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The Effect of Irrigation Water Quality, Compost Level, and Their Interaction on the Growth and Yield of Sweet Corn (*Zea mays saccharata* L.) Grown in Gypsum Soil

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Abstract: In the fall of 2025, a field trial was conducted at the research station of the Department of Soil Science and Water Resources, Faculty of Agriculture, Tikrit University, to investigate the effects of irrigation water quality (Non-saline water with a salinity of 0.467 dS/m¹ and Saline water with a salinity of 3.316 dS/m¹), plant compost application rates (0%, 1%, 2%), and their interactions on the growth and yield of sweet corn (*Zea mays saccharata* L.) grown in gypsum soil. The experiment used a fully randomized block design (RCBD) as a three-replicate factorial experiment. The traits investigated were plant height, panicle area, dry weight of above-ground and root parts, number of kernels per panicle, 500-grain weight, and total yield.

The results showed that Non-saline water irrigation was significantly superior to Saline water irrigation in most of the traits investigated, with the highest values observed in panicle area (483.77 cm²), dry weight of vegetative organs (83.88 g plant⁻¹), dry weight of root system (32.44 g plant⁻¹), number of grains per panicle (516 grains), weight of 500 grains (154.21 g), and total yield (7410 kg ha⁻¹). Compost addition also improved all traits investigated. The 2% fertilization plot showed the highest values in average plant height (190.33 cm), panicle area (442.33 cm²), dry weight of above-ground parts (84.16 g/plant), dry weight of roots (28.83 g/plant), number of grains (533 grains), weight of 500 grains (150.92 g), and total yield (7755 kg/ha).

The interaction between irrigation water quality and compost was significant for most traits. The treatment plot using Non-saline water and 2% compost yielded the best results, with a total yield of 8615 kg/ha, 579 panicles/plant, and a dry weight of 96.66 g/plant. The results indicate that compost addition improved the physical, chemical, and biological properties of gypsum soil, increasing water and nutrient absorption efficiency, thereby mitigating the adverse effects of irrigation water salinity and positively impacting plant growth and grain yield.

Keywords: sweet corn, gypsum soil, irrigation water salinity, plant compost

Introduction

Sweet corn (*Zea mays saccharata*) is a globally important field crop due to its high economic value and nutritional value. It is used in a wide range of applications, including human and animal

feed, various food and pharmaceutical industries, and the production of juices and nutritional supplements. Furthermore, because it efficiently converts solar energy into dry matter, it is widely cultivated under diverse climatic conditions [1].

The salinity of irrigation water is one of the most serious challenges facing agriculture in arid and semi-arid regions. Increased salinity not only degrades the physical properties of the soil (increased bulk density, decreased porosity, reduced water retention capacity, etc.), but also negatively impacts plant growth and nutrient absorption [2]. Recent studies have shown that continued use of saline irrigation water without proper management leads to the accumulation of salt in the topsoil, especially when using sprinkler irrigation systems with limited water depth. This exacerbates salinization problems and reduces irrigation efficiency [3]. Gypsum soils occupy vast areas of farmland in Iraq, particularly in Salah al-Din Governorate. These soils are characterized by high gypsum content and low clay and organic matter content, and are structurally weak, highly permeable, and have limited ability to retain water and nutrients [4]. These soils often behave similarly to coarse-grained soils, becoming more sensitive to salinity when using saline irrigation water, negatively impacting the growth and productivity of field crops [5].

Plant compost is an increasingly important source of organic matter in recent years, as it plays a crucial role in improving the physical, chemical, and biological properties of soils, especially gypsum soils. Numerous studies have shown that composting reduces soil bulk density, increases total porosity, improves water retention, and mitigates the adverse effects of salinization by improving the rhizosphere environment [6].

Research continues to understand the interaction between irrigation water salinity and organic matter in gypsum soils, improve soil physical properties, and identify optimal agricultural practices to ensure sustainable corn production. Given the limited research on this topic, this study aims to investigate the effects of irrigation water salinity and compost on sweet corn growth and yield.

Materials and Method

Site and Soil Analysis:

In the fall of 2026, a field trial was conducted at the research station of the Department of Soil Science and Water Resources, Faculty of Agriculture, Tikrit University, to investigate the effects of plant compost addition, irrigation water quality, and their interactions on several physical properties of gypsum soil, as well as sweet corn growth and yield. The site is located at 43°38'55.97"N, 34°40'59.02"E, at an elevation of 129m.

The soil at the test site is classified as a poorly structured, underdeveloped, arid or semi-arid soil (Aridisols) according to the Modern American Soil Classification System (ASCS). Representative soil samples were collected from a depth of 0–0.30 m before sowing. These samples were air-dried, lightly crushed, and passed through a 2 mm sieve to estimate some of the initial physical and chemical properties of the soil, as shown in Table 1.

Table 1. Partial Physical and Chemical Properties of the Surveyed Soils

Property	Unit	Site 1	Method of Analysis
Sand	g kg ⁻¹	467	Determined by the hydrometer method [7]
Clay	g kg ⁻¹	291	
Silt	g kg ⁻¹	242	
Soil Texture	–	Loam	Based on particle-size distribution
CEC	cmolc kg ⁻¹	11.50	Determined using ammonium acetate solution [7]
pH (1:1)	–	7.10	Measured using a pH meter [8]
EC (1:1)	dS m ⁻¹	4.37	Measured using an electrical conductivity meter [8]
CaSO ₄	g kg ⁻¹	62	Determined by the dilution method [9]
CaCO ₃	g kg ⁻¹	210	Determined by the gravimetric method [8]

Organic Matter (O.M.)	g kg ⁻¹	7.9	Determined by the wet digestion method [7]
Available Nitrogen	mg kg ⁻¹	19.02	Determined by the Micro-Kjeldahl method [7]
Available Phosphorus	mg kg ⁻¹	7.23	Extracted with 0.5 M NaHCO ₃ at pH 8.5 according to the method of [10]
Available Potassium	mg kg ⁻¹	121.11	Extracted with ammonium acetate according to the method described by Black [7] and measured using a flame photometer
Bulk Density	Mg m ⁻³	1.40	Determined according to Black [7]

Cultivation, Crop Management, Experimental Design, and Target Traits

In the fall of 2025, a field trial was conducted at the Faculty of Agriculture, Tikrit University, focusing on sweet corn (*Zea mays saccharata* L.). The experiment used a fully randomized block design (RCBD) as a factorial experiment incorporating two factors: irrigation water quality and compost application rate. The first factor was two types of irrigation water: saline water with a salinity of 3.316 dS/m¹ and Non-saline water with a salinity of 0.467 dS/m¹. The second factor was three levels of compost application rate (0%, 1%, and 2%). Three replicate experiments were conducted for each condition, resulting in a total of 18 experimental plots. Seeds were sown on July 28, 2025, using a drip irrigation system. Thinning, weeding, tilling, and weed control were performed according to crop growth conditions. A prescribed amount of compost was applied before sowing.

The traits investigated were plant height, leaf area, dry root weight, fresh and dry weight of above-ground parts, number of grains per panicle, 500-grain weight, and total yield. These traits were measured using standard methods. For most trait measurements, five plants were randomly selected from each experimental plot. Total yield was calculated by drying the yield of the five plants to a moisture content of 17% and then converting it to kg ha⁻¹. The data were statistically analyzed using Duncan's test at a significance level of 5%.

Result and Discussion

Plant Height (cm)

From the results in Table (2), it was found that the water quality of the irrigation water did not have a significant effect on the plant height of corn. The average plant height was 187.33 cm when irrigated with Non-saline water with a salinity of 0.467 dS/m¹, while the average plant height was 186.22 cm when irrigated with Saline water with a salinity of 3.316 dS/m¹.

Furthermore, it was revealed that the addition of compost resulted in a significant increase in plant height. The average plant height was highest at 190.33 cm with a 2% compost addition, followed by 188.83 cm with a 1% addition. The lowest plant height was 181.16 cm without compost addition. This favorable effect is thought to be due to the compost playing a role in improving the physical, chemical, and biological properties of the soil. Organic fertilizers increase soil porosity, improve soil structure, enhance water retention, and increase the availability of macronutrients and micronutrients. Furthermore, they activate beneficial microorganisms in the rhizosphere, increasing absorption efficiency and promoting vegetative growth. This manifests as increased stem elongation and height. These results are consistent with Al-Kalabi's [11] study, which explained that the addition of organic fertilizers and compost promotes the growth and increases height of corn by improving soil fertility and nutrient availability.

Regarding the interaction between irrigation water quality and compost addition, the results showed significant differences between the interaction treatments. The treatment with 2% compost added to Non-saline water resulted in the highest height (190.66 cm), which was no significant difference from the treatment with 2% compost added to Saline water (190.00 cm). The treatment using Saline water without compost added resulted in the lowest height (180.00 cm). This advantage can be explained by the synergistic effect of compost, which mitigates the potential adverse effects of salinity in irrigation

water. Compost improves soil properties, increasing water retention and nutrient retention capacity, and reduces osmotic stress on plants, thus contributing to improved root growth and nutrient absorption efficiency.

Table 2. Effects of irrigation water quality, compost, and their interactions on corn plant height (cm)

Irrigation Water Salinity (dS m ⁻¹)	Compost Level (%)			Mean
	0	1	2	
0.467 (Non-saline water)	182.33 c	189.00 ab	190.66 a	187.33 a
3.316 (Saline water)	180.00 c	188.66 ab	190.00 a	186.22 a
Organic Matter Mean	181.16 c	188.83 b	190.33 a	

Leaf Area (cm²)

The results in Table (3) show that the quality of irrigation water, the amount of compost added, and their interaction significantly affect the ear leaf area of corn. Non-saline water irrigation significantly increased the ear leaf area, reaching an average of (483.77 cm²). This is a remarkable difference compared to Saline water irrigation (360.00 cm²). The decrease in ear leaf area when using Saline water is thought to be due to the adverse effects of dissolved salts in the soil. Increased salinity raises the osmotic pressure of the soil solution, reducing the root's water absorption capacity. Furthermore, the accumulation of salts in the rhizosphere deteriorates some of the soil's physical properties, limiting leaf growth and expansion. These results are consistent with the findings of Skaggs et al [12] and Phogat et al. [13]. Ali et al. [14] state that salt stress causes cell swelling and reduced leaf area due to a decrease in the plant's water content.

Furthermore, it was revealed that the addition of compost significantly increased the leaf area of corn ears. The average leaf area was highest at a compost addition rate of 2% (442.33 cm²), followed by 426.16 cm² at 1%, and lowest at 397.16 cm² in the control group (0%). This increase can be explained by the important physical roles that compost plays, such as improving soil structure, enhancing soil aggregate stability, reducing bulk density, and increasing total porosity. This improves the movement of water and air in the soil, improving field water capacity and water retention. These improvements are reflected in improved root system growth and water and nutrient absorption efficiency, providing better conditions for cell division and expansion, and consequently leading to an increase in leaf area. A 2019 study showed that the addition of organic matter improves the physical properties of soil, increases water use efficiency, and promotes plant growth in arid and semi-arid regions. Regarding the interaction between irrigation water quality and compost addition, the treatment plot using Non-saline water with 2% compost added showed the highest ear area (512.33 cm²), while the treatment plot using Saline water without compost added showed the lowest (338.33 cm²). This advantage is thought to be due to the synergistic effect of irrigation water quality and compost addition. Non-saline water provides an environment suitable for root growth, while compost improves the physical structure of the soil, increases water retention capacity, and reduces the adverse effects of salinization. Furthermore, organic matter improves soil permeability and suppresses fluctuations in moisture content around the roots, thereby increasing the efficiency of water and nutrient absorption, promoting photosynthesis, and facilitating the formation of dry matter necessary for leaf elongation.

Table 3. Effects of irrigation water quality, compost, and their interaction on ear area (cm²) of corn.

Irrigation Water Salinity (dS m ⁻¹)	Compost Level (%)			Mean
	0	1	2	
0.467 (Non-saline water)	456.00 bc	483.00 ab	512.33 a	483.77 a
3.316 (Saline water)	338.33 d	369.33 cd	372.33 cd	360.00 b
Organic Matter Mean	397.16 b	426.16 ab	442.33 a	

Dry Weight of Seedlings (g plant⁻¹)

The results in Table (4) showed significant effects of irrigation water quality, compost levels, and their interactions on the dry weight of corn seedlings. Non-saline water irrigation was remarkably superior, recording the highest average (83.88 g plant⁻¹), whereas using Saline water reduced the average to (65.00 g plant⁻¹). This superiority was attributed to the lower salinity of fresh irrigation water compared to Saline water, which improved plant water quality, increased the efficiency of nutrient absorption, particularly nitrogen, phosphorus, and potassium, and enhanced photosynthetic activity and carbohydrate formation necessary for plant tissue construction. The reduction in salt stress also increased plant height (Table 2) and leaf area (Table 3), which was reflected in increased dry matter production. In the case of irrigation with Saline water, high salinity increased the osmotic pressure of the soil solution, reducing the water suitability of plants, leading to nutrient imbalances as a result of ion competition, and negatively impacting the accumulation of dry matter in shoots. These results were consistent with [15]

Regarding compost levels, the results showed that the 2% compost level was superior, recording the highest average (84.16 g plant⁻¹), followed by the 1% level average (74.16 g plant⁻¹), while the control treatment (0%) yielded the lowest average (64.99 g plant⁻¹). This improvement is thought to be due to the positive role of compost in improving the physical properties of the soil, as it contributes to reduced bulk density, increased total porosity, improved aeration and saturated water conductivity, and provides an environment suitable for root growth and spreading. Furthermore, compost enhances soil water retention, improves soil structure, and stabilizes aggregates, leading to improved water and nutrient absorption efficiency. In addition, compost is an important source of macronutrients, increasing soil bioactivity and stimulating beneficial microorganisms, positively impacting vegetative growth and dry matter accumulation. These results were consistent with [16].

These results clearly show that the increase in dry weight of shoots with compost addition is directly related to increases in plant height (Table 2) and leaf area (Table 3). Improved soil physical conditions and increased nutrient availability contribute to the formation of more vigorous shoots, leading to increased leaf area that can block more sunlight and thus improving photosynthetic efficiency. Increased stem diameter also reflects improved vascular tissue growth and the ability to transport water and nutrients to the above-ground parts, while plant height indicates increased meristematic activity. The interaction between irrigation water quality and compost levels was significant because the Non-saline water treatment with 2% compost added recorded the highest dry weight of seedlings (96.66 g plant⁻¹), compared to the lowest value (53.33 g plant⁻¹) with Saline water treatment without compost. This interaction is thought to be due to the integration of the effects of Non-saline water and salinity stress reduction on the one hand, and the effects of compost on improving the physical, chemical, and biological properties of the soil on the other. The compost contributed to improved porosity, reduced bulk density, and increased moisture retention. It also helped mitigate the harmful effects of salt by improving the ion balance in the root region and increasing the efficiency of nutrient utilization. Thus, this treatment provided optimal conditions for plant growth, resulting in larger leaf area, greater height, and larger stem diameter, and these characteristics directly reflected the increased accumulation of dry matter. On the other hand, the combination of Saline water salinity and no added compost resulted in a relatively worsened root environment, decreased absorption efficiency, restricted plant growth, and reduced dry weight of new shoots.

The processes of cell division and elongation continued, ultimately leading to an increase in dry matter accumulation within the plant.

Table 4. The effect of water quality, compost, and their interaction on the dry weight of corn shoots (g plant⁻¹)

Irrigation Water Salinity (dS m ⁻¹)	Compost Level (%)			Mean
	0	1	2	
0.467 (Non-saline water)	76.66 abc	78.33 ab	96.66 a	83.88 a
3.316 (Saline water)	53.33 c	70.00 abc	71.66 abc	65.00 b

Irrigation Water Salinity (dS m ⁻¹)	Compost Level (%)			Mean
	0	1	2	
Organic Matter Mean	64.99 b	74.16 ab	84.16 a	

Root Dry Weight (g plant⁻¹)

The results in Table (5) show that irrigation water quality, compost application rate, and their interaction significantly affect the root system dry weight of corn.

The results indicate that Non-saline water irrigation treatment yielded the highest average root system dry weight (32.44) g plant⁻¹, significantly superior to Saline water irrigation treatment (21.22) g plant⁻¹. This is thought to be because higher salinity in irrigation water increases the osmotic pressure of the soil solution, reducing water supply to the plants. This restricts root elongation and cell division, decreases nutrient absorption efficiency, and leads to the accumulation of some harmful ions in the rhizosphere. Furthermore, reduced vegetative growth under saline conditions leads to a decrease in the amount of carbohydrates synthesized and translocated to the roots, negatively impacting root growth and dry matter accumulation. These results are consistent with those of Hu et al. [17]. As the results show, the addition of compost significantly increased the dry matter weight of the root system. At a 2% compost level, the average weight was recorded at 28.83 g plant⁻¹, the highest value compared to 25.00 g plant⁻¹ in the no-compost treatment, while at the 1% level, the average was 26.66 g plant⁻¹, with no significant difference compared to higher levels. This is due to the important role compost plays in improving the physical properties of the soil by reducing bulk density, increasing porosity, improving soil structure, and stabilizing soil aggregates. This provides a suitable environment for roots to penetrate and spread over a wider area of the soil. Compost also contributes to improved water retention, improved aeration, and gradual nutrient delivery, positively impacting root growth and increasing dry weight. Furthermore, improved vegetative growth (Tables 2, 3, 4) increases the translocation of photosynthetic products to the roots, promoting root growth and dry matter accumulation. These results are consistent with those found by Alamer et al. [18]. The interaction between irrigation water quality and compost levels was significant. Non-saline water irrigation with 2% compost treatment resulted in the highest root dry weight (35.66 g plant⁻¹), which was not significantly different from Non-saline water with 1% compost treatment (31.66 g plant⁻¹). The lowest dry weight (20.00 g plant⁻¹) was recorded with Saline water irrigation without compost. This superiority reflects the synergistic effect of irrigation water quality and compost addition. Non-saline water provided favorable conditions for water and nutrient absorption, while compost improved soil physical properties and mitigated the adverse effects of salinization, leading to enhanced root growth, root spread, and improved absorption efficiency. Furthermore, the enhanced above-ground growth under these conditions directly influenced root growth due to the complementary relationship between above-ground and root growth. When above-ground growth is promoted, the exchange of nutrients and photosynthetic products within the plant is accelerated, resulting in further above-ground growth.

Table 5. Effects of irrigation water quality, compost, and their interactions on the dry weight of the root system (g/plant) of corn.

Irrigation Water Salinity (dS m ⁻¹)	Compost Level (%)			Mean
	0	1	2	
0.467 (Non-saline water)	30.00 ab	31.66 ab	35.66 a	32.44 a
3.316 (Saline water)	20.00 c	21.66 bc	22.00 bc	21.22 b
Organic Matter Mean	25.00 b	26.66 ab	28.83 a	

Number of kernels per ear (kernels ear⁻¹)

The results in Table (6) show that irrigation water quality, compost application rate, and their interactions clearly affected the number of knits per ear of corn, with significant differences observed between treatments.

It was observed that higher salinity of irrigation water negatively impacted water quality. When Saline water (3.316 dS m^{-1}) was used, the number of knits decreased compared to when Non-saline water (0.467 dS m^{-1}) was used. The average number of knits was 425 kernels ear⁻¹ when using Saline water and 516 kernels ear⁻¹ when using Non-saline water. This is thought to be because increased salinity of irrigation water leads to a decrease in soil water potential, inhibiting the absorption of water and nutrients and negatively affecting physiological processes such as pollination, grain formation, and ripening. Furthermore, salt stress affects the physical and chemical properties of the soil, including deterioration of soil structure and reduced effective water permeability, thereby decreasing root elongation and absorption efficiency [19]. These results are consistent with those of Li et al. [15]. Regarding compost addition, the highest level of treatment (2%) was shown to be superior, recording the highest number of grains (533 kernels ear⁻¹) with a significant difference compared to the 0% and 1% application levels, which yielded averages of 407 kernels ear⁻¹ and 473 kernels ear⁻¹, respectively. This is attributed to the role of compost in improving soil fertility by increasing organic matter and enhancing physical properties such as improved granular structure, increased porosity, improved water retention capacity, and reduced effects of salt stress. Additionally, compost positively impacts plant growth and yield components, particularly the number of grains per panicle, by increasing the availability of nutrients (nitrogen, phosphorus, potassium) in the rhizosphere and stimulating microbial activity. These results are consistent with those of Cucci et al. [20].

Regarding the interaction between irrigation water quality and compost, the treated group (Non-saline water + 2% compost) showed the highest grain count (579 kernels ear⁻¹), while the treated group (Saline water + 0% compost) showed the lowest grain count (372 kernels ear⁻¹). This is thought to be because the addition of compost improved the physical properties of the soil, promoting internal leaching and water movement, which reduced the salinity in the root zone and mitigated the adverse effects of salinity. Furthermore, the compost increased plant stress tolerance and promoted nutrient absorption.

Table 6. Effects of irrigation water quality, compost, and their interaction on the grain count (kernels ear⁻¹) of corn.

Irrigation Water Salinity (dS m^{-1})	Compost Level (%)			Mean
	0	1	2	
0.467 (Non-saline water)	441 bc	527 ab	579 a	516 a
3.316 (Saline water)	372 d	418 cd	486 bc	425 b
Organic Matter Mean	407 b	473 ab	533 a	

500-kernel weight (g)

The results in Table (7) show that irrigation water quality, compost application rate, and their interactions significantly affect the 500-grain weight of corn. Treatment with Non-saline water (0.467 dS/m^1) yielded significantly better results than treatment with high-salinity Saline water (3.316 dS/m^1). The average 500-grain weight was lowest in the high-salinity Saline water treatment (136.07 g). This is because increased salinity in irrigation water reduces the osmotic pressure of the soil solution, decreasing the plant's ability to absorb water and nutrients. This negatively impacts grain formation and filling, leading to a decrease in grain weight. Furthermore, salt stress inhibits physiological processes, reducing the efficiency of photosynthesis and carbohydrate translocation to the grain during the filling stage. These results are consistent with the findings of multiple researchers indicating that high salinity in irrigation water leads to a decrease in grain weight and yield components in corn. They are also consistent with the findings of [21]

Furthermore, it was found that the amount of compost applied had a significant impact on this trait. The group with 2% compost application had the highest average yield (150.92g), followed by the group with 1% compost application (145.60g), and the control group (0%) had the lowest average yield (138.92g). This is thought to be due to the positive effects of compost, which improves the physical, chemical, and biological properties of the soil, increasing the availability of nutrients necessary for growth, improving soil water retention, and increasing water absorption efficiency. As a result, grain

formation and development were promoted, and grain weight increased. These results are consistent with the conclusions of other researchers that the addition of compost improves yield components and increases grain weight in corn by increasing soil fertility and promoting plant nutrient absorption. These results are consistent with the findings of Çerçioğlu [22].

Regarding the interaction of the two study factors, the 500-grain weight was highest (158.56 g) under Non-saline water irrigation and 1% compost supplementation, and there was no significant difference compared to the Non-saline water irrigation and 2% compost supplementation (154.36 g). The lowest value was observed under Saline water irrigation without compost (128.11 g). These results indicate that compost supplementation mitigated the adverse effects of salt stress by improving the rhizosphere environment, enhancing nutrient availability, and improving water use efficiency, thereby positively impacting grain fullness and weight.

Table 7. Effects of irrigation water quality, compost, and their interaction on the weight (g) of 500 corn grains.

Irrigation Water Salinity (dS m ⁻¹)	Compost Level (%)			Mean
	0	1	2	
0.467 (Non-saline water)	149.72 bc	154.36 ab	158.56 a	154.21 a
3.316 (Saline water)	128.11 g	136.84 f	143.27 de	136.07 b
Organic Matter Mean	138.92 c	145.60 b	150.92 a	

Total Grain Yield (kg ha⁻¹)

The results in Table (8) show that irrigation water quality, compost application rate, and their interactions significantly affect the total yield (kg ha⁻¹) of corn. Non-saline water irrigation treatment showed significantly superior results in this characteristic, recording an average yield of (7410) kg ha⁻¹. In contrast, the average yield for Saline water irrigation treatment was (5901) kg ha⁻¹. The decrease in yield when irrigated with high salinity water is due to the adverse effects of dissolved salts in the soil. These salts increase the osmotic pressure of the soil solution, reducing the amount of water supplied to plants. Furthermore, they worsen the physical properties of the soil, including decreased soil structural stability, increased bulk density, decreased effective porosity, and reduced water and air movement in the rhizosphere. This negatively impacts root growth and nutrient/water absorption efficiency, leading to a decrease in grain number (Table 6) and grain weight (Table 7), and ultimately affecting total yield. Increased salinity can also cause nutrient imbalances due to ion competition and reduced absorption of essential nutrients necessary for grain formation and filling. These results are consistent with the findings of Cucci et al. [20].

Furthermore, it was found that compost application significantly increased total yield. The highest average yield was recorded at 7755 kg ha⁻¹ in the 2% compost application rate, followed by 6683 kg ha⁻¹ in the 1% rate. The lowest average yield was 5529 kg ha⁻¹ in the treatment plot without compost application. This yield increase is thought to be due to the important role compost plays in improving the physical properties of the soil. Compost improves soil aeration and water retention capacity by increasing structural stability, improving soil aggregate formation, increasing total porosity, and decreasing bulk density. Compost also contributes to cation exchange capacity, nutrient availability, and root growth and spreading. This positively impacts vegetative and reproductive growth, improving grain formation and filling efficiency, and ultimately increasing total yield. These results are consistent with those of Getachew et al. [23]. The interaction between irrigation water quality and compost levels was significant. Treatment with Non-saline water supplemented with 2% compost resulted in the highest total yield of 8615 kg ha⁻¹, while treatment with Saline water without compost resulted in the lowest yield of 4872 kg ha⁻¹. This indicates that compost has the ability to mitigate the adverse effects of salinity by improving soil physical properties, increasing water permeability and root motility, improving water retention, and reducing salinity accumulation in the rhizosphere. This provides a more favorable environment for plant growth and continued physiological activity even under salt stress conditions.

Table 8. Effects of irrigation water quality, compost, and their interactions on total corn yield (kg ha⁻¹)

Irrigation Water Salinity (dS m ⁻¹)	Compost Level (%)			Mean
	0	1	2	
0.467 (Non-saline water)	6185 c	7429 b	8615 a	7410 a
3.316 (Saline water)	4872 e	5936 d	6895 bc	5901 b
Organic Matter Mean	5529 c	6683 b	7755 a	

Conclusion

Conclusions

1. Increased salinity of irrigation water significantly reduced most of the growth and yield characteristics of sweet corn. In particular, significant effects were observed on ear area, dry weight of above-ground and root parts, kernel number, kernel weight, and total yield.
2. Compost application improved all investigated characteristics, with a 2% application rate being most effective in improving growth and productivity.
3. A significant interaction was observed between irrigation water quality and compost application rate. Treatment plots using Non-saline water and 2% compost showed the highest values in most investigated characteristics, particularly in total yield, which reached 8615 kg ha⁻¹.

Recommendations

1. When cultivating sweet corn in gypsum soil, the application of 2% compost is recommended.
2. Use Non-saline water whenever possible, or if using high-salinity irrigation water, carefully manage it to minimize salt accumulation in the root zone.
3. Encourage the use of locally available organic matter (such as plant compost) as an economical and environmentally friendly option for improving crop productivity and reducing reliance on chemical fertilizers.
4. Conduct future research to assess the effects of increased compost application, different types of organic matter, and increased salinity over multiple seasons in order to identify optimal methods for the sustainable management of gypsum soils.

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