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Evaluation of Organic Sources and Mineral N Fertilizer on Soil Fertility and Coriander Plant (*Coriandrum sativum* L.) Productivity and Quality under Saline Soil

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Two field experiments were carried out at Gelbana, North Sina government during successive winters 2021/2022 and 2022/ 2023 to study the evaluation of organic sources (compost, biochar, and organic farm) combined with or without mineral N different rates on soil fertility and Coriander productivity. Lies coast of Sinai, between 32o_ 350 and 32o_ 450 E and 31o_ 000 and 31o_ 250 N. Lies in the north-western Mediterranean coast of Sinai, between 32o_ 350 and 32o_ 450 E and

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31o_ 000 and 31o_ 250 N. Each experiment was carried out in a split-plot design with three replicates in both seasons. Results showed that applying compost combined with or without mineral N fertilizer at different rates improved soil fertility (decreased soil pH, soil salinity, and increase of available macronutrients and micronutrient contents in soil) compared with other treatments. Also, the maximum mean values of Plant height (cm); No. of branches /plant; the weight of seeds /plant (g); the weight of seeds yield (ton/fed), fresh green leaves (ton/fed), and dry yield leaves (ton/fed) for soil treated with compost combined with mineral fertilizer different rate, while the weight of 1000 (g) seeds as affected by organic farm combined with mineral N fertilizer rate. The highest values of N, P, K, Fe, Mn, and Zn concentrations in seeds were treating with compost combined with mineral N fertilizer at a 100 kg N /fed rate than other treatments. As well as, the application of compost combined with mineral N fertilizer at different rates was an increase in protein (%), oil (%), and carbohydrate (%). chlorophyll while the proline was decrease value.

Keywords: Soil salinity; soil chemical; coriander nutrients and productivity; and quality.

1. INTRODUCTION

“Compost is the source of organic fertilizer characterized by high organic matter content as well as increase macro-micronutrients influence the plant growth. Compost is improving the physical and chemical properties of soil, such as soil structure, soil aggregation, porosity, hydraulic conductivity, air exchange, water holding capacity, soil pH, and microbial activity. Organic fertilizers have a slower release rate than mineral ones” [1]. “Compost improves the physical and chemical characteristics of soil, in addition to its role in increasing plant output” [2]. “The effect of the integration of chemical fertilizers, enriched compost, and biofertilizers on the growth and yield of coriander and post-harvest soil fertility led to improving availability of plant nutrients, these additions help to reduce the composting time considerably and increase the population of microorganisms” [3]. “Compost application at 10 ton/fed increase plant height, stem diameter, and herb dry weight/plant for coriander” reported by Rekaby [4].“The application of compost at 10 (ton/fed) significantly increased the number of umbels/plants, fruit yield per plant and per fed, and the highest increase of yield and yield components compared with control” [5]. “The use of compost to Coriander (*Coriander sativum* L.) led to increase growth parameters (plant height, number of branches, weight of 1000 seeds (g), weight of seeds per plant (g), yield of seeds (kg/fed), oil percentage, oil yield (L/fed), total nitrogen and carbohydrate percentages and essential oil composition compared control”, Waleed [6]. “The significant effect of compost addition on soil EC might attributed to the improvement of physical and chemical properties of soil such as ESP, porosity, aggregation, and infiltration rates which led to increased salt leaching through the soil profile” [7].

“Organic farming practices have been associated with improved soil properties through a number of considerations including the addition of soil organic matter, increased earthworm population, biodiversity, soil fertility, etc,” (Pulleman *et al.*, 2004). “Application of organic manures to soil led to decreased soil salinity and they attributed that to improving physical properties of the soil, which in turn facilitate the leaching of salts outside from the root zone” [8]. “Generally, the combined application of organic farm, compost, and N mineral fertilizers levels improved the chemical properties of soil and enriched the fertility status of the soil. In addition, the compost can be a very good organic amendment in saline agriculture as well as for the reclamation of salt – affected soils” [9]. “Organic farm application significantly reduced soil EC, and soil pH, and increase mineral contents in soil rather than control as well and organic farm significantly improves the growth of maize under saline conditions. This may be due to the application of organic amendments that can improve the concentration of Ca^{2+} in soil solution thus replacing Na^{+} and reducing salinity” [10].

“Biochar is great in organic carbon and largely resistant to decomposition. It is produced from the pyrolysis of plants and waste feedstocks. Biochar improves plant growth by improving the chemical properties of soil (i.e. nutrient retaining and availability) and physical traits of soil (i.e. bulk density, water holding capacity, permeability), and biological properties of soil, all contributing to improved crop productivity” (Lehmann. 2007). “The international biochar initiative (IBI) defines biochar as a fine-grained organic material with a high carbon content that was produced through the pyrolysis process, which involves the thermal degradation of biomass at temperatures varied between 300 to 600 °C in the complete or partial absence of oxygen" [11]. "Biochar reduced Na^+ % uptake under salt stress, while increased K^+ % uptake by plants. Biochar-mediated increase in salt tolerance of plants is mainly associated with enhancement in soil properties, thus increasing plant water status, decrease of Na^+ % uptake, increasing uptake of minerals, and regulation of stomata conductance and phytohormones. The bio-char and the organic fertilizer in the increase of nutrients in the sandy soil compared to the control treatment may be due to their role in improving soil physical and chemical properties and also the increase of nutrients content in studied soil, especially N, P, and K, along with their role in reducing the loss of these nutrients from the soil by increasing the ability of the soil to retain them and minimize the down movement of water in sandy soil due to the increase of these applied organic matter to soil" [12].

"The coriander plant (*Coriandrum sativum* L.) is an aromatic annual herbaceous plant that belongs to Apiaceae (Umbelliferae) family which originates from the Mediterranean area and Middle Eastern" (Khater et al., 2021). "Coriander is an annual herbal, spice, and melliferous plant from the family Apiaceae. It grows to a height of 60-120 cm. All parts of this plant are edible and have dietary value, but the herbal material is the fruit (*Fructus Coriandri*), mainly used to obtain oil (*Oleum Coriandri*), which contains coumarin compounds, triterpenes, flavonoids, phytosterols and protein compounds" [13]. "Fruit essential oils up to 2.6% essential oil, vitamins C, A, and B2 and they also present a high antioxidant activity" [14].

The objective of this study is to evaluate the effectiveness of compost, biochar, and organic farm combination with mineral N chemical fertilizers on some soil chemical properties and fertility as well as Coriander crop productivity and quality in saline soil.

2. MATERIALS AND METHODS

Two field experiments were carried out at Gelbana, North Sina government during successive winters 2021/2022 and 2022/ 2023 to study the evaluation of organic sources (compost, biochar, and organic farm) combined with or without mineral N different rates on soil fertility and Coriander productivity. Lies on the north-western Mediterranean coast of Sinai, between 32º_ 35⁰ and 32º_ 45⁰ E and 31º_ 000 and 31º_ 25⁰ N. The main physical and chemical properties of the cultivated soils and also their content of some macro-micronutrients were determined before planting according to the methods described by Cottenie et al [15] and Page et al [16]. In both seasons, each experiment was carried out in a split-plot design with three replicates.

The compost biochar and organic farm analyses were done according to the standard methods as described by Brunner and Wasmer (1978).

All farming processes were carried out before planting. Also, the compost, biochar, and organic farm at a rate of 5 ton /fed were applied 20 days from planting. Superphosphate (15.5 % P_2O_5) was applied at a rate of 200 kg/fed during tillage soil. Urea (46 N %) was applied at rates of 50,75 and 100 kg /fed on the three equal doses after 30, 50, and 75 days from planting. Potassium sulphate (48 % K_2O) at a rate of 50 kg/fed was applied after 30 and 50 days from planting. The area of each experimental unit plot was 5 X 10 m which divided into was 60 cm.

"Sowing seeds of (*Coriandrum sativum* L.) was on 25 th in both seasons. Seeds of the Coriander plant was obtained from the Agriculture Research Center, Giza Egypt. Two to three seeds were sown in the hole with a 2 cm depth. The distance between each two holes was 25 cm. After 25 days of sown, the plant of each hole was thinned to one plant. Plant samples of three replicates were taken after 75 days from planting detrained of chlorophyll" described by Witham et al [17].

Data were taken at the harvest, the plant height (cm), the number of main branches/plants, the fresh and dry weights of the plant (ton/fed), weight of 1000 seeds (g), weight of seeds/plant, and weight of seeds yield (ton/fed). The dry weight of seeds of (*Coriandrum sativum* L.) plants was determined after harvest. The concentration of N, P K, Fe, Mn, and Zn of seeds were determined after digestion using a mixture

Table 1. Physical and chemical properties of the investigated soil

Coarse sand (%)	Fin sand (%)	Silt (%)	Clay (%)	Texture		O.M (%)	SAR	CaCO$_3$ (%)
12.50	43.90	20.39	23.21	Sandy clay loam		0.65	8.91	12.55
pH (1:2:5)	**EC (dS/m)**	**Cations (meq/l)**				**Anions (meq/l)**		
		Ca^{++}	**Mg^{++}**	**Na^{+}**	**K^{+}**	**HCO$^-_3$**	**Cl$^-$**	**SO$^{--}_4$**
8.03	7.35	12.80	22.30	37.43	0.97	12.75	34.87	25.88
Macronutrients (mg/kg)			**Micronutrients (mg/kg)**					
N	**P**	**K**	**Fe**		**Mn**		**Zn**	
37.80	5.96	182.00	3.98		1.20		0.52	

Table 2. Organic matter sources analysis

Organic source	pH (1:2.5)	EC (dSm^{-1})	C	C/N	N	P	K	Fe	Mn	Zn
					(%)				(mg kg^{-1})	
Compost	7.30	3.25	33.00	13.20	2.50	0.97	2.35	185.25	89.33	46.75
Biochar	8.25	4.12	55.36	24.10	2.30	0.56	5.75	98.30	70.33	32.00
Organic farm	7.44	3.55	40.22	14.62	2.75	0.77	4.20	165.00	82.10	52.10

of H_2SO_4 and $HClO_4$ (2:1 ratio) according to Chapman and Pratt [18] and Cotteine et al (1982). Statistical analysis: was assigned using MSTAT-C developed by Russell [19].

3. RESULTS AND DISCUSSION

3.1 Effect of Organic Matter on Some Soil Chemical Properties

3.1.1 Soil pH

Soil pH is one of the most important parameters which reflect the overall changes in soil chemical properties. It is obvious in Table (3) shows that the pH soil for the study was tented to increase slightly after planting. The soil pH is slightly alkaline conditions, where the pH value in always arranged from 8.04 to 7.90. Also, there was no clear effect of the applied of compost, biochar, and organic farm with or without mineral nitrogen rates fertilizer on the soil pH. The soil pH decreases as treated with compost combined with 100 kg N/fed compared to other treatments. This positive effect is more pronounced in the surface layers of soils for the application of compost followed by organic farm and biochar reductions in soil pH value may be related to the residual organic compounds of biochemical and chemical changes and the active organic acids. These results are in agreement with Khaled and Jeff, [20] found that the application of biochar led to a decrease in soil pH. “Increasing the period between compost application and the plantation to 30 days resulted in low soil pH values” Claudio et al., [21]. Albert and Kwame [22] indicated that “the soil pH in all the biochar- or compost was above the threshold level pH below”. Prapagar et al. (2012) suggested that “organic farms were reducing soil pH. Reduction in soil pH may be related to the residual organic matter after different biochemical and chemical changes”. “In addition, the activity of micro-organisms led to the production of organic acid. The decrease in soil pH in organically managed soils might be due to the formation of organic acids during decomposition and mineralization of organic farms and compost” [23]. Simon et al., (2019) indicated that “the biochar combined with nitrogen mineral rates slightly reduced the pH by 0.22 than biochar alone”. “The soil pH tends to decrease slightly and moderate after the applied of compost more than biochar with or without different nitrogen minerals different rates” [24].

3.1.2 Soil salinity (EC dSm^{-1})

Data presented in Table (3) show that the studied three experimental pilot units are generally characterized, from the salinity point of view, by the characters found in the semi-arid regions. These characters include the accumulation of salts in the surface zone of the soil, mainly due to the higher evaporation process under the dry and hot climate. The soil salinity decreases with increasing of mineral N fertilizer rate mixed by compost than other treatments. The applied of organic sources and mineral N rates were no significant on soil salinity. The interaction between organic source and mineral N rate fertilizer were significant in decreasing saline soil (EC dSm^{-1}).

Corresponding relative decrease in soil salinity of mean value were 20.27 %, 7.99 %, and 15.20 % for soil treated with compost, biochar, and organic farm respectively, combined with mineral N different rates compared by control. The efficiencies of organic sources in decreasing soil salinity are arranged as follows:

> Compost > organic farm > biochar > control combined with or without mineral N fertilizer different rats.

"The application of organic farm and compost to soil can increase both the CEC and the soluble and exchangeable K+, which is a competitor of Na^+ under sodicity conditions, thus, limiting the entry of Na^+ into the exchange complex" [25]."Organic farms are improving the soil salinity. This may be due to the application of organic farms that can improve the concentration of Ca^{2+} in soil solution thus can replace Na^+ and reducing salinity", Khatum *et al*., [10]." The application of organic farms to saline soils can accelerate Na+ leaching, increase the percentage of water-stable aggregates, and decrease electrical conductivity (EC) and soil salinity" [26]. "The relatively low EC levels in the organic farm-managed soils indicate that the use of composts has not resulted in increased salinity" [23]. "The application of soil biochar and compost combined with the different rates of nitrogen fertilizer to soil significantly decreased soil EC" [24]. These results may be due to that compost, organic farm, and biochar application has reduced soil bulk density and improved soil aggregate structure, which led to an increase total porosity in soil and an increase in macro-pores and turn to increased water content at low suction pressures led to the movement of leaching water that enhances progressive removal for Na-salts.

3.1.3 Available macronutrient contents in soil

Data presented in Table (3) show that the highest mean values of N, P, and K available contents in soil were soil treated with organic farm combined with mineral N fertilizer rates than other treatments. The effect of organic sources on Available contents N. P and K were no significant. Also, the mineral N had different

Table 3. Soil pH, Soil salinity, and available macro-micronutrients in soil

Treatments	Rate of N ($kgfed^{-1}$)	pH (1: 2.5)	EC (dSm^{-1})	Macronutrients ($mgkg^{-1}$)			Micronutrients ($mgkg^{-1}$)		
				N	P	K	Fe	Mn	Zn
Control	100	8.04	5.13	42.90	6.24	184.60	4.65	1.34	0.57
Compost	0	8.01	4.87	45.60	6.74	187.45	4.88	1.80	0.61
	50	7.98	4.35	47.43	6.80	189.30	5.08	2.04	0.65
	75	7.96	3.98	52.11	7.12	192.44	5.14	2.07	0.69
	100	7.92	3.17	54.30	7.19	193.75	5.48	2.32	0.72
Mean			4.09	49.86	6.96	190.74	5.15	2.06	0.67
Biochar	0	8.02	5.05	44.89	6.35	184.22	5.05	2.06	0.63
	50	8.01	4.88	47.74	6.89	185.90	5.55	2.22	0.64
	75	7.98	4.73	51.89	7.09	188.65	5.80	2.54	0.66
	100	7.96	4.22	53.80	7.13	191.90	6.34	2.66	0.68
Mean			4.72	49.58	6.87	187.67	5.69	2.37	0.65
Organic farm	0	8.01	4.85	47.90	6.77	186.77	4.89	2.10	0.66
	50	7.97	4.55	53.89	6.88	193.90	5.12	2.44	0.68
	75	7.93	4.12	55.89	7.15	194.66	5.67	2.65	0.72
	100	7.90	3.88	58.90	7.42	196.22	6.55	2.79	0.74
Mean			4.35	54.15	7.06	192.89	5.56	2.50	0.70
LSD.5% organic			ns	ns	ns	ns	ns	ns	ns
LSD5 %. N rate			ns	1.44	ns	1.91	ns	0.30	0.02
Interaction			*	**	ns	***	ns	ns	***

rates and interactions all treatments applied led to a significant increased for N and K but P no significant. On the other hand, the relative increases of mean values available N, P, and K contents in soil were 16.22 % for N, 11.54% for P, and 3.33 % for K respectively, treating by compost combined with different mineral N rates; 15.57 % for N, 10, 10 % for P and 1.66 % for K respectively as affected with biochar combined with N mineral fertilizer rates and 26.22 % for N, 13.14 for P and 4.49 % for K respectively, treating by organic farm combined with N mineral fertilizer rates compared with control. On the other hand, the macronutrient content in soils subjected the different organic sources could be arranged as fallows organic farm > compost > biochar > control. The obtained data in agreement with those reported by Ahmed et al., [23] reported that organic farm application was a significant increase of available N, P, and K, then in the control. Also organically managed soils showed significantly better soil nutritional status regardless of the periods of organic farming practice. Lehmann and Josehp, [27] show biochar is abundant in the organic matter, water-holding capacity, nutrient-retaining capacity, and bioavailable nutrition elements (N, P, and K). Abdel-Azeem [20] indicated that the high of mean values of N, P, and K contents in soil as affected with treated by compost together nitrogen mineral fertilizer rates. The increases in available soil nutrients (N, P, K, Ca, and Mg) resulting due to the biochar and compost application. Biochar applied to soil led to an increase of organic matter, water-holding capacity, nutrient-retaining capacity, and bioavailability nutrition elements (e.g., N, P, K, Ca) in soil [28].

3.1.4 Available micronutrient contents in soil

Data presented in Table (3) indicated that the maximum values of Fe, Mn, and Zn contents in soil were 6.55, 2.79, and 0.74 mg/kg respectively, treated organic farm combined with 100 kg/fed mineral N fertilizer rate. The increase of mean values was 5.69 mg/kg for Fe content in soil treated with biochar combined with mineral N fertilizer, while Mn and Zn contents were 2.50 and 0.70 mg/kg in soil treating with organic farm combined with mineral fertilizer compared by other treatments. The effect of organic sources on available Fe, Mn, and Zn contents in soil was Not significant. The Mn and Zn contents in soil was significant increase with increasing mineral fertilizer different rates, while the Fe no significant. The interaction between organic sources and mineral N fertilizer different rates on available Fe and Mn were no significant, while the Zn was significant increase. Corresponding, relative increases of mean values were 10.75 % for Fe; 53.73 % for Mn, and 17.54 % for Zn respectively contents in the soil as affected by compost combined with mineral fertilizer different rate compared by control. Also, the relative increases of mean values available Fe, Mn and Zn contents were 22.37 % for Fe; 76.87 % for Mn and 14.04 % for Zn respectively in soil treating by biochar combined with mineral N fertilizer compared with control. As well as, the relative increases of mean values were 19.57 % for Fe; 86.57 % for Mn and 22.81 % for Zn respectively in soil treated with organic farm combined with mineral N fertilizer different rates compared by control. These results are in agreement by El-Kamar [7] found that the effects of organic fertilizer on availability of some micro nutrients in the soil was increase under newly reclaimed saline soil conditions. Organic farm application to soil was significantly better soil nutritional (Fe, Mn and Zn) status regardless the periods of organic farming practice Ahmed *et al.,* [23]. Abdel Azeem [24] found that compost and biochar combined with nitrogen mineral applications led to decreased soil pH and EC, while increased the contents of Fe, Mn and Zn in soil. The organic amendments (organic farm and biochar) application to soil led to significant increase of chemical and physical properties of sandy soil such as, available Fe, Zn and Mn (Amaref *et al, 2018).*

3.1.5 Effect of organic sources on coriander (*Coriandrum sativum*, L.) productivity

Data presented in Table (4) suggested that the increase of mean values of vegetative growth characters i.e. Plant height (cm); No. of branches /plant; weight of seeds /plant (g); weight of 1000 (g); weight of seeds yield (ton/fed), fresh green leaves (ton/fed) and dry yield leaves (ton/fed) were increase with increasing mineral N fertilizer rate combine with organic sources. The maximum mean values of Plant height (cm); No. of branches /plant; weight of seeds /plant (g); weight of seeds yield (ton/fed), fresh green leaves (ton/fed) and dry yield leaves (ton/fed) for soil treated with compost combined with mineral fertilizer different rate, while the weight of 1000 (g) seeds as affected by organic farm combined with mineral N fertilizer rate. On the other hand, the effect of organic sources on Plant height (cm); fresh green leaves (ton/fed) and dry yield leaves (ton/fed) were significant increase, while the No. of branches /plant; weight of 1000 seeds (g); weight of seeds /plant (g) and weight of seeds yield (ton/fed) were no significant. Also, the applied of mineral N fertilizer rates on Plant height (cm); weight of 1000 seeds (g); weight of seeds yield (ton/fed) and dry yield leaves (ton/fed) were significant increase with increasing mineral N fertilizer rates but No. of branches /plant; weight of seeds /plant (g) and fresh green leaves (ton/fed) were no significant. As well as, the interaction between organic sources and mineral N rates fertilizer on Plant height (cm); No. of branches /plant; weight of seeds /plant (g); fresh green leaves (ton/fed) and dry yield leaves (ton/fed) were significant increase, while the weight of seeds yield (ton/fed) was no significant.

The relative increases of mean values were 18.77 %; 50.64 % 35.00 %; 28.18 %; 20.83 % and 22.86 % for Plant height (cm); No. of branches /plant; the weight of seeds /plant (g); the weight of 1000 (g); the weight of seeds yield (ton/fed), fresh green leaves (ton/fed), and dry yield leaves (ton/fed) respectively as affected with compost combined with mineral N fertilizer rates compared with control. Concerning, the relative increases of mean values were 6.85 % for plant height (cm); and 11.48 % for No. of branches /plant; 18.26 % for weight of seeds /plant (g); 19.59 % for weight of 1000 (g); 11.79 % for weight of seeds yield (ton/fed), 12.50 % for fresh green leaves (ton/fed) and 4.57 % for dry yield leaves (ton/fed) respectively in soil treating with biochar combined with mineral N fertilizer rates compared with control. As well as, the relative increases of mean values were 10.33 %; 20.41 %; 27.59 %; 47.01 % 17.92 %; 18.33 %, and 8.57 % for Plant height (cm); No. of branches /plant; weight of seeds /plant (g); the weight of 1000 (g); weight of seeds yield (ton/fed), fresh green leaves (ton/fed), and dry yield leaves (ton/fed) respectively as affected with organic farm combined with mineral N fertilizer rates compared with control. These results are in agreement by Abdou *et al.* (2015) show that the compost application to soil gave increase of vegetative growth characters for coriander (*Coriandrum sativum*, L.) i.e. Plant height, dry weight/plant, yield components number of umbels/plant and fruit yield/plant and /fed). Ali, *et al.* (2017) found that applied of biochar improved the growth of plant, biological yield and fresh yield of Coriander under either salt stress. Ahmed *et al*. (2019) reported that the application of organic farm and compost was significant increase of the growth biological and

Table 4. Effect of organic fertilizers combined with mineral N rates on yield and yield component

Treatments	Rate of N (kgfed^{-1})	Plant height (cm)	No. of branches /Plant	Weight of seeds/plant (g)	Weight of 1000 seeds (g)	Weight of yield seeds (ton/fed)	Fresh green Leaves (ton/fed)	Dry yield leaves (ton/fed)
Control	100	76.79	7.84	12.43	14.55	0.653	1.20	0.350
Compost	0	84.30	8.64	14.24	15.88	0.660	1.33	0.385
	50	87.90	10.65	16.54	17.43	0.785	1.45	0.420
	75	94.28	12.98	17.89	18.50	0.840	1.65	0.435
	100	98.30	14.96	18.43	22.80	0.890	1.85	0.475
Mean		91.20	11.81	16.78	18.65	0.79	1.57	0.43
Biochar	0	73.88	6.55	12.99	15.20	0.659	1.15	0.300
	50	78.50	7.90	13.75	16.77	0.720	1.26	0.340
	75	85.40	9.75	15.30	17.50	0.750	1.33	0.375
	100	90.43	10.74	16.77	20.12	0.800	1.67	0.450
Mean		82.05	8.74	14.70	17.40	0.73	1.35	0.366
Organic farm	0	76.30	7.55	13.20	16.70	0.655	1.18	0.320
	50	80.43	8.63	14.65	20.54	0.750	1.30	0.366
	75	86.70	9.77	16.70	22.70	0.822	1.40	0.395
	100	95.44	11.80	18.88	25.60	0.850	1.78	0.420
Mean		84.72	9.44	15.86	21.39	0.77	1.42	0.380
LSD. 5 % organic		1.82	ns	ns	ns	ns	0.11	0.38
LSD. 5 % rate of N		1.37	ns	ns	0.84	0.11	ns	0.08
Interaction		***	***	*	***	ns	***	***

yield of the coriander plant. Badran *et al.* [29] indicated that the applied of compost on vegetative growth traits, plant height, and herb dry weight per plant of coriander plants were increase significantly.

3.1.6 Macronutrient Concentration in Seeds Coriander

Results in Table (5) show that the Effect of organic sources cumbered with mineral N fertilizer different rate on macronutrients i.e. N, P and K concentrations in seeds of (*Coriandrum sativum*, L.) were increase with increasing mineral N fertilizers different rates. The highest values of N, P and K concentrations in seeds were 3.56 % for N; 0.48 % for P and 3.35 % for K respectively, as treating with compost combined with mineral N fertilizer at rate 100 kg N /fed than other treatments. The increase of N, P and K concentration in seeds as treating with organic sources and mineral N fertilizer different rates were no significant. As well as, the interaction between organic sources and mineral N fertilizer different rates give significant increase of P concentration in seeds but the N and K were no significant. Corresponding, relative increases of mean values were 18.42 % for N; 57.69 % for P and 13.58 % for K respectively, concentrations in seeds treated with compost; 5.04 % for N; 46.15 % for P and 9.06 % for K in seeds treated with biochar and 10.07 % for N; 53.85 % for P and 12.45 % for K respectively, treated with organic farm concentration in seeds combined mineral N fertilizer rates compared with control. Therefore, it could be categorized the beneficial effects of the used organic sources resources on the concentrations of N, P and K in seeds (*Coriandrum sativum* L.) into different orders according the amounted increases in seeds, as follows:

Compost > organic farm > biochar > control combined with mineral N fertilizer. These results are in agreement by Salem and Awad [30] reported that the used of organic farm combined mineral N was increase of N, P and K concentration in Coriander.

Badean *et al.*, [29] found that the applied of compost combined mineral fertilizers led to increase of N, P and K concentrations in herb coriander. Amaref *et al.,* [12] reported that the used of organic farm to coriander plant tissue was increase of N, P and K contents while biochar application was moderate compared

Table 5. Macro-micronutrients concentration contents in seeds

Treatments	Rate of N (kgfed^{-1})	Concentration of macronutrients (%)			Concentration micronutrients (mg kg^{-1})		
		N	P	K	Fe	Mn	Zn
Control	100	2.78	0.26	2.65	65.20	35.90	18.90
Compost	0	3.12	0.34	2.67	72.10	38.49	22.35
	50	3.27	0.37	2.88	75.30	42.33	27.49
	75	3.34	0.43	3.15	80.30	45.20	32.10
	100	3.56	0.48	3.35	83.20	48.30	35.55
Mean		3.32	0.41	3.01	77.73	43.58	29.37
Biochar	0	2.74	0.30	2.63	68.40	30.65	17.30
	50	2.85	0.35	2.78	71.90	33.65	20.94
	75	2.99	0.40	2.98	73.20	38.90	24.30
	100	3.08	0.46	3.15	79.40	40.54	29.77
Mean		2.92	0.38	2.89	73.23	35.94	23.08
Organic farm	0	2.76	0.33	2.65	66.50	33.20	18.50
	50	2.96	0.36	2.85	71.98	36.90	21.50
	75	3.18	0.42	3.15	73.60	44.85	25.75
	100	3.32	0.47	3.25	80.30	46.30	30.88
Mean		3.06	0.40	2.98	73.10	40.31	24.16
LSD. 5 % organic		ns	ns	ns	ns	ns	ns
LSD. 5 % rate of N		ns	ns	ns	1.83	1.80	1.80
Interaction		ns	***	ns	***	***	***

with control. Ali *et al.,* [31] suggested that the use of biochar improved photosynthesis, nutrient uptake, and amended gas exchange characteristics in salt-stressed plants. Biochar-mediated intensification in salt tolerance of plants is mainly associated with an enhancement in the properties of soil, thus increasing plant water status, decreasing Na+ uptake, and increasing the uptake of minerals.

3.1.7 Micronutrients concentration in seeds coriander plant

Data in Table (5) show that the increase of micronutrients Fe, Mn and Zn concentrations in seeds were 83.20; 48.30 and 35.55 mg/kg respectively, as affected with compost combined with mineral N fertilizer at 100 kg N/fed, compared other treatments. The effect of organic sources on micronutrients concentration in seeds was no significant, while the mineral N different rates were significant increase Fe, Mn and Zn concentrations with increase of mineral N fertilizer different rates. As well as, the interaction between organic sources and mineral N fertilizer different rates were significant increases for Fe, Mn and Zn concentrations in seeds coriander. The corresponding relative increases of mean values Fe, Mn and Zn concentrations in seeds were 19.22 %, 21.39 % and 55.40 % respectively, as affected with compost combined with mineral N fertilizer different rates compared with control. The relative increase of mean values was 12.32 % for Fe, 0.11 % for Mn and 22.12 % for Zn respectively, as affected with biochar combined with mineral N fertilizer different rates compared with control. Also, the relative increases of mean values were 12.12 % for Fe, 12.28 % for Mn and 27.83 % for Zn respectively, as affect with organic farm combined with mineral N fertilizer different rates compared with control.

According to the obtained concentrations of Fe, Mn and Zn in seeds coriander it could be categorized into different orders, as follows:

Utilization of organic farm and biochar had significant increase effect on Fe, Zn and Mn ($mgkg^{-1}$) concentrations in the coriander plant tissue [12]. The compost application was increase of nutrients and that plants can quickly absorb the compost application was increase of nutrients and that plants can quickly absorb for Coriander plant (*Coriandrum sativum* L.)[32]. Application of biochar and compost combined with mineral N fertilizer different rates to maize plants was significant of Mn and Zn for stover and grains under soil salinity [24]. The organic fertilization applied is role in enhancing N, P , K % , Fe , Mn and Zn contents in coriander plants may be attributed to the fact that organic manure minimizes the loss of nutrients by leaching and forms considerable amounts of humus during the decomposition of organic manure, whether in composts or soils, leads to significant increase in microbial activities in the root zones, improves soil permeability and releases carbon dioxide and certain organic acids during decomposition.

3.1.8 Coriander plant (*Coriandrum sativum* L.) quality

Data presented in Table (6) indicated that the effect of organic sources alone or combined with mineral nitrogen fertilizer different rates were positive effect on protein (%), oil (%), carbohydrate (%), chlorophyll ((mg/g f.w) and proline (mg/g. dr.w) . The highest mean values were 20.77 % for protein, 0.41 % for oil, 20.83 % for carbohydrate and 7.34 mg/g.f.w for chlorophyll respectively while the low values 51.53 mg/g.dr.w for proline content in seeds as affected with compost alone or combined with mineral N fertilizer different rates than other treatments. On the other hand, the oil (%) content in seeds was significant increase with protein, carbohydrate, chlorophyll and proline contents were no significant as treated with organic sources. Also, the oil, carbohydrate, chlorophyll contents in seeds for treated with mineral N fertilizer different rates were significant increase with increasing mineral N fertilizer rates, while the protein and proline content in seeds were no significant. As well as the interaction between mineral N fertilizer different rates and organic sources were significant increase for protein (%), oil (%), carbohydrate (%), chlorophyll ((mg/g f.w) and proline (mg/g. dr.w) respectively.

Corresponding relative increases of mean values were 19.51 % for protein; 41.38 % for oil (%); 15.80 % for carbohydrate and 59.57 % for chlorophyll respectively, contents of coriander plant treated with compost combined with mineral N different rates compared by control. The relative increases of mean values were 4.83 % for protein; 10.34% for oil; 4.66 % for carbohydrate, 27.17 % for chlorophyll respectively, contents in coriander plant treated with biochar combined with mineral N different rates compared by control. As well as, the relative increases of mean values were 9.90 %

Table 6. Quality contents in seeds coriander plant

Treatments	Rate of ($kgfed^{-1}$)	NProtein (%)	Oil (%)	Carbohy drate (%)	Chlorophyll (mg/g f.w)	Proline (mg/g.d.w
Control	100	17.38	0.29	25.76	4.60	75.30
Compost	0	19.50	0.34	26.75	5.77	69.80
	50	20.44	0.37	28.95	7.40	58.30
	75	20.88	0.45	30.77	7.97	45.90
	100	22.25	0.48	32.85	8.20	32.10
Mean		20.77	0.41	29.83	7.34	51.53
Biochar	0	17.13	0.26	23.75	4.88	71.00
	50	17.81	0.30	25.40	5.33	63.20
	75	18.69	0.33	27.80	6.30	56.44
	100	19.25	0.39	30.88	6.90	44.90
Mean		18.22	0.32	26.96	5.85	58.89
Organic farm	0	17.25	0.29	24.90	5.33	69.90
	50	18.50	0.33	26.77	6.95	61.98
	75	19.88	0.35	28.95	7.29	50.88
	100	20.75	0.43	30.85	7.88	40.49
Mean		19.10	0.35	27.87	6.86	55.81
LSD. 5 % organic		ns	0.012	ns	ns	ns
LSD. 5 % rate of N		ns	0.007	0.0650	0.370	ns
Interaction		***	***	***	***	***

for protein; 20.69 % for oil; 8.19 % for carbohydrate and 49.13 for chlorophyll contents in coriander plant treated with organic farm combined with mineral N different rates compared by control. According to the obtained quality of coriander it could be categorized into different orders, as follows:

> Compost > organic farm > biochar > control combined with mineral N fertilizer different rates compared with control.

The relative decreases of mean values were 31.57 %; 21.78 % and 25.88 % for proline content in seeds coriander plant treated with compost, biochar and organic farm respectively, combined with mineral N fertilizer than control. These results are in agreement by Abd El-Azim [24] found that the used of compost was increase of oil (%), oil yield (L/fed), protein (%) and carbohydrate (%) and essential oil composition. Taufiq et al., [33] indicated that the organic farm and compost fertilizer was non-significant in all treated plots. Gahory et al., [34] suggested that the increase of protein (%), chlorophyll content in leaves of coriander plants utilization of compost compared with control. The highest oil (%), oil yield/plant and oil yield/fed were obtained at 10 ton/fed compost. [35-37]. This result might be due to the role of organic material for continues supply of nutrients, growth stimulants, disease suppressors and support biologically diverse and metabolically dynamic process during the plant growth plays an essential role in the biosynthesis of the organic substances Abdou et al (2015).

4. CONCLUSION

It could be used of compost, biochar and organic farm combine with mineral N fertilizer led to improve the chemical properties and increase of available nutrients contents in saline soil. The increase of plant growth, nutrients concentration and quality as organic sources combined with mineral N fertilizer rate.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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