Effect of some soil amendments and irrigation water salinity on wheat plant and some Soil Characteristics

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ABSTRACT

This study aims to evaluate the effects of some soil amendments (biochar, vinasses and humic acid) and irrigation water salinity application on some properties of sandy loom soil and wheat plant (*Triticum aestivum*) grains Giza (156) growth. Wheat was grown in the soil with rates of different amendments (0.0), (5000) and (10000) kg/fed weight of biochar (B), which was produced from local woad under pyrolysis conditions. Vinasses (V) were added at three different rates: (0.0), (100), (200) and (300) kg per fed, while humic acid (H) was added at a rate of (0.0) and (100) kg fed. The wheat plant was planted in a sandy loom soil in pots, the size of the pots where 50 cm by 70 cm, so it carried 14 kg of soil. Moisture was maintained at field capacity by weight with different modified saline water (400,1500 and 3000 ppm). The wheat plant was harvested after 160 days. The plant samples were collected to estimate plant height, straw, and grain weight .soil samples were also collected and analyzed for the change in physicochemical properties. The results indicated that the applications of organic amendments slightly increased soil organic carbon and cation exchange capacity, but it significantly increased plant height, straw weight and grain weight of wheat by addition of organic amendments, while it decreased soil bulk density. Saline water had a negative effect on both the cultivated plant and the chemical properties of the soil. The best treatment was recorded when biochar using at a rate from (10) tons per fed with (300) kg of vinasses to reduce all saline water levels. The results suggested that the applications of organic amendments in sandy loam soil have benefits to both soil quality and plant growth.

Keywords: Saline water, (pH) value, (EC) electrical conductivity, (OM) organic matter. Wheat plant.

INTRODUCTION:

According to the United Nations Population Division, the population of Egypt will grow from 100.4 million in 2019 to 120.8 million by 2030 and will likely reach 159.9 million before it stabilizes in the year 2050 (United Nations, 2019). Increasing demand for food in the future inasmuch increasing population will certainly bring further pressure on the scarce water supply (Swain, 2008). In arid and semi-arid areas, low precipitation associated with inefficient recharge of aquifers has been one of the main reasons for the lower availability of good quality water and its scarcity (Huang et al., 2019). So, many studies suggested using organic amendments as a means of remediating agricultural soil, improving soil properties, and increasing the availability of nutrients

The effect of using saline irrigation water on soil chemical properties which are related to its fertility has been extensively studied by numerous investigators all over the world. Using saline irrigation water has an effect on soil electrical conductivity (E.C), Soil reaction (pH), soil organic matter (SOM) and plant nutrient availability. The soil pH slightly decreased using all irrigation management treatments of the saline water compared with the control (Abedinpour and Rohani, 2017). Increasing amounts of salts in the soil due to the irrigation with saline water causes the soil to keep more moisture at saturation compared with that irrigated by fresh water (Malash et al., 2008). Essential nutrients play important roles in the salinity stress resistance of higher plants (Marschner, 1995). The nutrient availability is affected by the saline conditions and a shortage of some nutrient availability may occur due to salinity conditions (Reda et al., 2011; Syeed et al., 2011).

The effect of organic amendments on the soil properties such as physical, chemical, and biological has been well known for a long time. It contains residues of plants and animals and primary and high polymer organic compounds formed through their decomposition soil organic matter plays an important role in soil properties and plant growth (Pampuro et al., 2020). Organic matter decreases in many agroecosystems occurs because losses of carbon through oxidation and erosion by intensive cropping are not compensated by carbon inputs through the return of plant biomass. Recycling the plant residual in the soil can improve soil structure and maintain agriculture and decrease land degradation (Lal, 2015; Lal et al 2019).

Humic substances (HS), are the major component of soil organic matter, (Ouni et al., 2014). Also, Humic acid is the main fraction of Humic substances and the most active component of soil and organic matter. It can enhance nutrient availability and improve chemical, biological, and physical soil properties (Selim et al., 2009).

Biochar (B) as black carbon or charcoal is produced from the pyrolysis of biomass process in the presence of partial oxygen (Zhang et al., 2020). There is intense interest in using this biochar as a means to sequester C in soils as a tool for offsetting anthropogenic carbon dioxide. (Lehmann and Joseph, 2009). Biochar application is related to increased soil porosity and hydraulic conductivity and decrease soil pH (Akhtar et al., 2015).

Vinasse (V) is a byproduct of the sugar industry residual (Hidalgo 2009).

Importance of wheat production for global food security since its domestication around 10,000 years ago. wheat has played a crucial role in global food security.

This experiment aims to study the effect of adding some organic amendments (Biochar, Vinasse and Humic acid) to mitigate salt stress caused by the saline irrigation water and therefore sustainable productivity and increase dry matter production. For this purpose, Biochar, Vinasse and Humic acid were used in this study as organic amendments at different levels which were irrigated with saline water.

MATERIALS AND METHODS

The present study aims to evaluate the effect of organic amendments (Biochar, Vinasse and Humic acid) under different levels of saline irrigation water on sandy loam soil properties and plant growth parameters.

Soil samples

A surface soil sample (0-30 cm) was used in the current study collected from El- Sadat city, Menofiya Governorate. The collected soil sample was air-dried and sieved to pass through a 2 mm sieve. The results are present in tables (1-a), (1-b) and (1-c).

Tested plant

A pot experiments was conducted by the wheat plant (*Triticum aestivum*) grains Giza (156) (Biochar, Vinasses and Humic acid) selected for this study, investigate the effects of irrigation water salinity, and organic amendments (Biochar, Vinasses and Humic acid).

Experiment:

A pot experiment was conducted in plastic pots (50 cm in width and 70 cm in length) under different levels of saline water to estimate their effect with organic amendments on plant growth parameters and soil properties. The experiment was designed as Complete Block Design (CBD) with three replicates for each treatment. The pots were packed with 14 kg sandy loam soil after sieved to pass through a 2 mm sieve then added and mixed with organic amendments with different rates (0.0), (5000) and (10000) kg/fed weight of biochar (B), which was produced from local woad under pyrolysis conditions. vinasses (V) were added at three different rates: (0.0), (100), (200) and (300) kg per fed, while humic acid (H) was added at a rate of (0.0) and (100) kg per fed.

The fertilizer recommendations for wheat plants were added from nitrogen, phosphorous and potassium according to the recommendations of the Egyptian Ministry of Agriculture appropriate for the type of soil and plant.

Wheat grains (*Triticum aestivum*) and grains Giza (156) were planted on 10 \October \2020, at a rate of 15 grains per pot.

The pots were irrigated with different irrigation water salinity at field capacity.

Estimated germination time and germination percentage, then select the number of plants in each pot to 10 plants.

The plants were harvested after the full maturity of the crop on 10 /April /2021after 160 days of planting. The plant Height, straw weight and grains weight were estimated.

Saline irrigation water was artificially prepared by adding chemical salts then analyzed as shown in Tables (2-a), (2-b) and (2-c)

Chemical analysis of Organic amendments: the main chemical characteristics of the tested organic amendments are shown in Tables (3 -a), (3-b) and (3-c). Biochar (BC), Humic acid (HA), and Vinasses (Vin) were applied to the studied soil at previous levels and homogenized with 14 kg of soil and filled in plastic pots.

Analytical methods

Methods of organic amendments analysis:

Electrical conductivity: EC measurements were run in 1:5 of organic amendments to water extract as described by Jackson, (1973).

pH: was determined in 1:5 of organic amendments to water suspension using a glass electrode according to Jodice et al. (1982).

***Methods of soil analysis*:**

Particles size distribution: the particle size distribution of soil samples will be carried out according to the international pipette method (Klute, 1986).

Soil pH was estimated in the 1: 2.5 of soil: water soil extract using the Beckman pH meter.

Electrical conductivity (EC $_{(1:2.5)}$): it was determined using the salt bridge.

Organic matter (O. M): was determined wet oxidation method by ($K_2Cr_2O_7$ IN and H_2SO_4 conc.) and titrating with standardized 0.5 M ($(NH_4)_2SO_4$ Fe SO_4 $6H_2O$) according to Walkely and Black's wet oxidation method (Jackson, 1973).

Statistical analysis:

The experimental design was Complete Block Design (CBD) with three replicates. The Analysis of Variance (ANOVA) and Duncan multiple range tests at a 5% level of probability were used to test the significance of differences between the treatments. Data statistical analysis were performed using Costate software (Steel and Torrie, 1986).

RESULTS AND DISCUSSION

Effect of irrigation water salinity and soil amendments on some wheat plant growth parameters.

Effect of irrigation water salinity, soil amendments and their interaction effect on some plant growth parameters i.e., Plant height (cm), Straw weight g/pot, and grain weight g/pot of the wheat plant, were measured to observe the effect of organic amendments and saline water on some growth parameters of a wheat plant.

In the current study two levels of irrigation water salinity (1500 ppm), and (3000 ppm) were used to study the growth parameters of wheat plants under salinity conditions compared to the control treatment (400 ppm). Data in table (4) declared that saline water decreases the plant growth parameter of wheat plant height, from (95.27) cm to (70.47) cm. Also, straw weight g/pot also decreases from (106.47) (g/pot) to (84.73 g/pot) and so grains weight g/pot (216.20 g/pot) to (121.93 g/pot). Generally, plant growth and development are adversely affected by salinity. The reduction in plant height on sandy loam soil is due to irrigation with saline water. The maximum value was recorded under the control level and the minimum one at the highest salinity level. These results are in agreement with those obtained by El-Sodany (2004) who found that fresh and dry weight gradually decreased as the salt concentration increased. He concluded that increasing the salinity of irrigation water reduced all the investigated growth parameters in both sandy and clay soil, and increasing the salinity of irrigation water reduced the plant height of wheat and minimized biomass production.

This deficiency in growth parameters may be due to the biological effect of salinity in plant growth that leads to disturbances in plant metabolism, which consequently led to a reduction in plant growth, Tavakoli et al. (2010). The results of the current study clearly showed that increasing salinity significantly decreased the growth parameter of wheat plants.

Additionally, the data in Table (4) declared that the organic amendments improved plant height (cm), straw weight g/pot, and grains weight (g/pot), it increases from 95.27(cm) to118.75 (cm) for irrigation water with 400 ppm, while it increases from 82.70 cm to 115.20 (cm) for irrigation water with 1500 ppm and it increases from 70.47 cm to 89.67 (cm) for irrigation water with 3000ppm. These results are similar to that obtained by Tavakoli et al. (2010). He agreed with the same results.

The application of organic amendments in sandy loam soil increased the plant height cm of wheat significantly as compared to the control. The low rate of application of organic amendments: (HA100+B1+Vin1), increased the plant height cm of the wheat plant by (11.39 %) above the control,while the highest rates of organic amendments (HA100+B2+Vin3) increased the plant height cm of the wheat plant by (24.64%), above the control. Consequently, the plant height of wheat plant as affected by the treatments can be arranged in the descending order: (HA100+B2+Vin3)> (HA100+B2+Vin2) > (HA100+B2+Vin1) > (HA100+B1+Vin3) > (HA100+B1+Vin2) > (HA100+B1+Vin1) > (HA0+B0+Vin0), as showed in Table (4) and figure (1).

Effect of irrigation water salinity and soil amendments on some soil chemical characteristics.

Adding the organic amendments (biochar, vinasses and humic acid) to the studied soils had effects on the studied soil's chemical properties i.e., soil pH, electrical conductivity (EC) and soil organic matter (OM). Data in Table (5) and Figure No (4) declared that the application of organic amendments showed a slight decrease in the soil pH values in the studied soil compared to the control. The application of the organic amendments on the sandy loam soil decreased the soil pH slightly compared to the control. The lower rate of application of all organic amendments: biochar (B), vinasses (Vin) and humic acid (HA) (HA100+B1+Vin1) decreased the soil pH by 1.4 %, below the control while the highest rates of organic amendments: (HA100+B2+Vin3) decreased the soil pH by 3.8 %, lowering the control. Consequently, the soil pH affected by the treatments in this soil can be arranged in descending order:

(HA100+B2+Vin3)>(HA100+B2+Vin2)>(HA100+B2+Vin1)>(HA100+B1+Vin3)>(HA100+B1+Vin2)>(HA100+B1+Vin1) > (HA0+B0+Vin0). The same trends of the obtained results were also found in the tread with irrigation water type, (1500 ppm) whereas the low-rate application of (HA100+B1+Vin1) treatments decreased the soil pH by (0.36) %, blowing the control. Also, (HA100+B2+Vin3) treatment application rate decreased the soil pH by (3.89) %, blowing the control,while the application of (HA100+B1+Vin1) treatment with irrigation water type, (3000 ppm) decreased the soil pH by (0.35) %, blowing the control. These decreases were pronounced with the rate of application. Therefore, the soil pH as affected by the treatments can be arranged in descending order: (HA100+B2+Vin3) > (HA100+B2+Vin2) > (HA100+B2+Vin1) >(HA100+B1+Vin3) > (HA100+B1+Vin2) > (HA100+B1+Vin1) > (HA0+B0+Vin0).

In most cases, the lowest value of the soil pH was observed after the harvest of the wheat plant with the application of (HA100+B2+Vin3) treatments with irrigation water control (400 ppm) (7.59) pH value for the irrigation water control, and (7.89) pH value for the irrigation water (1500ppm) with the application of (HA100+B2+Vin3) treatments. On the other hand, the highest value of the soil pH was recorded with (HA100+B2+Vin3) treatments (8.09) pH value for the irrigation water (3000ppm). Moreover, the pH value of the organic amendment treated soil decreased with increasing the level of the organic amendment. The inherently lower buffering capacity of sandy soils. One may explain the rapid decrease in the soil pH (El-Naggar et al., 2019). The decrease in soil pH may be due to the lowered pH value of the biochar, humic acid and compost. The addition of organic matter has been reported to decrease soil pH by enhancing processes of ammonification, binding of acidic cations and decarboxylation (Sun et al., 2017). The sensitivity of the soil pH to the organic amendments was likely due in part to the low buffering capacity of sandy loam soil. These results agree with other studies which confirmed that the organic amendments may be led to a decrease in the soil pH (Hassan and Mohey El-Din, 2002; Yang et al., 2016; Zheng et al., 2017; Eissa, 2019).

The application of organic amendments showed increases in the soil EC values compared to the control soil. The application of organic amendments on sandy soil types increased the soil salinity slightly as compared to the control. biochar (B), vinasses (Vin) and humic acid (HA) (HA100+B1+Vin1) increased the EC by (5.1%), above the control. While the highest rates of organic amendments: (HA100+B2+Vin3) increased the EC by (43.9%), above the control. Consequently, the EC as affected by the treatments can be arranged in descending order: (HA100+B2+Vin3)>(HA100+B2+Vin2)>(HA100+B2+Vin1)>(HA100+B1+Vin3)>(HA100+B1+Vin2)>(HA100+B1+Vin1) > (HA0+B0+Vin0). The same trends of the obtained results were also found in the tread with irrigation water type, (1500 ppm) whereas the low-rate application of (HA100+B1+Vin1) treatments increased the soil EC by (4.13) %, above the control,while the application of (HA100+B1+Vin1) treatment with irrigation water type, (3000 ppm) increased the soil EC by (3.96) %, above the control. These increases were pronounced with the rate of application. Therefore, the soil EC as affected by the treatments can be arranged in incensing order:(HA100+B2+Vin3)>(HA100+B2+Vin2)>(HA100+B2+Vin1)>(HA100+B1+Vin3)>(HA100+B1+Vin2)>(HA100+B1+Vin1) > (HA0+B0+Vin0). While the highest rates of organic amendments:

In most cases, the highest value of the soil EC was observed after the harvest of the wheat plant with the application of (HA100+B2+Vin3) treatments with irrigation water control (400 ppm) (1.67dS/m) for the irrigation water control, and (1.59 dS/m) for the irrigation water (1500ppm) with the application of

(HA100+B2+Vin3) treatments. On the other hand, the highest value of the soil pH was recorded with (HA100+B2+Vin3) treatments (1.77dS/m) value for the irrigation water (3000ppm).

The EC dS/m of the studied soil was increased with increasing the application levels of the tested organic amendments and irrigation water salinity. Many studies indicated that the EC increased in soils when different organic materials were applied to the soil (González et al., 2010; Carmo et al., 2016; Ara et al., 2018).

Soil organic matter (OM) is one of several key indicators of soil quality (Juriga and Šimanský, 2018). OM is critical for normal growth and production, particularly in weathered tropical soils (Das et al., 2017), providing a crucial reservoir of macronutrients, such as N, P and S. The application of organic amendments showed increases in soil OM values compared to the control soil.

The low-rate application of organic amendments: biochar (B), vinasses (Vin) and humic acid (HA) inholding (HA100+B1+Vin1), increased OM% by (6.9 %), above the control treatment,while the highest rates of organic amendments (HA100+B2+Vin3) increased the soil OM content by (116.2 %), above the control. Consequently, the soil OM as affected by the treatments can be arranged in descending order: (HA100+B2+Vin3)>(HA100+B2+Vin2)>(HA100 +B2+Vin1)>(HA100+B1+Vin3)>(HA100+B1+Vin 2)>(HA100+B1+Vin1) > (HA0+B0+Vin0).

The same trends of the obtained results were also found in the treated with saline irrigation water concentration, (1500 ppm) whereas the low-rate application of (HA100+B1+Vin1) treatments increased the soil OM by (4.65) %, in the sandy loam soil with the used organic amendments increased OM significantly as compared to the untreated soil,while the application of (HA100+B1+Vin1) treatment with irrigation water type, (3000 ppm) increased the soil EC by (3.96) %, above the control. These increases were pronounced with the rate of application. Therefore, the soil EC as affected by the treatments can be arranged in incensing order:(HA100+B2+Vin3)>(HA100+B2+Vin2)>(HA100+B2+Vin1)>(HA100+B1+Vin3)>(HA100+B1+Vin2)>(HA100+B1+Vin1) > (HA0+B0+Vin0).

In most cases, the highest value of the soil OM was observed after the harvest of barley plants with the application of HA100+B2+Vin3 (0.93%) for sandy loam soil.

Moreover, the SOM of the organic amendment treated soils increased with the increasing level of the organic amendment. The increase in OM due to the application of organic amendments was confirmed in several studies (ElKouny et al., 2004; Das et al., 2017; Mooshammer et al., 2014). Enough nutrients in the soil will provide the optimum condition for the increase in over and underground biomass, increasing soil organic carbon (Pampuro et al., 2020).

CONCLUSION:

The addition of biochar as organic amendments to the soil can be one of the best practices to overcome any biotic stress in soil and increase crop productivity. The positive effects of organic amendments on the interactions between soil-plant-water caused better performance and improved water use. It can improve the properties of soil, and plant growth. Therefore, it is recommended to use biochar and vinasses as a soil amendment for long-term carbon sink restoration. In conclusion, the result of this study indicated that soil properties and yield of wheat plant (*Triticum aestivum*) varieties were significantly influenced by organic amendments. Significantly higher yields were recorded with (10) T/fed of biochar. The best treatments are when adding biochar at the rate of (10) tons per fed with (300) kg of vinasses. These materials can be adopted by the farmers.

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Table 1: some physical and chemical properties of the studied soil

Table 1-a: Soil particle size distribution

Sand%	Silt%	Clay%	Soil texture
80.7	11.6	7.7	Sandy Loam

Table 1-b: Chemical analysis of soil before planting.

pH value (Soil paste)	O.M %	CEC meq/100g	EC (dSm^{-1}, at 25 °C) 1:5	Soluble ions (m $mol\text{-}L^{-1}$)							
				cation				Anion			
				Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO3^{--}$	$HCO3^{-}$	Cl^{-}	$SO4^{--}$
7.89	0.43	17	0.43	4.64	2.09	4.06	0.81	0.00	3.60	4.99	3.0

Table 1-c: Physical properties of the soil before planting

Soil Physical prosperities				
Bulk Density g/cm^3	Porosity %	S.P %	F.C %	A.W %
1.62	32	33	17.5	8.75

(pH) value, (EC) electrical conductivity, (OM) organic matter, (CEC) cation exchange capacity, (AW) available water, (FC) field capacity, (BD) baulk density, (PO) porosity %, (SP) saturation per cent %.

Table 2-a: Artificial saline water 400ppm

pH value	EC dSm-1	Soluble ions (m $mol\text{-}L^{-1}$)							
		cation				Anion			
		Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO3^{--}$	$HCO3^{-}$	Cl^{-}	$SO4^{--}$
7.50	0.63	2.50	1.13	2.19	0.44	0.00	1.94	2.69	1.6

Table 2-b: artificial saline water 1500ppm

pH value	EC dSm-1	Soluble ions (m $mol\text{-}L^{-1)}$							
		cation				Anion			
		Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO3^{--}$	$HCO3^{-}$	Cl^{-}	$SO4^{--}$
8.00	2.45	9.80	4.41	8.58	1.72	0.00	7.60	10.54	6.4

Table 2-c: artificial saline water 3000 ppm

pH value	EC dSm-1	Soluble ions (m $mol\text{-}L^{-1}$)							
		cation				Anion			
		Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO3^{--}$	$HCO3^{-}$	Cl^{-}	$SO4^{--}$
8.25	4.69	18.76	8.44	16.42	3.28	0.00	14.54	20.17	12.2

Table 3-a: Chemical analysis for Biochar)

EC (dSm^{-1}, at 25 °C) 1:5	PH value	Total N %	Total P %	Total K %	Ca meleq/100g	Mg meleq/100g	Na meleq/100g	Total C %	Density g/cm^3 B	W.H.C g/g	CEE Mel/100 g	C/N ration	Density g/cm^3 R	Porosity %
1.59	7.55	0.35	2.63	0.8	35	1.63	123	83	0.43	3.6	150	237.1	0.9	52.2

Table 3-b: Chemical and physical analysis for Vinasses

Density g/cm^3	Total K %	Total P %	Total N %	Vulvic acid %	Amino acid %	Humic acid %	Cytokine %	O.M%	pH value
1.26	20	1	1	5	25	5	0.1	18.4	5.1

Table 3-c: Chemical and physical analysis for Humic acid

Moisture %	Solvability In water %	K humate %	K %	Dry matter %	N %	Fe
12	99	85	11	86	0.8	1.0

Table 4: Effect of irrigation water salinity and soil amendments on plant height (cm), straw weight (g/pot) and grain weight (g/pot) of the wheat plant.

Irrigation (I)	Soil amendments (SA)	Plant height (cm)	Straw weight g/pot	grains weight g/pot
400 ppm	HA0+B0+Vin0	95.27	106.47	216.20
	HA100+B1+Vin1	106.13	127.17	246.83
	HA100+B1+Vin2	111.50	133.43	258.90
	HA100+B1+Vin3	114.47	136.80	268.20
	HA100+B2+Vin1	110.93	136.13	263.53
	HA100+B2+Vin2	114.23	140.23	272.10
	HA100+B2+Vin3	118.75	148.80	288.70
	mean	100.33	132.72	259.21
1500 ppm	HA0+B0+Vin0	82.70	103.47	148.87
	HA100+B1+Vin1	83.53	127.27	183.07
	HA100+B1+Vin2	94.53	131.80	189.53
	HA100+B1+Vin3	97.50	138.27	199.04
	HA100+B2+Vin1	95.47	126.00	189.00
	HA100+B2+Vin2	97.90	133.33	198.80
	HA100+B2+Vin3	115.20	140.69	226.39
	mean	88.69	128.69	190.67
3000 ppm	HA0+B0+Vin0	70.47	84.73	121.93
	HA100+B1+Vin1	78.90	108.93	156.73
	HA100+B1+Vin2	83.47	115.10	165.57
	HA100+B1+Vin3	85.83	121.33	174.40
	HA100+B2+Vin1	83.23	118.93	171.07
	HA100+B2+Vin2	86.17	123.87	178.13
	HA100+B2+Vin3	89.67	136.27	196.07
	mean	82.53	115.59	166.27
LSD at 0.5	Irrigation (I)	102.46	2.97	10.63
	Soil amendments (SA)	159.27	2.34	11.51
	I x SA	277.51	4.09	20.05

Table 5: Effect of Biochar, Vinasses, and Humic Acid with different irrigation water salinity on some chemical properties of soil after the harvesting season.

Soil amendments			Irrigation water 400 ppm			Irrigation water 1500 ppm			Irrigation water 3000 ppm		
Humic aced 2 rats	Biochar 3 rats	Vinasses 4 rats	pH value (Soil paste)	O.M %	EC (dSm^{-1}, at 25 ºC) 1:5	pH value (Soil paste)	O.M %	EC (dSm^{-1}, at 25 ºC) 1:5	pH value (Soil paste)	O.M %	EC (dSm^{-1}, at 25 ºC) 1:5
Humic aced Control	Biochar Control	Vinasses 0	7.89	0.43	1.16	8.21	0.43	1.21	8.53	0.43	1.26
		Vinasses 1	7.80	0.45	1.22	8.18	0.45	1.26	8.50	0.45	1.31
		Vinasses 2	7.76	0.47	1.27	8.14	0.47	1.32	8.46	0.47	1.37
		Vinasses 3	7.71	0.49	1.35	8.09	0.49	1.4	8.41	0.49	1.45
	Biochar 1	Vinasses 0	7.81	0.53	1.29	8.15	0.53	1.34	8.35	0.53	1.39
		Vinasses 1	7.74	0.55	1.34	8.12	0.55	1.39	8.32	0.55	1.44
		Vinasses 2	7.70	0.57	1.40	8.08	0.57	1.45	8.28	0.57	1.50
		Vinasses 3	7.65	0.59	1.48	8.03	0.59	1.53	8.23	0.59	1.58
	Biochar 2	Vinasses 0	7.72	0.83	1.44	8.05	0.83	1.36	8.25	0.83	1.54
		Vinasses 1	7.70	0.85	1.49	8.02	0.85	1.41	8.22	0.85	1.59
		Vinasses 2	7.66	0.87	1.55	7.98	0.87	1.47	8.18	0.87	1.65
		Vinasses 3	7.61	0.89	1.63	7.93	0.89	1.55	8.13	0.89	1.73
Humic aced 100 kg/f	Biochar Control	Vinasses 0	7.80	0.47	1.20	8.18	0.47	1.25	8.50	0.47	1.30
		Vinasses 1	7.77	0.49	1.25	8.18	0.49	1.29	8.47	0.49	1.35
		Vinasses 2	7.73	0.51	1.31	8.11	0.51	1.35	8.43	0.51	1.41
		Vinasses 3	7.68	0.53	1.39	8.06	0.53	1.43	8.38	0.53	1.49
	Biochar 1	Vinasses 0	7.74	0.57	1.33	8.11	0.57	1.38	8.32	0.57	1.43
		Vinasses 1	7.71	0.59	1.38	8.08	0.59	1.42	8.29	0.59	1.48
		Vinasses 2	7.67	0.61	1.44	8.04	0.61	1.48	8.25	0.61	1.54
		Vinasses 3	7.62	0.63	1.52	7.99	0.63	1.56	8.20	0.63	1.62
	Biochar 2	Vinasses 0	7.70	0.87	1.48	8.01	0.87	1.4	8.21	0.87	1.58
		Vinasses 1	7.67	0.89	1.53	7.98	0.89	1.45	8.18	0.89	1.63
		Vinasses 2	7.63	0.91	1.59	7.94	0.91	1.51	8.14	0.91	1.69
		Vinasses 3	7.59	0.93	1.67	7.89	0.93	1.59	8.09	0.93	1.77

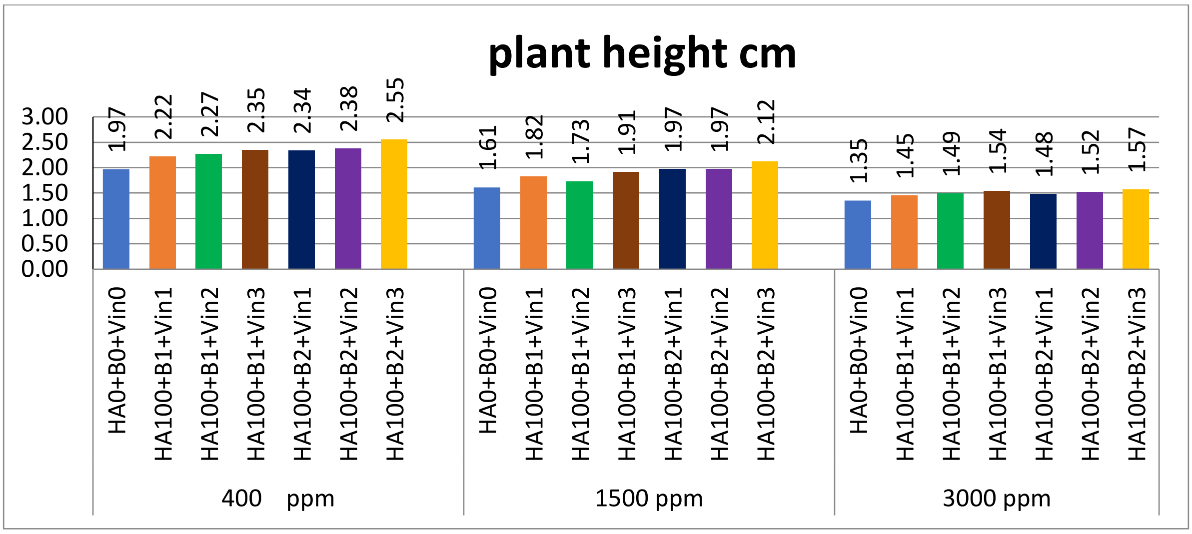

Figure 1: Effect of irrigation water salinity, soil amendments and their interaction effect on plant height (cm) of the wheat plant. The same trends of the obtained results were also found in the Straw weight (g/pot). With the low rate of application of organic amendments: (HA100+B1+Vin1), the relative increase of straw weight (g/pot) for the wheat plant is (19.44%) above the control. on the other hand, the highest rates of organic amendments: (HA100+B2+Vin3) increased the plant height of the wheat plant by (39.75%), above the control. Consequently, straw weight g/pot of wheat plant as affected by the treatments can be arranged in the descending order: (HA100+B2+Vin3) > (HA100+B2+Vin2) > (HA100+B2+Vin1) > (HA100+B1+Vin3) > (HA100+B1+Vin2) > (HA100+B1+Vin1) > (HA0+B0+Vin0). It showed in Table (4) and figure (2)

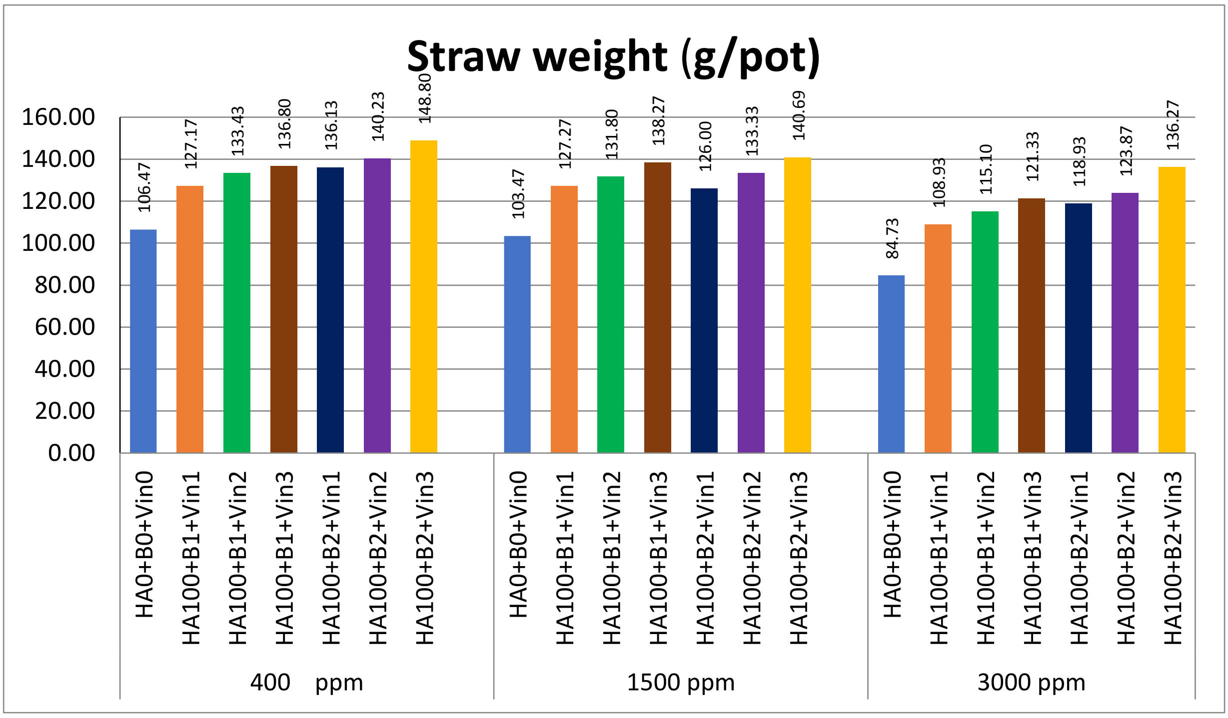

Figure 2: Effect of irrigation water salinity, soil amendments and their interaction effect on straw weight g/pot of the wheat plant. The same trends of the obtained results were also found in the weight of the grain (g/pot). With the low rate of application of organic amendments: (HA100+B1+Vin1), the relative increase of grains weight (g/pot) for wheat plant compared to control treatment increased by 14.16 % above the control,while the highest rates of organic amendments: (HA100+B2+Vin3) increased the grain weight (g/pot) of the wheat plant by 25.8 %, above the control. Consequently, grains weight (g/pot), wheat plant as affected by the treatments can be arranged in the descending order: (HA100+B2+Vin3) > (HA100+B2+Vin2) > (HA100+B2+Vin1) > (HA100+B1+Vin3) > (HA100+B1+Vin2) > (HA100+B1+Vin1) > (HA0+B0+Vin0), as showed in Table (4) and figure (3).

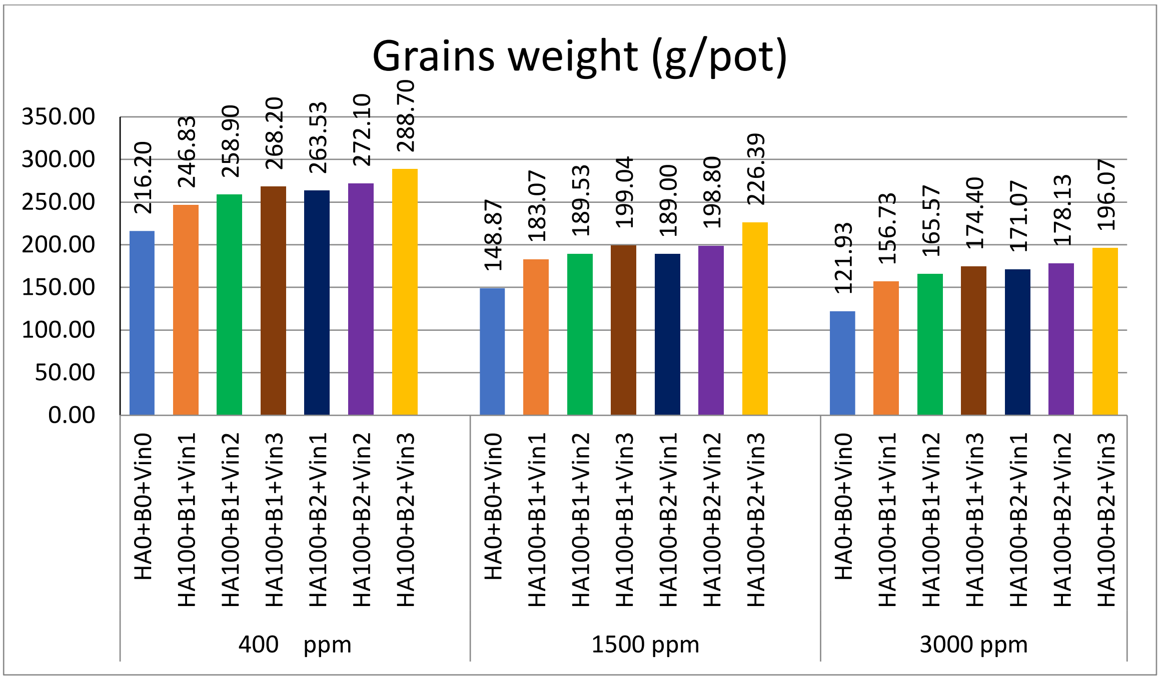

Figure 3: Effect of irrigation water salinity, soil amendments and the interaction effect on grains weight (g/pot) of the wheat plant.

تأثير بعض مصلحات التربة وملوحة مياه الري على نبات القمح وبعض خواص التربة

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الملخص العربي

تهدف هذه الدراسة إلى تقييم تأثير بعض محسنات التربة (الفحم النباتي والفيناس وحمض الهيوميك) وملوحة مياه الري على بعض خصائص التربة الرملية ونمو نبات القمح (Triticum aestivum) صنف الجيزة (١٥٦). نما القمح في التربة مع إضافة المعدلات المختلفة من المحسنات (٠.٠) و (٥٠٠٠) و (١٠٠٠٠) كجم / فدان من الفحم الحيوي (B) والذي تم إنتاجه من المخلفات العضوية تحت ظروف الانحلال الحراري وإضافة والفيناس بثلاث معدلات مختلفة: (٠،٠)، (١٠٠)، (٢٠٠) و (٣٠٠) كجم لكل فدان، بينما تمت إضافة حمض الهيوميك (AH) بمعدل (٠،٠) و (١٠٠) كجم لكل فدان لنبات القمح المنزرع في التربة الرملية في أصص، حجم الإصيص ٥٠ سم في ٧٠ سم، وكان كل إصيص يحتوي على ١٤ كيلوغراماً من التربة. تم الحفاظ على الرطوبة عند السعة الحقلية بمياه مختلفة الملوحة (٣٠٠٠ و ١٥٠٠ و٤٠٠ جزء في المليون). تم حصاد نبتة القمح بعد ١٦٠ يومًا من الزراعة. تم جمع عينات النباتية لتقدير طول النبات ووزن القش ووزن البذور. كما تم جمع عينات من التربة بعد الزراعة لتحليل التغيرات في الخواص الفيزيائية والكيميائية. أشارت النتائج إلى أن اضافة المحسنات العضوية أدت إلى زيادة معنوية في الكربون العضوي للتربة، وزيادة السعة التبادلية الكاتيونية، وارتفاع النبات، ووزن القش، ووزن البذور لنبات القمح، بينما قللت من الكثافة الظاهرية للتربة وكان للمياه المالحة تأثير سلبي على كل من النبات المنزرع والخصائص الكيميائية للتربة. تم تسجيل أفضل معاملة عند استخدام biochar بمعدل (١٠) طن لكل فدان مع (٣٠٠) كيلو جرام من الفيناس لتقليل التأثير الضار من الري بمياه مالحة. أشارت النتائج إلى أن إضافة المحسنات العضوية للتربة الرملية لها فوائد لكل من جودة التربة ونمو النبات.

الكلمات الاسترشادية: الماء المالح، قيمة الـph، التوصيل الكهربي، المادة العضوية، نبات القمح.