Effect of wheat straw as organic matter and different water quality on some chemical soil properties and growth of pepper (Capsicum annuum)

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Abstract. A field experiment was carried out in the area of Al-Mahtahia in Babil province. The experiment was aimed at studying the effect of using different levels of plant waste (wheat straw) as organic fertilizer and using different water types (river water, drainage water and well water) In the growth and yield of pepper and some chemical soil properties measured. Use Randomized Complete Block Design was used to implement the experiment. The results showed that the values of plant height were 52.33 cm, 25 fruit / plant for fruit number, 24.11 sp. For chlorophyll and 54.24 g / fruit for the weight of thyme, adding organic matter to 20 ton / ha. It was also the highest value for the use of different irrigation water when using the river water and all the characteristics of the plant as its values in plant height 52.76 cm compared to other water types. As for the chemical soil properties, the results showed that the effect of adding the organic matter on the Ph soil, which was 7.3 when adding organic matter to the level of 20 tons / ha compared with the comparison treatment, which amounted to 7.7 g / kg. Soil salinity values were 4.5 ds.m-1 when organic matter was added to the 20 ton / ha level compared with the comparison treatment of 3.4 ds.m-1, and the organic matter values were 2.267 g.kg-1 When adding organic matter to the level 20 ton / ha compared to the comparison treatment of 0.86 g.kg-1. Interaction between straw and water quality was found to have a good effect in reducing the salinity effect of water used by wheat straw.

1. Introduction

Pepper (Capsicum annuum) is one of the important vegetable crops in Iraq, which is due to the Solanaceae family, which is cultivated by open farming and covered agriculture during the winter and is one of the important marketing crops in Iraq.

Soil salinity is one of the most important problems faced by Iraqi soils, especially the soils south of Iraq. Irrigation water is one of the main factors that cause the accumulation of salts in soils. He pointed out that increased salinity concentration led to a decrease in germination rates, concentration of plant pigments, percentage of water content and dry matter. Also [1] refer that the water quality effect on soil properties, the soil become bad when increasing salinity in water . when using three different types of water to sate their effect on some physical properties of soil, particularly permeability [2] found that the increase of irrigation water saline leads to increase bulk density and to decrease mean weight diameter. [3] found that the well water are salinity so should find more studies to use these water.

The addition of organic fertilizers plays an important role in the processing of many nutrients such
as nitrogen, phosphorus and potassium and some minor elements such as iron, copper, sulfur and others, which are released from organic materials slowly due to microorganisms that have the main role in turning into a mineral image ready for the plant. It improves root growth and development, which is positively reflected on plant growth better [4]. Much research has also shown that the use of organic fertilizer improves some physical and chemical soil properties and improves water use efficiency. Organic fertilizers are an important source, containing all the necessary elements for the growth and development of plants, including micro elements, on broad ranges of dissolved organic compounds such as proteins, sugars and amino acids [5].

2. Materials and methods
A field experiment was carried out in Al-Mahtahia area of Babel governorate to study the effect of adding levels of wheat manure and concentrations of 0-10-20 ton / hectare and used different irrigation water (river water, drainage water, well water) with salinity (1.4-3.3 - 4.5) ds.m$^{-1}$ and respectively in some chemical soil properties and pepper growth.

The number of treatment is $3 \times 3 \times 3 = 27$ treatment, ie 27 experimental units. The distance between the experimental unit was 4.8 m$^2$ and the intervals were 2.5 m between the repeaters and 1.5 m between the treatments. The distance between plant and another 40 cm. RCBD was used.

The river water was irrigated using the river water adjacent to the field. A nearby well was drilled for use in watering the crop and the water was used in the crop.

Table 1 will show some soil properties. The crops were harvested from irrigation and control to the bushes, and then the crop was harvested and some measurements were made for (plant height, number of fruits, chlorophyll, weight of fruits). Some chemical tests were carried out for the soil after harvest, Soil - organic matter).

| Property    | EC  | pH  | CaCO$_3$ | CaSO$_4$ | O.M | Bulk density | Particle density | Hydraulic conductivity |
|-------------|-----|-----|----------|----------|-----|--------------|-------------------|-----------------------|
| Units       | ds.m$^{-1}$ | g.kg$^{-1}$ | g.kg$^{-1}$ | g.kg$^{-1}$ | g.kg$^{-1}$ | Mg.m$^{-3}$ | Mg.m$^{-3}$ | cm.h$^{-1}$ |
| Value       | 2.5 | 7.70 | 229      | 1.8      | 9.95 | 1.35         | 2.65              | 1.95                  |

3. Results and discussion

3.1. Plant characteristics

3.1.1. Plant height. The results showed in table 2 that there was an increase in organic matter in the plant height, especially the M2 treatment, which gave the highest rate of plant height and reached 52.33 cm when adding the organic material compared to the comparison treatment which amounted to 38.46 cm. As for the effect of irrigation on different water types, it was found that the highest value was at W0, which gave the highest value of plant height and was 52.76 cm compared to W1 and W2, which reached 45.73 and 37.07 cm respectively. As for the overlap between the additive level of organic matter and the water quality, the highest value was at M2.W0, which was 52.56 cm compared to W1 and W2, which reached 45.73 and 37.07 cm respectively. As for the overlap between the additive level of organic matter and the water quality, the highest value was at M2.W0, which was 52.56 cm compared to W1 and W2, which reached 45.73 and 37.07 cm respectively. In the process of carbon representation and respiration and its role in the manufacture of hormones and important toxins in the division of cells, which increase the elongation of the leg [6] and these results are consistent with the findings [7] that the increase of organic fertilization leads to an increase in plant height [8].

Table 2. Effect of organic fertilizer (wheat strew) and water quality in high plant.

|       | M0  | M1  | M2  | Mean |
|-------|-----|-----|-----|------|
| W0    | 45.3| 52.2| 60.7| 52.76|
| W1    | 38.6| 44.9| 53.8| 45.73|
| W2    | 31.5| 37.1| 42.5| 37.07|
3.1.2. Number of fruits. The results show in table 3 that there is a superiority in the factors of adding organic matter in the number of fruits, especially the treatment M2, which gave the highest rate of the number of fruits and 25 fruit / plant when adding organic matter compared to the treatment of comparison, which amounted to 18 fruit / plant. As for the irrigation effect of different water samples, the highest value was found in W0, which yielded the highest value of fruits, which reached 25.3 fruit / plant compared to W1 and W2, which reached 21.3 and 17.3 fruits / plant respectively. In terms of the overlap between the level of addition of organic matter and water quality, the highest value was in the treatment of M2 and W0, which amounted to 30 fruit / plant, while the lowest value was at treatment 0M and W2, which amounted to 15 fruit / plant. The reason for this increase in the number of fruits to the role of organic matter in the increase of nutrients in the soil, which led to the increase of dry weight and number of flowers, which led to an increase in the number of fruits in the plant [9]. These results agree with the findings [10]. Increased organic matter increases the number of fruits. He also stressed [11] that the addition of different levels of organic fertilizer leads to an increase in the number of fruits.

| Table 3. Effect of adding organic matter (wheat straw) and water quality in the number of fruits. |
|---------------------------------|-----|-----|-----|-----|
| W0    | M0 | M1 | M2 | Mean |
| 21    | 25 | 30 | 25.3|
| W1    | 18 | 21 | 25 | 21.3|
| W2    | 15 | 17 | 20 | 17.3|
| Mean  | 18 | 21 | 25 |

3.1.3. Chlorophyll ratio. The results of table 4 showed that the addition of the organic matter increased the chlorophyll rate in the leaves with the highest level (24.11) at the treatment (M2), compared with the lowest proportion was treated with the comparison (M0) as (13.29), as for the effect Salinity was the lowest in W3 treated water (14.36) while the ratio of treatment was (W1) (26.61). The overlap between them was the highest interference ratio (M3W1), which gave a ratio of (35.33).

| Table 4. Effect of adding organic manure (wheat straw) and water quality in chlorophyll ratio. |
|---------------------------------|-----|-----|-----|-----|
| W1    | M0 | M1 | M2 | Mean |
| 15.24 | 29.28 | 35.33 | 26.61|
| W2    | 13.67 | 16.06 | 19.37 | 16.36|
| W3    | 10.96 | 14.48 | 17.64 | 14.36|
| Mean  | 13.29 | 19.94 | 24.11 |

This may be due to the abundance of nitrogen in organic matter that enters a cycle in the synthesis of the chlorophyll molecule by entering it in the rings of pophyrine [6]. This is consistent with what is stated.

As for the salinity effect in the chlorophyll ratio, it was found that by increasing salinity, chlorophyll decreased. This may be due to the negative effect of salinity on the magnesium ion, which enters the building of the plant pigments and thus enters the structure of the chlorophyll molecule. He stressed that increasing the salt content is working to reduce the concentration of chlorophyll in the leaves of pepper plant [12].

3.1.4. Weight of fruits. The results were shown in table 5. The addition of the organic matter led to an increase in the weight of the fruit as it reached the highest level with the highest addition to organic matter (M2), reaching 54.24 g / fruit. The same table showed that the quality of irrigation water had an
effect on the peppers. W1 recorded the highest weight of 55.71 g/fruit and the lowest weight was at W3, which gave a weight of 41.89 g/fruit. Results of the overlap between the addition of organic matter and water quality, the highest value was at the treatment (M2W3), which amounted to (62.22) g/fruit.

Table 5. Effect of adding organic manure (wheat straw) and water quality in the weight of the fruit.

|       | M0  | M1  | M2  | Mean |
|-------|-----|-----|-----|------|
| W1    | 50.04 | 54.87 | 50.04 | 55.71 |
| W2    | 39.52 | 45.32 | 39.52 | 45.65 |
| W3    | 36.11 | 40.54 | 36.11 | 41.68 |
| Mean  | 41.89 | 46.91 | 41.89 |      |

This may be due to increasing vegetative growth and increase the paper area and leaf content of chlorophyll, which led to an increase in carbohydrates and thus increase in the weight of fruits and this is consistent with what he said [13].

As for the saline effect of the water may be due to the decline in the water content of the fruits, and may be caused by imbalance of food balance within the plant [14]. This is confirmed [15], by studying different levels of salts on peppers, which concluded to decrease The percentage of water content within the fruit increases salinity.

3.2. Soil characteristics

3.2.1. pH Soil. The results of table 6 showed that the addition of the organic matter reduced the pH soil by recording the lowest value in M2 compared with the M0 treatment which gave the highest readings (7.3 and 7.7) respectively.

Table 6. Effect of adding organic manure (wheat straw) and water quality in the pH soil.

|       | M0 | M1 | M2 | Mean |
|-------|----|----|----|------|
| W1    | 7.9 | 7.7 | 7.5 | 7.7  |
| W2    | 7.7 | 7.6 | 7.4 | 7.5  |
| W3    | 7.6 | 7.2 | 7.1 | 7.3  |
| Mean  | 7.7 | 7.5 | 7.3 |      |

As for treatment of water types, acidity tended to increase with salinity of irrigation water. W3 recorded the lowest soil acidity value (7.3) while W1 was highest. The interaction between the study factors was higher (M0W1) The value of soil acidity was (7.9) while the treatment was recorded (M2W3) and the lowest value was (7.1).

Which confirms the important role of organic matter in the equation of the degree of soil interaction and may be due to the chemical role of organic matter as it works to free some organic acids and the decomposition of these substances produces the release of CO2 component of carbonic acid [16] and [17] as they found that the addition of wild cane reduces the degree of soil interaction.

3.2.2. Electrical conductivity. The results of table 7 showed that the addition of organic matter affected the electrical conductivity values of the soil. The lowest measurements of electrical conductivity were recorded in the treatment (M1) which was (3.4) compared with the comparison treatment (4.5) The mean value was (2.4) at the treatment (W1), the highest value (5.3) was at the treatment (W3), the intervention between the transactions was less reading (1.8) at the treatment (M2W1) and the highest value of this interference is (6.1) M0W2).

This is due to the role of organic matter in increasing the permeability of water in the soil, which led to the cycle of washing these salts from the surface to the depths through the contribution of
organic matter increase the porosity of the soil and thus increase washing and the speed of movement of water from the surface to the bottom and this is consistent with the conclusion of the mechanism [16].

Table 7. Effect of adding organic manure (wheat straw) and water quality in soil electrical conductivity.

|      | M0  | M1  | M2  | Mean |
|------|-----|-----|-----|------|
| W1   | 2.9 | 2.5 | 1.8 | 2.4  |
| W2   | 4.5 | 4.1 | 3.6 | 4.0  |
| W3   | 6.1 | 5.2 | 4.8 | 5.3  |
| Mean | 4.5 | 3.9 | 3.4 |

3.2.3. Organic matter. The results of the study showed in table 8 that the soil content of the organic material increased with the increase in the level of the addition and recorded the highest values in the treatment (M2) which amounted to (2.26) kg - 1 kg. The effect of irrigation water quality was higher. Its value (1.87) is at the transaction (W1). Interaction between the coefficients was highest (M2W1) at 2.73 g.kg⁻¹.

Table 8. Effect of adding organic manure (wheat straw) and water quality in soil content of organic matter.

|      | M0  | M1  | M2  | Mean |
|------|-----|-----|-----|------|
| W1   | 1.1 | 1.8 | 2.73| 1.877|
| W2   | 0.92| 1.59| 2.32| 1.61 |
| W3   | 0.56| 1.12| 1.75| 1.143|
| Mean | 0.86| 1.503| 2.267|

This confirms the role of organic matter in the revitalization of soil and the formation of an environment conducive to the growth of bacteria and fungi, which works to support the soil dissolved organic matter and this is consistent with the conclusion of the mechanism [16] that the organic matter increased in the soil with increasing levels of adding wild reeds as a material Membership [17].

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