Al-Furat Journal of Innovations in Agricultural Sciences (FJIAS)

Effect of adding organic matter and spraying with nano-iron and on soil content of nutrient during flowering and harvesting stages of yellow corn plants under salt stress conditions

Walaa Rasul Abdulhussein [1] Mohamed Tarkhan Abo Almeek Al-Mamoori [2*]

[1]Al- Mussaib Technical College , Al-Furat Al-Awsat Technical University, Babylon province , Iraq.
[2] Al- Mussaib Technical College , Al-Furat Al-Awsat Technical University, Babylon province , Iraq.

[*]Corresponding author E-mail: walaa.rasoulabd@gmail.com

FJIAS 2025, 1(3): 88-99

Abstract *A field experiment was conducted during the summer season for the year 2020-2021 in one of the private farmers' farms belonging to Babylon province-Al-Kifl district in the Abu Simij region. The experiment included three factors, the first factor, spraying the nano iron fertilizer with three levels (Fe2, Fe1, Fe0), the second factor, and three levels of organic fertilizer (O2, O1, O0).The third factor and two levels of salinity of irrigation water (W2, W1). The experiment was conducted according to Randomize Complete Block Design and with three replications. The results were summarized as follows: There were no significant differences when adding nano iron by spraying on leaves to increase the availability of nutrients in the soil. The addition of organic fertilizer led to a significant increase in the availability of the nutrients in the soil, including nitrogen, phosphorus, and potassium, at an average of (34.85, 16.17, 186.28) mg / kg soil -1 Respectively in the flowering stage of the plant.As for the post-harvest stage, the highest average for the studied traits was (27.41, 11.84 and 158.37) mg / kg soil -1 respectively. As for the salinity of irrigation water, the first level exceeded the second level significantly in all the studied traits and reached (33.68, 14.12 and 186.94) for the flowering stage and reached (26.40, 10.87 and 158.21) mg kg soil -1 post-harvest stage. the bi-interaction between organic matter and irrigation water was excelled and it gave the highest average of nutrient concentration in the soil, and it reached the flowering stage (35.98, 16.55 and 189.13), and the highest rate for the post-harvest stage (29.84, 12.85 and 160.80) mg / kg soil -1 post-harvest stage.*

Key words: nano iron, compost, yellow corn, salinity of irrigation water

1. INTRODCTION

Some countries, including Iraq, suffer from a lack of rain where it is in arid and semi-arid regions. Lack of fertility lands suitable for agricultural exploitation. The difficulty in providing sufficient quantities for irrigation operations has become impossible due to poor water management on the one hand and its scarcity on the other hand. Therefore, researchers have tended to find alternatives and apply modern means to improve the agricultural reality. The use of nano fertilizers is one of these alternatives, especially the unprepared micronutrients in our soils, as they are basic and calcareous soils, which play an important role in the metabolic life of plants. Nanotechnology is one of these modern applications, which has proven its worth in the agricultural field in increasing agricultural production and improving the quality of food produced by farmers. It is believed that this modern technology will secure the world's growing food needs as well as provide a set of economic, environmental, and health benefits. Nanotechnology has proven its position in agricultural sciences and related industries as a multidisciplinary technology and a pioneer in problem-solving [1]. Iron is involved in many of the vital processes of the plant, either through its direct participation as a synthetic part of building materials or its activation of enzymatic processes inside the plant, Iron enters a catalyst for pigment formation reactions through a series of compounds that end with the formation of the chlorophyll molecule, and these results agree with [2]and [3]or through its important role in the process of RNA representation of chloroplasts in leaves, which are bodies that contain chlorophyll,Iron also enters into the formation of the cytoplasm of great importance in the processes of photosynthesis and respiration through its role in receiving and transmitting electrons, and that any defect that occurs in these enzymatic pigments as a result of iron deficiency leads to an imbalance in the process of photosynthesis, yellowing of young leaves and burning of their edges and tops of plants [4], Organic matter is a mixture of residual substances from plant or animal organisms, and microorganisms that were produced during the process of decomposition for a long period of time, and organic materials are composed of nutrients, the most important of which are carbon, hydrogen, nitrogen, and oxygen and sulfur, phosphorous and other mineral elements, so one of the benefits of the decomposition of organic matter is the release of the aforementioned mineral elements, to be a food source for the plant [5]. The effect of salt stress is evident in arid and semi-arid regions, with limited rains, accompanied by high averages of temperatures, causing high averages of evaporation-transpiration and a decrease in the average of water absorption [6]The limited water resources have a great impact and the loss of large quantities of them during traditional irrigation operations, many studies cities have tended to try to find different methods in programming irrigation operations by determining the quantities of irrigation water to be added, and determining the dates for addition using modern irrigation methods, especially in areas that suffer from water scarcity. One of the most important of these technologies is the adoption of the surface and subsurface drip irrigation system, where it is considered one of the most efficient irrigation systems because it supplies the plant with water directly at the periphery of the root zone during the stages of plant growth [7]. Yellow corn (Zea mays L.) belongs to the Poaceae family, and it is one of the most important foods and industrial grain crops of this family. It is cultivated in different regions of the world and is the third crop after wheat and rice from .In terms of its economic and production importance due to its many uses, corn grain contains high amounts of vitamin A, which is twenty times higher than what is contained in wheat grains [8].

The study aims to:

1- Reducing the effect of irrigation water salinity on the growth and yield of yellow corn by using organic fertilizers and spraying with nano iron.

2- Reducing chemical fertilizers and supplementing them by adding organic fertilizers and spraying with nano iron.

3- Study the interaction between the effect of the study factors on some chemical properties of soil and the growth of the yellow corn plant.

2. MATERIALS AND METHODS

The experiment was conducted on 22/7/2020 in Silty Clay Loam soil, where a sample of the soil was taken before cultivation and brought from the surface horizon from 0-30 cm to one of the farmers' fields _ Al-Kifl / Babylon area to specify some chemical and physical traits as in (Table 1).The cultivation, smoothing, and leveling of the soil were conducted after which the experiment soil was divided into three replicates and each replicate was divided into 18 experimental units, and the dimensions of the experimental unit were (3 * 3) m. The distance between the replicate was left 2 m wide to prevent the transfer of fertilizer between the replicate during the spraying process, and a distance of 1.5 m wide was left between the experimental units. The experimental units were irrigated lightly for calibration. The experiment included the following factors: The first factor: salinity of irrigation water (W) and it included two levels of salinity of irrigation water which are (4,2) DS.m-1 (W1 and W2) respectively, and the second factor: the addition of organic wastes (O) in three levels, which are (0, 40,20) tons. ha-1 from buffalo wastes (O0, O1 and O2) and the third factor: spraying with nano iron, in three levels (1,2,0) g.L-1 are (Fe0, Fe1, Fe2) respectively, and the average of treatments were compared under the LSD test at a probability level of 0.05 [9]Adding mineral fertilizers to all treatments 50% according to the full fertilizer recommendation [10]Adding nitrogen and potassium at a constant level for all treatments. Nitrogen was added in the form of urea fertilizer (46% N) at a level of 240 kg. N ha-1 and the adding of potassium in the form of potassium sulfate (41.5% K) at a level of 150 kg. K ha-1 with two equal batches, the first at germination, mixed with the soil, and the second batch after 30 days. Phosphorous was added in the form of triangular calcium superphosphate fertilizer (20% P) at a level of 80 kg. P ha-1 at once before cultivation, mixed with soil. Organic matter was added in three levels before cultivation(40,20,0) tons. ha-1.The cultivation was conducted on 7/22/2020 in the form of lines, the distance between one line and another 40 cm and one plant and another 25 cm and used the seeds of yellow maize (Baghdad 3), which were obtained from the Agricultural Research Center in Abu Ghraib - Department of Yellow Corn (production of the Ministry of Agriculture) of the Ministry of Agriculture at an average of 3 seeds per pit, then the plants were reduced to one plant in one pit after 10 days of germination and the average of germination was 80%.The plants were irrigated by surface irrigation, and after 20 days they were irrigated by drip irrigation. Weeding was conducted manually three times during the growing season, to remove the growing bushes along with the crop. The control of the Corn Stem Borer insect (Sesamiacreteca) was conducted using the granulated diazone pesticide at a concentration of 10% (5 kg ha-1) in two periods, the first after (20) days from germination and adding four grains to the core of the leaf, and the second (10) days after the first control was conducted. As for the third control, after 25 days of the second control. The nano iron was sprayed with a 20 liter sprayer and the concentration was reduced with a small amount of Al-Zahi material to ensure complete wetness of the leaves and increase the efficiency of the spraying solution.The spraying process was conducted early in the morning to avoid high temperatures. The without addition treatment was sprayed with distilled water.

Table (1): Some physical and chemical properties of the field study soil

Traits		Values	Units
Ph		7.6	---
Ec		3.6	dSm^{-1}
Organic matter		9.87	$g\ kg^{-1}$
Positive ions	Ca^{+2}	17.63	$meqL^{-1}$
	Mg^{+2}	15.04	
	K^{+1}	1.87	
	Na^{+1}	8.40	
Negative ions	CO_3^{--}	NiLL	
	HCO_3^{-}	10.10	
	Cl^{-}	23.78	
	SO_4^{--}	9.85	
availability nitrogen		20.34	$mgkg^{-1}$
availability phosphorous		6.33	
availability Potassium		164.25	
availability iron		8.7	
Sand		270	gkg^{-1}
Silt		280	
Clay		450	
Bulk density		1.43	gm\cm3

Table (2) the chemical traits of the irrigation water used in the experiment

Treatment		Unit	Traits
W2	W1		
4.6	1.8	Dsm^{-1}	EC
8.1	7.5		PH
4.1	3.4	$Mmol.L^{-1}$	Ca^{+2}
6.2	2.1	$Mmol.L^{-1}$	Mg^{+2}
11.31	7.4	$Mmol.L^{-1}$	Na^{+1}
0.2	0.1	$Mmol.L^{-1}$	K^{+1}
15.2	8.64	$Mmol.L^{-1}$	Cl^{-1}
6.7	2.8	$Mmol.L^{-1}$	$SO4^{-2}$
2.6	2.3	$Mmol.L^{-1}$	HCo_3^{-1}
4.4	3.4	Mmol charge -1	(SAR)

Table (3) Some chemical traits of cow manure after preparation

Traits	Values	Units
Ece	.23	dSm^{-1}
PH	7.81	
Total nitrogen	14.4	%
Total potassium	4.2	
Total phosphorous	5.25	
C/N	16.85	

Studied traits

1) Concentration of nitrogen in the soil: the available nitrogen was estimated by extraction method using potassium chloride solution (2M) and using MgO and then distillation after evaporation through the microchloride device according to the Bremner method and described in [11]

2) Phosphorus concentration in the soil: available phosphorus was extracted by using NaHCO3 sodium bicarbonate at a concentration of 0.5 M and the color phase was made with ammonium molybdates and ascorbic acid, and the estimation was made by using a spectrophotometer at a wavelength of 882 nanometers, as mentioned in [11]

3) Potassium concentration in the soil: It was estimated using a Flam photometer, as reported in [11]

statistical analysis:

The data were analyzed statistically according to the Randomized Complete Block Design (RCBD) , and the averages were compared using the least significant difference test at the level of significance (0.05) [9]using Excel program.

3. RESULTS AND DISCUSSION

Effect of nano iron, organic fertilization, and salt stress levels on the availability of some macro elements in the soil

1- availability nitrogen (mg N kg soil -1) for flowering and post-harvest stage

The results in Tables (6) and (7) indicated that there were no significant differences when spraying with nano iron concentrations in the average nitrogen concentration in the soil for the flowering and post-harvest stages. The results showed in the two tables that organic fertilization O2 was significantly excelled in increasing the nitrogen concentration in the soil for the flowering and post-harvest stages, and it reached (34.85 and 27.41 mg N kg soil -1), respectively compared with the control treatment O0 (30.82 and 23.59 mg N kg soil -1), with an increase of (13.07 and 16.19)%.The treatment of normal irrigation water, W1, for the two stages of flowering and post-harvest, also excelled and gave the highest average (33.68 and 26.40 mg N kg of soil -1) respectively.compared to the control treatment W2 (31.74 and 24.15 mg N kg of soil -1) with a significant increase of (6.11 and 9.31)%. The results of the two tables showed that the bi and triple interaction was not significant in these traits, with the exception of the bi-interaction between organic fertilization and irrigation water. The treatment W1O2 significantly excelled on the flowering and post-harvest stage, and the values reached (35.98 and 29.84 mg N kg soil -1) compared with control treatment (W2O 29.06) and 23.36 mg N (kg soil -1), with a significant increase of (23.8 and 6.48)%.The results in Tables (6) and (7) showed that the adding of organic matter had a significant effect on the availability of nitrogen in the soil for the flowering and post-harvest stage and therefore for its role in improving soil physical properties, including soil building, porosity, chemical and biological properties in addition to the production of organic and amino acids from the decomposition of organic matter in the soil and thus increases the nitrogen availability in the soil.These results are consistent with [12], as well as the addition of organic fertilizer, which has a role in reducing salt stress, and that the addition of organic fertilizer with salinity led to an increase in nitrogen concentration under the influence of salt stress of the role of organic fertilizer in the production of organic acids after their decomposition and through their groups. Effective chelating micro-nutrients and some macronutrients, [13].The results in Tables (7) and (8) show that there was a significant effect of salinity of irrigation water on the concentration of available nitrogen in the soil for the flowering and post-harvest stage.The reason for this is due to the increase in soil salinity, which increases the osmotic pressure and thus reduces the plant's absorption of nitrogen and thus increases its concentration in the soil solution, It also leads to an imbalance in plant nutrient absorption. The addition of nitrogen in batches has affected the increase in its concentration in the soil in addition to the role of organic fertilization in enriching the soil with nitrogen.

Table (6) the effect of nano iron, organic fertilization, and salt stress levels on the available nitrogen in the soil for the flowering stage (mg N kg soil -1).

Average W.O	Nano iron ($g.L^{-1}$)			Organic matter ($tons.ha^{-1}$)	Irrigation water levels (dS/m)
	Fe2	**Fe1**	**Fe0**		
32.58	33.20	32.35	32.19	**O0**	**W1**
32.47	33.39	32.36	31.66	**O1**	
35.98	37.08	35.987	34.87	**O2**	
29.06	29.53	29.37	28.28	**O0**	**W2**
32.43	33.07	32.24	31.99	**O1**	
33.73	34.67	33.36	33.15	**O2**	
1.83	3.17			**LSD0.05**	

W Average	Average W.Fe			W
33.68	34.55	33.57	32.90	**W1**
31.74	32.42	31.66	31.14	**W2**
1.06	**1.295**			**LSD0.05**
Average O	**Average O.Fe**			**O**
30.82	31.37	30.86	30.23	**O0**
32.45	33.23	32.30	31.83	**O1**
34.85	35.87	34.67	34.01	**O2**
1.30	2.24			**LSD0.05**
	33.49	32.61	32.02	**Average Fe**
1.30				**LSD0.05**

Table (7) Effect of nano iron, organic fertilization and salt stress levels on available nitrogen in soil post-harvest (mg N kg soil -1)

Average W.O	Nano iron ($g.L^{-1}$)			Organic matter ($tons.ha^{-1}$)	Irrigation water levels (dS/m)
	Fe2	**Fe1**	**Fe0**		
23.82	24.23	23.72	23.52	**O0**	**W1**
25.54	26.48	25.27	24.88	**O1**	
29.84	31.06	30.200	28.25	**O2**	
23.36	25.36	22.41	22.30	**O0**	**W2**
24.10	24.49	24.39	23.43	**O1**	
24.98	26.11	25.19	23.66	**O2**	
2.27	3.93			**LSD 0.05**	
W Average	**Average W.Fe**			**W**	
26.40	27.26	26.40	25.55	**W1**	
24.15	25.32	23.99	23.13	**W2**	
1.31	1.605			**LSD0.05**	
Average O	**Average O.Fe**			**O**	
23.59	24.80	23.06	22.91	**O0**	
24.82	25.49	24.83	24.16	**O1**	
27.41	28.59	27.69	25.96	**O2**	
1.61	2.78			**LSD0.05**	
	26.29	25.20	24.34	**Average Fe**	

1.61	**LSD0.05**

2- Available phosphorus concentration (mg P / kg soil -1) for flowering and post-harvest stage

Tables (8) and (9) that there are no significant differences in the concentration of available phosphorus in the soil for the flowering and post-harvest stages when spraying with nano iron fertilizer.The results in the two tables showed that the adding of organic fertilizer showed significant differences, where the treatment O2 significantly excelled and gave the highest average (16.17 and 11.84 mg P kg soil -1) for the flowering and post-harvest stages, compared to control treatment O 0, which gave the lowest average (11.06 and 9.14 mg P). Soil kg -1), respectively, with a significant increase of (46.20 and 29.5%).The treatment of irrigation water, W1, also significantly excelled and gave the highest average (14.12 and 10.87 mg P kg soil -1) for the flowering and post-harvest stages, compared to the treatment of irrigation water W2, which gave the lowest average of (13.14 and 9.94 mg P kg soil -1), with a percentage of increase. The significance of the amount was (7.45 and 9.35%).The results of the two tables indicated that the bi and triple interaction was not significant in these traits, with the exception of the bi-interaction between organic fertilization and irrigation water. The treatment W1O2 significantly excelled on the two stages of flowering and post-harvest stage and the values reached (16.55 and 12.85 mg P kg soil -1) respectively compared to the control treatment W2O0 (9.87) and 8.77 mg P (kg soil -1), with a significant increase of (67.6 and 46.5)%.The results in Tables (8) and (9) indicate that the addition of organic matter had a significant effect on the availability of phosphorus in the soil for the silk and post-harvest stages. The reason is due to the role of organic matter in the soil after its complete decomposition. Humus is produced, which reduces the chances of phosphorous fixation to form a humic phosphate compound due to the release of negative ions, which in turn interact with calcium and magnesium ions and thus reduce phosphorous fixation in the soil. These results are consistent with [14]. Also, adding organic fertilizer has a role in improving the soil's physical and chemical properties and fertility, and thus increasing some nutrients in the soil, including phosphorus, and these results are consistent with [15] and [16]. As for the salinity of the irrigation water, it negatively affected the increase in the available of phosphorus in the soil for the flowering and post-harvest stage. Therefore, we find that the available phosphorus in the treatment W2 was less than the treatment W1 in the soil for the silk stage and post-harvest stage, the reason for the decrease in the availability of phosphorus to the increase in the salinity of the irrigation water is due to the availability of ions that are associated with phosphates such as calcium ion, it is precipitated and then converted into non-availability forms of the plant. The results agree with [17].

Table (8) the effect of nano iron, organic fertilization, and salt stress levels in available phosphorus in the soil (mg P / kg soil -1) for the flowering stage.

Average W.O	**Nano iron ($g.L^{-1}$)**			**Organic matter ($tons.ha^{-1}$)**	**Irrigation water levels (dS/m)**
	Fe2	**Fe1**	**Fe0**		
12.25	12.36	12.07	12.33	**O0**	**W1**
13.55	15.28	13.51	11.86	**O1**	
16.55	17.18	17.123	15.34	**O2**	
9.87	9.93	9.90	9.77	**O0**	**W2**
13.77	13.78	13.77	13.75	**O1**	

15.79	15.99	15.73	15.64	**O2**	
1.33	2.30			**LSD0.05**	
Average w	**Average W.Fe**			**W**	
14.12	14.94	14.23	13.18	**W1**	
13.14	13.23	13.13	13.06	**W2**	
0.77	0.941			**LSD0.05**	
Average O	**Average O.Fe**			**O**	
11.06	11.14	10.99	11.05	**O0**	
13.66	14.53	13.64	12.81	**O1**	
16.17	16.59	16.43	15.49	**O2**	
0.94	1.63			**LSD0.05**	
	14.09	13.68	13.12	**Average Fe**	
0.94				**LSD0.05**	

Table (9) The effect of nano iron, organic fertilization, and salt stress levels in available phosphorus in the soil (mg P / kg soil -1) post-harvest

Average W.O	**Nano iron ($g.L^{-1}$)**			**Organic matter ($tons.ha^{-1}$)**	**Irrigation water levels (dS/m)**
	Fe2	**Fe1**	**Fe0**		
9.51	9.81	9.48	9.25	**O0**	**W1**
10.24	10.50	10.27	9.95	**O1**	
12.85	13.20	12.730	12.63	**O2**	
8.77	9.10	8.84	8.36	**O0**	**W2**
10.23	10.95	10.18	9.55	**O1**	
10.84	10.88	10.73	10.90	**O2**	
0.74	1.29			**LSD0.05**	
Average W	**Average W.Fe**			**W**	
10.87	11.17	10.83	10.61	**W1**	
9.94	10.31	9.92	9.60	**W2**	
0.43	0.526			**LSD0.05**	
Average O	**Average O.Fe**			**O**	
9.14	9.45	9.16	8.81	**O0**	
10.23	10.72	10.23	9.75	**O1**	
11.84	12.04	11.73	11.76	**O2**	
0.53	0.91			**LSD0.05**	

	10.74	10.37	10.11	**Fe Average**
0.53				**LSD0.05**

3- Available Potassium Concentration (mg K kg soil -1) for flowering and post-harvest stage

Tables (10) and (11) showed that there were no significant differences in the concentration of available potassium in the soil for the flowering and post-harvest stages when spraying with nano iron fertilizer. As for adding organic fertilizer, the treatment O2 significantly excelled and gave the highest average (186.28 and 158.37 mg K kg soil -1) for the flowering and post-harvest stages, compared to the control treatment 0 O, which gave the lowest average of (182.30 and 154.86 mg K kg soil -1) respectively, with a significant increase of (2.18 and 2.26%). The treatment of irrigation water, W1, also significantly excelled and gave the highest average of (186.94 and 158.21 mg K kg soil -1) for the two stages of the flowering and post-harvest stage, compared to the treatment of irrigation water W2, which gave the lowest average of (181.50 and 155.05 mg K kg soil -1) with a percentage increase (2.99 and 2.03%). The results of the two tables showed that the bi and triple interaction was not significant in this trait, with the exception of the bi-interaction between organic fertilization and irrigation water W1O2 significant for the flowering and post-harvest stages, and the values were (189.13 and 160.80 mg K kg soil -1) respectively compared to control treatment W2O0 (180.54 and 154.52 mg). K kg of soil -1), with a significant increase of (4.75 and 4.06)%.

Table (10) the effect of nano iron, organic fertilization and salt stress levels in available potassium in soil (mg K kg soil -1) for the flowering stage

Average W.O	**Nano iron ($g.L^{-1}$)**			**Organic matter ($tons.ha^{-1}$)**	**Irrigation water levels (dS/m)**
	Fe2	**Fe1**	**Fe0**		
184.06	184.42	183.94	183.82	**O0**	**W1**
187.63	187.82	187.90	187.16	**O1**	
189.13	189.54	189.340	188.51	**O2**	
180.54	180.59	180.53	180.50	**O0**	**W2**
180.54	180.63	180.69	180.29	**O1**	
183.43	183.98	183.96	182.36	**O2**	
1.96	3.40			**LSD0.05**	
Average W	**Average W.Fe**			**W**	
186.94	187.26	187.06	186.50	**W1**	
181.50	181.73	181.73	181.05	**W2**	
1.13	1.389			**LSD0.05**	
Average O	**Average O.Fe**			**O**	
182.30	182.51	182.24	182.16	**O0**	
184.08	184.23	184.29	183.73	**O1**	
186.28	186.76	186.65	185.44	**O2**	

1.39	2.41			LSD0.05
	184.50	184.39	183.78	**Average Fe**
	1.39			**LSD0.05**

Table (11) Effect of nano iron, organic fertilization, and salt stress levels in available potassium in soil (mg K kg soil -1) post-harvest stage

Average W.O	**Nano iron ($g.L^{-1}$)**			**Organic matter ($tons.ha^{-1}$)**	**Irrigation water levels (dS/m)**
	Fe2	**Fe1**	**Fe0**		
155.20	155.33	155.20	155.07	**O0**	**W1**
158.65	159.16	159.11	157.68	**O1**	
160.80	161.22	161.127	160.04	**O2**	
154.52	154.88	154.56	154.12	**O0**	**W2**
154.70	155.15	154.61	154.35	**O1**	
155.93	156.38	156.07	155.35	**O2**	
2.13	3.69			**LSD0.05**	
Average w	**Average W.Fe**			**W**	
158.21	158.57	158.48	157.60	**W1**	
155.05	155.47	155.08	154.61	**W2**	
1.23	1.507			**LSD0.05**	
Average O	**Average O.Fe**			**O**	
154.86	155.10	154.88	154.60	**O0**	
156.68	157.16	156.86	156.01	**O1**	
158.37	158.80	158.60	157.70	**O2**	
1.51	2.61			**LSD0.05**	
	157.02	156.78	156.10	**Average Fe**	
1.51				**LSD0.05**	

The results in tables (10) and (11) showed that when adding organic fertilization, it had a significant effect on the concentration of available potassium in the soil for the flowering and post-harvest stages. As a result of adding organic matter that affects the mineral part of the soil, such as dissolving the chemical compounds of the nutrients and converting them into availability and easy form of taking by the plant, by means of the effect of dissolving in organic acids as a result of the activity of microorganisms in the soil leading to the release of potassium from its minerals these results agree with [18] and [19]. Also, organic matter, in general, improves plant growth and increases its resistance to salt stress, and this agrees with [20]. Also, the role of organic matter that limits the loss of nutrients due to increasing the Cation-exchange capacity of positive ions in the soil and reducing the degree of soil reaction and has a role in the release of potassium from soil minerals by replacing the hydrogen ion resulting from the dissolution of these acids in place of the potassium ion, in addition to what is released from potassium upon the dissolution of organic matter and some of the compounds and minerals that carry it [21] As for the effect of the salinity of irrigation water, it had a significant effect on increasing the potassium concentration of the flowering and post-harvest stages. The reason for the increase in the potassium ion concentration was due to the increase in the concentration of the sodium ion in that water, which increased its concentration in the soil solution, which negatively affected the absorption of potassium by the plant due to the competition of sodium ions. The potassium ion at the sites of absorption by the roots of the plant and then increased its concentration in the soil solution, and this result is consistent with what [22]. Thus, its concentration increased in the soil.

4- CONCLUSIONS

1. The second level (40 tons.ha-1) of organic matter excelled on the first level (20 tons ha-1) in soil-plant traits.
2. The first level (w1) of irrigation achieved significant values in many traits compared to the second level of irrigation (w2), as it negatively affected many of the traits compared to (w1).
3. We can conclude from the above that organic matter has a positive effect on reducing the salinity of irrigation water.
4. The bi-interactions between organic matter and (w1) level of irrigation were all significant.

REFERENCES

[1]Mousavi, S.; Rezaei, M Nanotechnology in agriculture and food production. J. Appl. Environ. Biol. Sci., 1(10):414-419. .(2011).
[2]Hopkins, W. GIntroduction to Plant Physiology (2nd ED.). John Wiley and Sons, Inc. .(1999).
[3]Gibson, J. L., P. V. Nelson, D. S. Pitchay and B. E. Whipker. Identifying nutrient deficiencies of bedding plants. State University. . (2001).
[4] Abu Dahi, Yusef Muhammad and Muayad Ahmad al-Yunis, Handbook of Plant Nutrition, Ministry of Higher Education and Scientific Research, University of Baghdad. (1988),
[5]Awad, Kadhim Mashhouat, Principles of Soil Chemistry. Ministry of Higher Education and Scientific Research / University of Basra(1986),
[6]Azevedo-Neto, A.D.; Ptisco ,J.T.; EneasFilho J.; Abreu ,C.E.B., and GomezFilho ,E Effect of Salt Stress on Antioxidative Enzymes and Lipid Peroxidation in Leaves and Roots of Salt-Tolerant and Salt-Sensitive Maize Genotypes. Environ. Exp. Bot., 56, 87-94.,(2006).
[7]Sahoki, M. and Waheeb.K. MApplications in Experimental Design and Analysis, Ministry of Higher Education and Scientific Research, House of Wisdom for Printing and Publishing, University of Baghdad, Republic of Iraq, pp56. . (1990).
[8]Orhun G.Maize for Life, International Journal of Food Science and Nutrition Engineering,2(3): 13-16. .(2013).
[9] Alrawi, Khashi Mahmoud and Abdulaziz Muhammad Khalaf Allah. Design and analysis of agricultural experiments. Ministry of Higher Education and Scientific Research. University of Al Mosul . College of Agriculture and Forestry. (1990).
[10]Ali, Noureddine Shawky. Fertilizer technologies and their uses. Ministry of Higher Education and Scientific Research, University of Baghdad, University House for Printing, Publishing and Translation. (2012).

[11]Page , A. L. (Ed) Methods of Soil Anaslysis . Part 2 .Chemical and Microbiological Properties . Am. Soc.(1982)
[12] Maidaa, Lina, Zahir Zahir, Nabila Karidi and Haytham EidStudy of the effect of different levels of nitrogen fertilizer and biogas fertilizer on yield of maize yield and some soil properties, Syrian Journal of Agricultural Sciences, 4 (2): 120-128. (2017).
[13] Duini, Sadiq Jafar HasanThe role of organic matter and water quality in the movement and distribution of salts in salt-affected soils. Master Thesis. Soil Department. faculty of Agriculture. Baghdad University. .(2003).
[14] Naser, Kazem MakkiKinetics release phosphorous from phosphate rock added with some organic fertilizers in calcareous soil. Iraqi Journal of Agricultural Sciences, 47 (5): 1305-1311. .(2016).
[15] Nyiraneza ,J;M.H , Chantigny;A.N , Dayegamiye and M.R, Laverdière. Dairy Cattle Manure Improves Soil Productivity in Low Residue Rotation Systems. Agron J 101:207-214. .(2009).
[16]Golabi ,M.H ;P. Denney ana C . Iyekar Composting of Disposal Organic Wastes: Resource Recovery for Agricultural Sustainability . The Chinese Journal of Process Engineering :6(4) 585-591. .(2006) .
[17]Mahmoud, Youssef Ahmed and Hatem Saloum Saleh Al-ZaidiThe effect of irrigation water quality, organic matter and phosphorous on some chemical properties of soil and cauliflower yield. Iraqi Journal of Agricultural Sciences, 42 (Special Issue): 42-52. (2011).
[18]Al-Zubaidi, Bashar Mazher Jader. The effect of organic and potassium fertilization on ready-made ammonium, nitrate content in soil, and protein content in yellow corn kernels. Babylon University Journal of Pure and Applied Sciences, 22 (18): 2233-2242. (2014).
[19]Al-Zaidi, Jibril Abbas Muhammad The Effect of Potassium Fertilizer and Organic on Potassium Pictures of the Rhizosphere Soil and Outside and Growth of Yellow Corn Plant, Master Thesis. faculty of Agriculture. Al-Qadisiyah University. .(2017).
[20]Delfine,S, Tognetti, R, Desiderio,E. and Alvino, A. Effect of foliar application of N and Humic Acids on Growth and Yield of Durum Wheat. Agronomy for sustainable development, 25,183-191. http://dx.doi.org/10.1051/agro.20. (2005).
[21]Abu Point, Falah and Muhammad Saeed Al-Shater .Soil fertility and fertilization. The theoretical part. Damascus University Publications. faculty of Agriculture. Syria. P. 371. (2011).
[22]Al-Maamouri, Abdul-Baqi Dawood Salman .The effect of phosphate fertilizer, soil tissue, and irrigation water source on some soil chemical properties, fertility and wheat plant growth. Master Thesis. faculty of Agriculture . Baghdad University. (2004).