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To cite this article: Haider A. Al-Maamori *et al* 2024 *IOP Conf. Ser.: Earth Environ. Sci.* **1371** 082011

Effect of Decomposing Organic Waste on the Growth of Barley Plants Under Irrigation with Salt Water

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Abstract. This study aimed to coexist with salinity by using water of different salinity in the presence of decomposed animal manure. Experiments were conducted at the Agricultural Station/Agricultural Research Office in Iraq to study different water types in the presence of increasing animal organic fertilizers. Nutrient preparation and barley plant growth and production. The experiment was conducted in the design (RCBD) The results showed the superiority of 35 t ha^{-1} of animal organic fertilizer as the nitrogen and phosphorus availability EC in the soil was 45.11, 25.68 mg kg^{-1}, and 3.99 dS m^{-1} . The 35 t ha^{-1} organic fertilizer treatment also had better characteristics (plant height, 1000 grain weight, grain yield, biological yield), (66.15 cm, 43.88 grains, 2.96 µg ha^{-1}, and 10.99 µg ha^{-1}) was given each. Comparison with control treatment.Irrigation water treatment resulted in a mixture of 3.3 dS m^{-1}, which was higher than 6.5 dS m^{-1} for saline water treatment and lower than 1.4 dS m^{-1} for sweet water treatment. There were no significant differences in all the characteristics, and the values of (nitrogen and phosphorus availability, EC, weight of 1000 grains, grain yield, biological yield) were (36.89, 20.99 mg kg^{-1}, 63.05 cm, and 38.58). cereals, 2.74 and 9.65 µg ha^{-1}, respectively).

Keywords. Animal organic fertilization, Salinity irrigation water, Barley plant.

1. Introduction

As the world's population increases, food supply has become an important issue, and this requires improvements in agricultural production quantity and quality. Due to the recent waves of drought, the issue of water scarcity has become one of the major problems facing the agricultural sector in our country and around the world, requiring the use of alternative water sources such as well water to compensate for the shortage. underwater [1].

Therefore, several steps and solutions have been introduced to limit the negative effects of salinity in this water and increase plant growth and absorption of mineral nutrients. To deal with this problem, countries around the world have relied on its use for many years and still today.

Large amounts of organic fertilizers are used to increase production to provide food, organic fertilizers, and decomposed animal waste. Water scarcity is a global problem, especially as the world has witnessed over the past two decades. In 2018, precipitation decreased significantly in many countries, creating a major problem in freshwater availability. Because it is considered a rare item. Water has become one of the major issues facing Iraq in recent years as the country has been exposed to drought. As the population increased and so did the demand for food, agricultural areas expanded to increase production [2]. The presence of organic fertilizers has improved the growth standards of plants. In recent years, attention has been paid to the increasing use of water from wells and wells for agricultural purposes, such as irrigation of plants and drinking water for animals [3].
This study aimed to reduce salinity by the presence of decomposed animal manure under salinity levels in irrigation water. The role of fertilizers used in increasing the availability of nutrients in the soil and the growth of barley plants.

2. Materials and Methods

The experiment was conducted at the Agricultural Experiment Station and Agricultural Research Department in Iraq. On January 12, 2022, the land was plowed and a leveling and smoothing process was carried out. The land is divided into panels, each panel has an area 2.5 and physical, as shown in Table 1 Treatments were then randomly distributed according to a (RCBD) design Seeds of barley plants were planted in the form of lines, and soil and plant samples were randomly taken from each experimental unit for the purpose of measuring plant growth indicators and estimating EC, nitrogen, and ready-made phosphorus in the soil experiment. it was done.

2.1. Experiment Transactions

2.1.1. First Factor

Irrigation water includes three levels:

- Water with a salinity of 1.4 dS m^{-1} (river water) SW1
- Water with a salinity of 3.3 dSm^{-1} (mixture of river water + well water) SW2
- Water with a salinity of 6.5 dS m^{-1} (wells water) SW3

2.1.2. Second Factor

Animal organic fertilizer (sheep waste) four levels

- Without adding OM1
- 20 t ha^{-1} OM2
- 30 t ha^{-1} OM3
- 35 t ha^{-1} OM4

*replicates = 3 * experimental units = * Trial units = 3*3*3= 27

2.2. Fertilization Process

Fertilization process was carried out at a level of 100 kg N ha^{-1} (urea), 100 kg P_2O_5 ha^{-1} (triple superphosphate), and 40 kg K_2O ha^{-1} according to what was stated [4].

Table 1. Field soil characteristics before planting the experiment.

Property			Value	Property			Value
pH			7.14	EC (1:1)		dS m^{-1}	4.53
Soluble Nutrients	Ca^{+2}	m.mole L^{-1}	14.73	available nutrients	N	mg kg^{-1}	17.95
	Mg^{+2}		10.21		P		13.47
	Na^{+}		6.25		K		172.41
	K^{+}		1	Analysis particle	Sand	g Kg^{-1}	208
	CL^{-}		16.34		Silt		451
	$SO4^{-2}$		18.21		Clay		339
	CO^{-2}		Nill	Texture			Clay loam
	$HCO3^{-}$		1.36				

3. Results

3.1. NP Availability and EC

3.1.1. N Availability in Soil

Results Table (2) The average nitrogen concentration increased significantly with organic fertilizer addition and OM4 treatment with a value of 45.11 compared to 25.74 for OM1. Statistical analysis showed that the S1 treatment had the highest nitrogen concentration reaching 39.07, while the S3 treatment had the lowest nitrogen concentration of 29.41, indicating that irrigation water salinity has a significant influence on the available nitrogen concentration. I gave it. The results showed significant differences between the dual interference treatments, with the OM4S1 treatment reaching 48.42 mg kg^{-1} and the highest average value, and the OM4S3 treatment reaching 39.70 mg kg^{-1}.

Table 2. Effects of irrigation water salinity and animal manure on available N (mg Kg^{-1}).

(OM)	(SW)			Average (OM)
	SW1	SW2	SW3	
OM1	28.90	27.98	20.35	25.74
OM2	35.93	30.95	23.07	29.98
OM3	43.23	41.23	34.52	39.66
OM4	48.22	47.41	39.70	45.11
L.S.D (OM*SW)		0.84		$L.S.D_{OM}$ =0.46
Average (SW)	39.07	36.89	29.41	$L.S.D_{SW}$=0.48

3.1.2. Phosphorus Availability

Statistical analysis results Table (3) showed an increase in availability P when adding organic fertilizer and to the OM4 treatment, which amounted to 25.68, compared to the lowest value in the OM1, gave 13.65. The results indicate that irrigation water significantly affected the ready phosphorus, as the S1 treatment was superior, which gave 22.06 mg kg^{-1}, compared to the S3 treatment, which gave 16.35. The results showed a significant difference between the binary interference treatments, OM4S1 gave the highest average 28.34 mg kg^{-1} to the OM1S3, which gave the lowest average 10.94 mg kg^{-1}.

Table 3. Effects of irrigation water salinity and animal manure on available P (mg kg^{-1}).

(OM)	(SW)			Average (OM)
	SW1	SW2	SW3	
OM1	15.9	14.11	10.94	13.65
OM2	18.89	18.27	14.16	17.106
OM3	25.12	24.9	18.3	22.77
OM4	28.34	26.71	22.01	25.68
L.S.D (OM*SW)		0.74		$L.S.D_{OM}$=0.43
Average (SW)	22.06	20.99	16.35	$L.S.D_{SW}$=0.39

The reason for the decrease in nutrient readiness was due to the increase in salinity level, and the effects of salinity stress decreased plant growth indicators and nutrient uptake. The reason for this may be the influence of salinity. At low levels, plants and soil were unaffected by irrigation water levels. That led to growth. A better and higher content of nutrients in plant tissues is reflected in the nitrogen and phosphorus content of the soil. Conversely, increasing salinity in the soil reduces plant growth and reduces nutrient content [5]. Organic fertilizers also act to form organic acids, which reduce the degree of soil interaction in the plant rhizosphere. This is thought to act to increase the preparation and availability of necessary nutrients such as N and P, and these results are on the one hand consistent with El [6]. Adding organic fertilizer to the soil increased nitrogen and raw phosphorus in the soil.

3.1.3. Electric Conductivity

The results in Table (4) show the superiority of animal organic fertilizers, with the lowest mean value of 3.99 dS m^{-1} for the OM4 treatment compared to 4.86 dS m^{-1} for the OM1 treatment. This table also shows that the irrigation water quality significantly influenced the average electrical conductivity as the S3 treatment gave the highest value of 5.02 compared to the S1 treatment which gave 4.69 dS m^{-1}.

Table 4. Effects of salinity of irrigation water and animal waste on electrical conductivity ds m^{-1}.

(OM)	(SW)			Average (OM)
	SW1	SW2	SW3	
OM1	5.21	4.81	4.56	4.86
OM2	5.54	5.21	5.43	5.39
OM3	5.80	5.14	5.21	5.38
OM4	2.22	4.87	4.89	3.99
L.S.D (OM *SW)		N.S		$L.S.D_{OM}$ =0.15
Average (SW)	4.69	5.00	5.02	$L.S.D_{SW}$=0.13

The results showed that organic fertilizer reduces the negative impact of irrigation water salinity as a result of improving soil properties, retaining mineral elements, reducing salt stress, and lowering electrical conductivity [7], This is because organic matter helps plants overcome salt stress by stimulating antioxidants. By improving the chemical, fertility and biological properties of soil by stimulating growth regulators and the formation of organic acids that activate the biological condition soil, which reduces soil salinity. This stimulates the presence of microorganisms present soil, and this soil salinity under the influence of all treatments through several mechanisms, including the secretion of acids, the expansion of hyphae, the absorption of nutrients, and the increase of plant resistance to salinity [8].

3.2. Growth and Yield Indicators

3.2.1. Plant Height

The results in Table (5) showed an increase in the height barley plants by adding organic fertilizer to the OM4 treatment, which gave 66.15 cm, compared to the OM1, which gave 59.80 cm. The S2 irrigation treatment also affected plant height compared to the S1 irrigation treatment, with no significant difference between them.

Table 5. Effects of irrigation water salinity and animal manure on barley height (cm).

(OM)	(SW)			Average (OM)
	SW1	SW2	SW3	
OM1	61.13	61.07	57.21	59.80
OM2	62.47	62.34	57.1	60.63
OM3	66.03	63.8	62.67	64.16
OM4	69.45	65.01	64.01	66.15
L.S.D (OM *SW)		N.S		$L.S.D_{OM}$ =3.34
Average (SW)	64.77	63.05	60.24	$L.S.D_{SW}$= N.S

3.2.2. Weight of 1000 grain

The results in Table 6 show that adding organic animal manure to the OM4 treatment increased the weight of 1,000 grains by 43.88 compared to the OM1 treatment where the average weight of 1,000 grains was 31.00. The S1 irrigation treatment also had a significant effect on the weight of 1,000 seeds with an average of 40.11 compared to the S3 treatment which had the lowest mean of 33.59. The results showed that the OM4S1 treatment was superior with a highest mean of 45.75 compared to the lowest mean of 28.17 for the OM1S3 treatment.

Table 6. Effects of irrigation water salinity and livestock manure on the weight of 1000 grains.

(OM)	(SW)			Average (OM)
	SW1	SW2	SW3	
OM1	33.85	31	28.17	31.00
OM2	37.65	35.95	29.45	34.35
OM3	43.21	41.83	36.4	40.48
OM4	45.75	45.55	40.36	43.88
L.S.D (OM *SW)		0.46		$L.S.D_{OM}$=0.27
Average (SW)	40.11	38.58	33.59	$L.S.D_{SW}$= 0.23

3.2.3. Grain Yield

The results in Table (7) show that the grain yield of the OM4 treatment with 2.96 µg ha^{-1} was significantly higher than that of OM1 which gave the lowest grain yield of 2.47 µg ha^{-1}. showed that it is excellent. Irrigation S1 also had a significant effect, giving the highest average of 2.82 compared to 2.58 megag ha^{-1} for S3. The results showed that the average value for OM4S1 was 3.07 µg ha^{-1}, which was higher compared to 2.43 µg ha^{-1} for OM1S3.

Table 7. Effects of irrigation water salinity and animal manure on barley yield (Mg ha^{-1}).

(OM)	(SW)			Average (OM)
	SW1	SW2	SW3	
OM1	2.55	2.45	2.43	2.47
OM2	2.75	2.63	2.43	2.60
OM3	2.91	2.86	2.68	2.81
OM4	3.07	3.02	2.79	2.96
L.S.D (OM *SW)		0.05		$L.S.D_{OM}$ =0.033
Average (SW)	2.82	2.74	2.58	$L.S.D_{SW}$=0.028

3.2.4. Biological Yield

The results in Table (8) showed a significant superiority in the biological yield of barley when adding organic fertilizer, the fertilizer recommendation, and the OM4 treatment, which gave 10.99, compared to the OM1 treatment, which gave the lowest average biological yield of 7.83. The S1 irrigation treatment also had a significant effect on the average biological yield, as it gave the highest average of 9.93 µg ha^{-1} S3 irrigation treatment, which gave the lowest average of 8.58 µg ha^{-1}. The results showed that there were significant differences between the binary interference treatments, as the OM4S1 gave the highest average, amounting to 11.32 µg ha^{-1}, compared to the OM1S3 treatment, which gave the lowest average, 7.08 µg ha^{-1}.

Table 8. Effects of irrigation water salinity and animal manure on biological yield of barley plants

(OM)	(SW)			(OM)
	SW1	SW2	SW3	
OM1	8.28	8.15	7.08	7.83
OM2	9.66	8.79	7.34	8.59
OM3	10.46	10.42	9.52	10.13
OM4	11.32	11.27	10.38	10.99
L.S.D (OM*SW)		0.12		$L.S.D_{OM}$ =0.07
Average (SW)	9.93	9.65	8.58	$L.S.D_{SW}$=0.06

Salinity of irrigation water has a negative effect on plant growth parameters. This is due to the increased salt accumulation in the root region based on the effect that the presence of ions in the root region has on the cellular water potential. High salinity also reduces leaf growth, reduces size, and processes such as transpiration and photosynthesis.

[9]. A positive effect of the addition of animal organic fertilizers on plant properties was revealed, which is consistent with Verma [10]. Organic fertilizers also contain nitrates and phosphorous in a form suitable for plants. It also contains hormones and growth regulators that affect cell division and activate important processes within the plant. These secretions support plant growth, including increases in plant height, chlorophyll, and dry weight. Nutrients released after decomposition. This is reflected in increased photosynthetic processes and increased carbohydrates produced, leading to increased plant growth standards [11].

The addition of organic fertilizers provides the plants with the nutrients they need, and increasing organic fertilizers leads to improved plant growth standards, resulting in higher average plant height, dry weight, and yield. The presence of saline water led to a decrease in plant growth indicators. This is due to increased salt accumulation in the root zone, which causes biological and physiological changes in the plant depending on the cellular water potential and its effects on the cells. The biochemical functions of the cell are reduced, swelling is reduced, the photosynthetic process is reduced, and the movement of ions within is reduced. plants [9].

Irrigation with salt water not only causes negative effects such as osmotic pressure differences, but also affects enzymes involved in plant physiological activities, such as poor root hair development [9]. Plant yield with addition of organic fertilizers. The reason for this is to improve the properties of the soil, increase its nutrient reserve, ensure that the necessary nutrients are available to the plants, and carry out biological and physiological activities, including the process of photosynthesis, which are reflected in the plants. This is thought to be due to the role of organic fertilizer. Plant growth and production [12].

Conclusions

- The negative impact of salty irrigation water is reduced when adding organic matter. and Increasing plant growth and production
- The use of organic fertilizer reduced the salt effect and increased the absorption of nutrients.
- It's concluded from the study that mixing high-salinity wells water with fresh water improves water quality, reduces the degree of electrical conductivity of the water, and is suitable for irrigation, especially salt-tolerant crops such as barley.

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