding the fertilizer may be due to the positive effect in improving the status of nutritional nitrogen in the plant as a result of the atmospheric nitrogen fixation as well as the production of growth regulators, where this fertilizer combination reduces the degree of soil interaction (pH), which increases the availability of the micronutrient needed by the plant, thus improves plant growth (16, 17). As for the effect of the interaction between the salinity of irrigation water and bio-fertilizer, the effect was significant on the weight of the dry matter. The interaction treatment between the irrigation with river water and using bio-fertilization (F1W0) gave the highest value amounted to (44.96 g) compared to the interaction treatment between the irrigation with water at a level of (8 $dS.m^{-1}$) and without bio-fertilizer (F0W3) which amounted to (32.22 g). It is believed that the reason for the increase in weight of dry matter is attributed to the role of added bio-fertilizer in reducing the salinity of irrigation water, which reduces the accumulation of salts in the soil and reducing the salinity effect of irrigation water, which is reflected positively on most bio-processes within the plant.

Table 4: Effect of bio-fertilization and irrigation with saline water on the weight of dry matter (g).

Bio-fertilization	**The salinity of irrigation water ($dS.m^{-1}$)**				
	W_0	**W_1**	**W_2**	**W_3**	**Average**
F0	39.70	33.70	33.53	32.22	34.78
F1	44.96	37.05	39.85	34.73	39.14
Average	42.33	35.37	36.96	33.47	
L.S.D(0.05)	**F**	**W**	**F*W**		
	1.486	**2.101**	**2.971**		

First: Effect of using salinity levels of irrigation water and bio-fertilizer on the traits of the yield and its components.

Number of grains per spike

Table (5) shows a significant decrease in the number of grains per spike with increasing salinity levels for the used irrigation water, where the average number of grains per spike amounted its highest value (45.11 $grain.spike^{-1}$) when irrigating with river water (w0), and the lowest average weight of dry matter amounted to (33.17 $grain.spike^{-1}$) when using irrigation water at the level of (8 $dS.m^{-1}$) (W3). The reason for the reduction of the number of grains in irrigation treatments with different salinity water is due to the negative effect on all plant growth indicators such as plant height, number of grains, number of spikes, and weight of 1000 grains. These results agree with (18) who showed that saline stress increases the osmotic effect that leads to increase plant suffering in extracting water due to saline stress and this causes indirect effects on the plant that are reflected in the growth and final yield as well as what is caused by an increase in the concentration of salts in the soil solution or absorbed by the plant directly. The addition of bio-fertilizer gave significant differences in the number of grains per spike amounted to (39.50 grain.spike^{-1}) compared to the unvaccinated treatment with biofertilizer, which gave an average value amounted to (37.37 grain.spike^{-1}). The reason for the increase in the weight of the dry matter when adding the fertilizer may be due to the positive effect in improving the status of nutritional nitrogen in the plant as a result of the atmospheric nitrogen fixation as well as the production of growth regulators, where this fertilizer combination reduces the degree of soil interaction (pH), which increases the availability of the micronutrient needed by the plant, thus improves plant growth (16, 17). As for the effect of the interaction between the salinity of irrigation water and bio-fertilizer, the effect was significant on the number of grains per spike. The interaction treatment between the irrigation with river water and using bio-fertilization (F1W0) gave the highest value amounted to (46.18 grain.spike^{-1}) compared to the interaction treatment between the irrigation with water at a level of (8 dS.m^{-1}) and without bio-fertilizer (F0W3) which amounted to (32.44 grain.spike^{-1}). The reason for the increase in the number of grains per spike is due to the role of added bio-fertilizer in reducing the salinity of irrigation water, which reduces the accumulation of salts in the soil and reducing the salinity effect of irrigation water, which is reflected positively on most bio-processes within the plant (16, 17).

Table 5: Effect of bio-fertilization and irrigation with saline water on the number of grains per spike (grain.spike^{-1}).

Bio-fertilization	**The salinity of irrigation water (dS.m^{-1})**				
	W_0	**W_1**	**W_2**	**W_3**	**Average**
F0	44.03	38.14	34.88	32.44	37.37
F1	46.18	39.05	38.75	33.91	39.50
Average	45.11	38.60	36.82	33.17	
L.S.D(0.05)	**F**	**W**	**F*W**		
	0.701	**0.991**	**1.402**		

Weight of 1000 grains (g)

Table (6) shows a significant decrease in the weight of 1000 grains with increasing salinity levels for the used irrigation water, where the average weight of 1000 grains amounted its highest value (38.64 g) when irrigating with river water (w0), and the lowest average weight of 1000 grains amounted to (32.51 g) when using irrigation water at the level of (8 dS.m^{-1}) (W3). The reason for the decrease may be attributed to the role of salinity of irrigation water in increasing soil salinity and then soil salinity negatively affects plant growth through the osmotic effect for the soil solution, which leads to the inability of the plant roots to absorb water, which leads to inhibition of photosynthesis, thus infilling of the grain that leads to low their weight. The addition of bio-fertilizer gave significant differences in the weight of 1000 grain amounted to (37.24 g) compared to the unvaccinated treatment with bio-fertilizer, which gave an average value amounted to (34.22 g). The reason for the increase in the weight of the dry matter when adding the fertilizer may be due to the positive effect in improving the status of nutritional nitrogen in the plant as a result of the atmospheric nitrogen fixation as well as the production of growth regulators, where this fertilizer combination reduces the degree of soil interaction (pH), which increases the availability of the micronutrient needed by the plant, thus improves plant growth (16, 17). As for the effect of the interaction between the salinity of irrigation water and bio-fertilizer, the effect was significant on the weight of 1000 grain. The interaction treatment between the irrigation with river water and using bio-fertilization (F1W0) gave the highest value amounted to (40.55 g) compared to the interaction treatment between the irrigation with water at a level of (8 $dS.m^{-1}$) and without bio-fertilizer (F0W3) which amounted to (30.80 g). The reason for the increase in the weight of 1000 grain is due to the role of added bio-fertilizer in reducing the salinity of irrigation water, which reduces the accumulation of salts in the soil and reducing the salinity effect of irrigation water, which is reflected positively on most bio-processes within the plant.

Table 6: Effect of bio-fertilization and irrigation with saline water on the weight of 1000 grain (g).

Bio-fertilization	**The salinity of irrigation water ($dS.m^{-1}$)**				
	W_0	**W_1**	**W_2**	**W_3**	**Average**
F0	36.73	35.56	33.79	30.80	34.22
F1	40.55	39.51	34.68	34.21	37.24
Average	38.64	38.64	34.23	32.51	
L.S.D(0.05)	**F**	**W**	**F*W**		
	0.821	1.161	1.642		

Grain yield

Table (7) shows a significant decrease in the grains yield with increasing salinity levels for the used irrigation water, where the average grains yield amounted its highest value (5.29 $tons.ha^{-1}$) when irrigating with river water (w0), and the lowest average grains yield amounted to (3.93 $tons.ha^{-1}$) when using irrigation water at the level of (8 $dS.m^{-1}$) (W3). The reason for the decrease may be attributed to the role of salinity of irrigation water in increasing soil salinity and then soil salinity negatively affects plant growth through the osmotic effect for the soil solution, which leads to the inability of the plant roots to absorb water, which leads to inhibition of photosynthesis, thus leads to decrease grains yield. The addition of bio-fertilizer gave significant differences in the grains yield amounted to (4.93 $tons.ha^{-1}$) compared to the unvaccinated treatment with bio-fertilizer, which gave an average value amounted to (4.05 $tons.ha^{-1}$). The reason for the increase in the weight of the dry matter when adding the fertilizer may be due to the positive effect in improving the status of nutritional nitrogen in the plant as a result of the atmospheric nitrogen fixation as well as the production of growth regulators, where this fertilizer combination reduces the degree of soil interaction (pH), which increases the availability of the micronutrient needed by the plant, thus improves plant growth (16, 17). As for the effect of the interaction between the salinity of irrigation water and bio-fertilizer, the effect was significant on the grains yield. The interaction treatment between the irrigation with river water and using bio-fertilization (F1W0) gave the highest value amounted to (5.52 $tons.ha^{-1}$) compared to the interaction treatment between the irrigation with water at a level of (8 $dS.m^{-1}$) and without bio-fertilizer (F0W3) which amounted to (3.16 $tons.ha^{-1}$). The reason for the increase in the grains yield is due to the role of added bio-fertilizer in reducing the salinity of irrigation water, which reduces the accumulation of salts in the soil and reducing the salinity effect of irrigation water, which is reflected positively on most bio-processes within the plant.

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Table 7: Effect of bio-fertilization and irrigation with saline water on the grain yield (g).

Bio-fertilization	**The salinity of irrigation water ($dS.m^{-1}$)**				
	W_0	**W_1**	**W_2**	**W_3**	**Average**
F0	5.07	4.37	3.62	3.16	4.05
F1	5.52	4.95	4.54	4.71	4.93
Average	5.29	4.66	4.08	3.93	
L.S.D(0.05)	**F**	**W**	**F*W**		
	0.262	0.371	0.524		

CONCLUSION

The addition of different levels of salty irrigation water led to an increase in soil salinity which led to a significant decrease in some traits of vegetative growth for wheat, including plant height, the weight of dry matter and number of spikes, and then a decrease in some traits of the yield and its components such as the number of grains per spike and the weight of 1000 grains. The addition of bio-fertilizer led to reducing the harmful effects for the salinity of irrigation water on the soil and plant by improving the general condition for the wheat plant, where it led to a significant increase in some traits of the vegetative growth for wheat, including plant height and weight of dry matter, and then a decrease in some traits of the yield and its components Like the number of grains per spike and the weight of 1000 grains.

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