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Effect of Foliar Application of Humic Acid, Em and Mineral Fertilization on Yield and Quality of Carrot Under Organic Fertilization

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ABSTRACT

The current experiment was established in the experimental farm of faculty of agricultural, El-Mansoura University, Egypt, to check the growth, yield and quality of carrot (*Daucus carota* L.) cv. Korea against the interaction application of mineral fertilization at different rates from recommended dose (50, 75 and 100%), foliar application of humic acid and addition of effective microorganisms (EM) all under compost town refuse as organic fertilization during season of 2017-2018. Experiment was laid out in complete randomized design with 14 treatments and each treatment was repeated three times.In general, it can be concluded that fertilizing with compost town refuse + 75% NPK +foliar application of humic acid and effective microorganisms gave the highest mean values of root length, diameter, weight and total yield as well as N, P, K%, Fe, Zn, Cu, Cd (mg kg^{-1}) as chemical components and total soluble soilds, total carotene, total carbohydrates, total sugar and vitamin A as quality parameters comparing with the control (without fertilization). As for soil availability, it was observed the highest mean values only with town refuse over control.

Keywords: Carrot, humic acid, microorganisms and organic fertilization.

INTRODUCTION

Carrot is a cool season crop which has a place to Umbeliferae family. It is one of the main remarkable crops cultivated throughout the world for its palatable roots. Carrot is an incredible source of carotene a precursor of vitamin A, which prevents some forms of cancer, infection and improves vision. It additionally contains thiamin B_1, vitamin C, fibre and riboflavin B_2 in the diet (Fritz, 2013). It additionally contains plentiful amounts of components such as carbohydrates, protein and sodium (Ahmad *et al*., 2004). Carrot fleshy roots are used as vegetables for soups and salads and also steamed or boiled in other vegetable dishes (Amjad *et al*., 2005).

The nutrients are either added to the soil by utilizing mineral fertilizers or by incorporating natural organic manures. The use of mineral fertilizers is the fastest way of expending crop production; almost 30 to 70% increment in yields of crops has been achieved through the use of balanced and optimum mineral fertilizers (Kiran *et al.* 2016). Generally, most carrot growers use inorganic fertilizers to achieve higher yields as unfavorable to the unfertilized fields (Dauda *et al.*, 2008). In the recent past decads, concentrated utilization of substance compost was one of the most appropriate instruments for getting a better return for food security. To get a high return by restricting the utilization of mineral fertilizers and enhancing them with organic based composts is another idea for supportable farming. Now, the cultivators are demonstrating interest in using organic manures principally because of the exorbitant price of imported chemical fertilizers and their freely availability. Organic wastes serve not only as a source of plant nutrients as well as in restoring soil quality, soil fertility and thereby improving the physical, chemical and biological properties of soil. A significant part of organic production component is providing organic sources of nutrients to promote plant growth as well as sustain soil quality (Dimitri and Greene, 2002). One of the most abundant organic material, locally available in Egypt is organic town refuse, which could easily be used as sources of organic material and nutrients.

The use of humic acids enlarge the effectiv eness of fertilizer and nutrient uptake by the root system. (Pena-Mendez *et al.* 2005) This can reduce the required amount of fertilizer by up to 30%, by default reduction of production costs. Lowering the amount of fertilizer is beneficial effect also on the environment. The humic acids can be an excellent foliar fertilizer with action on the development of leaves, roots and fruits (Albayrak and Camas, 2005). He contributes to plant growth by acting on the carbohydrate content of the leaves and stem. These carbohydrates are transported to the roots through the stem once they arrived are released into the soil for use as nutrients for organisms (Kulikova *et al.* 2005). Foliar application of the humic acid based products promotes photosynthesis and improves plant growth and development. In addition, the humic acids act as natural chelating agent or complexing agent for those substances that contribute to plant nutrition. Its effects may be due to many factors, including the natural source and soil pH, concentration of humic substances, and plant species (Tejada *et al.* 2006). A benefit of humic acid because of its ability to form aqueous complexes and complex metal ions with micronutrients as well as may form an enzymatically active complex, which can be carried on reactions that are usually assigned to the metabolic activity of living microorganisms. So, the utilize of these organic substances in such soil showed a good means in that concern (Habashy *et al.* 2008).

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Many farmers have become inspired in EM technology as a method of restoring soil productivity. Effective microorganisms (EM) comprise of a combination of live culturesv of microorganisms including predominant populations of lactic acid bacteria, smaller numbers of photosynthetic bacteria, yeasts, actinomycetes and other types of organisms, isolated from naturally fertile soils, that are useful during crop production (Mohan, 2008). All of these play beneficial roles in roots rheizosphere which improve vegetative growth, yield and quality of plants such onion (Abdel Naby *et al*. 2012) and carrot (Abdel Naby *et al*. 2013).

The study was undertaken to determine the influence of town refuse and recommended rates of chemical fertilizers beside humic acid and EM on chemical composition quality , yield and yield contributing traits of carrots.

MATERIALS AND METHODS

The current experiment was established in the experimental farm of faculty of agricultural, El-Mansoura University, Egypt, to check the growth, yield and quality of carrot (*Daucus carota* L.) cv. Korea against the application of mineral fertilization at different rates from recommended dose, foliar application of humic acid and addition of effective microorganisms (EM) all under compost town refuse as organic fertilizationduring season of 2017.

Experiment was laid out in a complete randomized block design with 14 treatments and each treatment was repeated three times. The treatments included:

1. Control (without fertilizer added).
2. Compost town refuse (CTR) at 15 m^3fed^{-1}.
3. Town refuse + 50% NPK.
4. Town refuse + EM + 50% NPK.
5. Town refuse + H.A + 50% NPK.
6. Town refuse + EM + H.A + 50% NPK.
7. Town refuse + 75% NPK.
8. Town refuse + EM + 75% NPK.
9. Town refuse + H.A + 75% NPK.
10. Town refuse + EM + H.A + 75% NPK.
11. Town refuse + 100% NPK.
12. Town refuse + EM + 100% NPK.
13. Town refuse + H.A + 100% NPK.
14. Town refuse + EM + H.A + 100% NPK.

The chemical and physical properties of the soil are presented in Table (1). Particle size distribution was determined according to the method of Haluschak, (2006). Available N, P and K were determined according to Reeuwijk, (2002). Fe, Zn, Cu and Cd were extracted and determined as mentioned by Mathieu and Pieltain (2003).

Table 1. Physical and chemical properties of the experimental soil.

Particle size distribution (%)				**Textural class**	**EC,dSm^{-1}**	**pH**	**$CaCO_3$**	**O.M**	**SP**
C. Sand sasand	**F. Sand sand**	**Silt**	**Clay**		**(1:5)**	**(1:2.5)**	**(%)**	**(%)**	**(%)**
2.97	19.33	47.16	30.54	**Clay loam**	0.87	7.98	3.61	1.81	62.0
Available element, mg kg^{-1}					DTPA extractable, mg kg^{-1}				
N			P	K Mn	Fe	Zn		Cu	Cd
62.1			6.81	178.2	3.66	1.97		0.29	0.02

Compost town refuse was taken from Mansoura manufactory for organic manure and mixed with surface soil at rate of 15 m^3fed^{-1} then irrigated up to saturation percentages. Then, left for 2 weeks for elucidate the damage on seedlings and their roots resulted from the heat of decomposition. The chemical analysis of organic manure used in this study is shown in Table 2.

Table 2. Chemical composition of the applied compost town refuse.

pH	**EC, dSm^{-1}**	**SP%**	**%**						**mg kg^{-1}**		
(1:10)	**(1:10)**		**OM**	**OC%**	**T.N**	**C/N**	**T.P**	**T.K**	**Pb**	**Ni**	**Cd**
7.83	4.25	95.3	21.15	12.36	0.61	20.26	0.32	0.71	7.67	2.01	0.51

Effective Microorganisms (EM) was obtained from Ministry of Agriculture laboratories Cairo, Egypt. EM at rate of 2 ml/L water and humic acid (4 g.L^{-1}) were sprayed twice, after 6 and 8 weeks from seed sowing.

Ammonium nitrate (33.5% N), Ca-superphosphate (15.5% P_2O_5) and K sulphate (48% K_2O) were the respective sources of N, P and K, respectively. Three treatments of N, P and K fertilizers at rates of 50, 75 and 100 % from the recommended doses for carrot plants, i.e., 60, 40 and 62 kg.fed^{-1} for N, P and K, respectively were used. Treatments of N, P and K fertilizers were divided into two equal doses and applied after 6 and 10 weeks from planting.

Seeds of Korea cultivar were sown at the end of October in plots (3m long and 70 cm wide). So, the experimental plot was 2.1 m^2/plot.

At harvesting stage; 160 days after sowing, root length , diameter (cm), weight (g) and total roots yield (ton/fed) were determined.

Five roots from each treatment were taken after harvesting to determined carrots chemical and quality (N, P and K%) according to the method described by Mertens, (2005a & b) and Agrilasa, (2002) respectively, also, Fe, Zn, Cu, Cd contents were determined according to Kumpulainen *et al*., (1983) and Khazaei *et al*., (2017). Chemical content and TSS%, carotene (mg/100g), total carbohydrates%, T.sugar % were determined according to Sadasivam and Manickam, (1996) and V.A (IU) was estimated according to Aremu and Nweze (2017), as quality parameters.

After harvesting, sample of soil was taken to determined available N, P and K according to Reeuwijk, (2002) as well as DTPA extractable Fe, Zn and Cu were determined using atomic absorption spectrometric methods as mentioned by Mathieu and Pieltain (2003).

The obtained data of experiments were subjected to the statistically analysis of variance procedure and means were compared using LSD method at 5% level of significance according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

1.Yield of carrot:-

Results in Table 3 describe the interaction effect of organic, HA and mineral fertilization on yield of carrot plants after 160 days from sowing date during the studied season.

Root length, diameter (cm), weight (g) and total roots yield (ton/fed) were affected significantly with using all treatments comparing with control. The root length and diameter contribute considerably towards weight and finally yield of carrot. The data indicated that root length and diameter were significantly affected by applying all treatments and the highest significant values from them (16.90 & 4.65 cm) were recorded in plants amended with (Town refuse + EM + H.A + 75% NPK) comparing with the plants from check plots contained the lowest root length and diameter (10.37 & 2.38 cm).

Considerable variations existed in root weight and yield of carrot due to different treatments. The highest root weight (g) and yield (ton/fed) (81. 83 & 13.79, respectively) were recorded with plants amended with (Town refuse + EM + H.A + 75% NPK), which were significantly akin with (Town refuse + EM + H.A + 100% NPK). The lowest root weight and yield (57.63 g & 9.37 ton fed^{-1}) were noticed in control pants.

The results suggested that root length, diameter, weight and yield of carrot were significantly enhanced by full dose of organic manure and 75% from chemical fertilizers and foliar application with humic acid and EM.

Table 3. Interaction effect of mineral fertilization, foliar application of humic acid and EM under compost town refuse on yield and its components.

Treatments	Root length, cm	Root diameter, cm	Root weight, g	Yield ton fed^{-1}
Control	10.37^{k}	2.38^{n}	57.63^{m}	9.37^{n}
Town refuse	10.93^{jk}	2.55^{m}	59.67^{l}	9.72^{m}
Town refuse + 50% NPK	11.30^{ij}	2.73^{l}	61.47^{k}	10.03^{l}
Town refuse + EM + 50% NPK	12.97^{fg}	3.26^{i}	67.30^{h}	11.17^{i}
Town refuse + H.A + 50% NPK	13.40^{ef}	3.43^{h}	69.43^{g}	11.51^{h}
Town refuse + EM + H.A + 50% NPK	13.90^{de}	3.57^{g}	71.07^{f}	11.83^{g}
Town refuse + 75% NPK	11.90^{hi}	2.88^{k}	63.47^{j}	10.43^{k}
Town refuse + EM + 75% NPK	16.60^{a}	4.27^{c}	79.50^{b}	13.30^{c}
Town refuse + H.A + 75% NPK	14.90^{c}	3.92^{e}	75.53^{d}	12.62^{e}
Town refuse + EM + H.A + 75% NPK	16.90^{a}	4.65^{a}	81.83^{a}	13.79^{a}
Town refuse + 100% NPK	12.37^{fg}	3.06^{j}	65.47^{i}	10.74^{j}
Town refuse + EM + 100% NPK	15.67^{b}	4.10^{d}	77.60^{c}	12.99^{d}
Town refuse + H.A + 100% NPK	14.47^{cd}	3.74^{f}	73.87^{e}	12.28^{f}
Town refuse + EM + H.A + 100% NPK	16.67^{a}	4.47^{b}	80.73^{ab}	13.59^{b}
LSD $_{at\ 5\%}$	0.63	0.14	1.38	0.18

2.Chemical content:

N, P and K concentration:

N, P and K concentration of carrot are presented in Table (4) as affected by the interaction of mineral fertilization at different rates, foliar application of EM and humic acid under organic fertilization with town refuse.

Data presented in Table (4) show high significant increase in N, P and K concentrations of carrot due to the effect of treatments under investigation. Illustrated data found that all treatments significantly affected N, P and K concentration. Treatment of town refuse only was over control. The highest values were (1.78, 0.311 and 2.78%) for N, P and K, respectively, which obtained with Town refuse + EM + H.A + 75% NPK followed by Town refuse + EM + H.A + 100% NPK. On the other hand, the lowest values (0.84, 0.193 and 1.74%) were recorded with the control treatment.

Table 4. Interaction effect of mineral fertilization, foliar application of humic acid and EM under compost town refuse on N, P and K concentration of carrot roots.

Treatments	N%	P%	K%
Control	0.84^{m}	0.193^{n}	1.74^{m}
Town refuse	0.91^{l}	0.205^{m}	1.82^{l}
Town refuse + 50% NPK	0.99^{k}	0.212^{l}	1.92^{k}
Town refuse + EM + 50% NPK	1.18^{i}	0.241^{i}	2.12^{h}
Town refuse + H.A + 50% NPK	1.25^{h}	0.250^{h}	2.23^{g}
Town refuse + EM + H.A + 50% NPK	1.32^{g}	0.258^{g}	2.28^{g}
Town refuse + 75% NPK	1.03^{k}	0.220^{k}	1.98^{j}
Town refuse + EM + 75% NPK	1.61^{c}	0.293^{c}	2.61^{c}
Town refuse + H.A + 75% NPK	1.46^{e}	0.273^{e}	2.43^{e}
Town refuse + EM + H.A + 75% NPK	1.78^{a}	0.311^{a}	2.78^{a}
Town refuse + 100% NPK	1.11^{j}	0.229^{j}	2.05^{i}
Town refuse + EM + 100% NPK	1.52^{d}	0.285^{d}	2.54^{d}
Town refuse + H.A + 100% NPK	1.39^{f}	0.265^{f}	2.36^{f}
Town refuse + EM + H.A + 100% NPK	1.70^{b}	0.302^{b}	2.71^{b}
LSD $_{at\ 5\%}$	0.05	0.005	0.06

Fe, Zn, Cu and Cd:

Concerning the effect of mineral fertilization at different rats, foliar application of humic acid and EM under compost town refuse, data in Table (5) reflect that the nutrients of Fe, Zn, Cu and Cd (mg kg^{-1}) of carrots significantly were affected with all treatments under investigation.

Table 5. Interaction effect of mineral fertilization, foliar application of humic acid and EM under compost town refuse on Fe, Zn, Cu and Cd (mg kg^{-1}) of **carrot roots.**

Treatments	Fe	Zn	Cu	Cd
	(mg kg^{-1})			
Control	38.57^{m}	27.63^{m}	8.29^{n}	1.39^{m}
Town refuse	40.13^{l}	28.83^{l}	8.64^{m}	1.49^{l}
Town refuse + 50% NPK	41.57^{k}	30.00^{k}	8.98^{l}	1.62^{k}
Town refuse + EM + 50% NPK	46.53^{h}	33.30^{i}	10.06^{i}	1.93^{h}
Town refuse + H.A + 50% NPK	47.83^{g}	34.53^{h}	10.44^{h}	2.04^{g}
Town refuse + EM + H.A + 50% NPK	49.37^{f}	35.90^{g}	10.79^{g}	2.15^{f}
Town refuse + 75% NPK	43.30^{j}	31.17^{j}	9.32^{k}	1.72^{j}
Town refuse + EM + 75% NPK	53.83^{c}	40.83^{c}	12.23^{c}	2.59^{b}
Town refuse + H.A + 75% NPK	51.17^{e}	38.47^{e}	11.53^{e}	2.37^{d}
Town refuse + EM + H.A + 75% NPK	57.10^{a}	43.23^{a}	13.07^{a}	2.78^{a}
Town refuse + 100% NPK	44.90^{i}	32.60^{i}	9.68^{j}	1.85^{i}
Town refuse + EM + 100% NPK	52.53^{d}	39.70^{d}	11.88^{d}	2.49^{c}
Town refuse + H.A + 100% NPK	50.60^{e}	37.17^{f}	11.12^{f}	2.28^{e}
Town refuse + EM + H.A + 100% NPK	55.33^{b}	42.07^{b}	12.52^{b}	2.71^{a}
LSD $_{at\ 5\%}$	1.07	1.09	0.21	0.08

As for using compost town refuse alone, significantly increase was observed in Fe, Zn, Cu and Cd of carrot over the control by (4.05, 4.34, 4.22 and 7.19%) for Fe, Zn, Cu and Cd, respectively comparing with control.

The interaction effect among all treatments increased significantly all traits under investigation. The highest mean values were (57.10, 43.23, 13.07 and 2.78 mg kg^{-1}) observed with the treatment of town refuse + EM + H.A + 75% NPK comparing with the lowest values with control treatments (38.57, 27.63, 8.29 and 1.39 mg kg^{-1}), then followed with nearly mean values of Town refuse + EM + H.A + 100% NPK.

3.Quality of carrots:

The parameters used for measuring quality in this study are total soluble soilds, total carotene, total carbohydrates, total sugar and vitamin A in the roots of carrot.

Results in Table (6) describe the interaction effect of soil addition of mineral fertilization, himic acid and effective microorganisms by foliar way with compost town refuse after 160 days planting.

Data in the same Table showed that adding compost town refuse alone significantly increased the average values of all quality parameters comparing with the control, but the highest mean values of total soluble solids, total carotene, total carbohydrates, total sugar and vitamin A in the roots of carrot were indicated with interaction of addition of compost town refuse with 75% from recommended dose and foliar application of humic acid and EM followed by treatment of the same with 100 % from recommended dose comparing with the lowest average values, which recorded with control

Table 6. Interaction effect of mineral fertilization, foliar application of humic acid and EM under compost town refuse on quality parakeets of carrots roots.

Treatments	TSS (%)	Carotene (mg/100g)	T.carbohydraties (%)	T.sugar (%)	V.A (IU)
Control	7.32^{f}	7.29^{n}	22.14^{n}	7.90^{l}	16610^{i}
Town refuse	7.43^{ef}	7.48^{m}	22.68^{m}	8.14^{k}	16550^{i}
Town refuse + 50% NPK	7.52^{def}	7.74^{l}	23.14^{l}	8.21^{k}	16898^{hi}
Town refuse + EM + 50% NPK	7.84^{b-f}	8.33^{i}	24.59^{i}	8.66^{h}	17312^{fgh}
Town refuse + H.A + 50% NPK	7.93^{b-f}	8.52^{h}	25.10^{h}	8.81^{g}	17523^{efg}
Town refuse + EM + H.A + 50% NPK	8.02^{b-f}	8.76^{g}	25.64^{g}	8.97^{f}	17753^{def}
Town refuse + 75% NPK	7.61^{def}	7.95^{k}	23.62^{k}	8.37^{j}	16977^{hi}
Town refuse + EM + 75% NPK	9.43^{a}	9.65^{c}	27.55^{c}	9.57^{c}	18576^{ab}
Town refuse + H.A + 75% NPK	8.23^{bcd}	9.24^{e}	26.55^{e}	9.25^{e}	18222^{bcd}
Town refuse + EM + H.A + 75% NPK	8.56^{b}	10.15^{a}	28.55^{a}	9.87^{a}	18955^{a}
Town refuse + 100% NPK	7.71^{c-f}	8.15^{j}	24.08^{j}	8.52^{i}	17170^{gh}
Town refuse + EM + 100% NPK	8.29^{bcd}	9.44^{d}	27.05^{d}	9.43^{d}	18389^{bc}
Town refuse + H.A + 100% NPK	8.12^{b-e}	8.96^{f}	26.08^{f}	9.12^{e}	17938^{cde}
Town refuse + EM + H.A + 100% NPK	8.47^{bc}	9.91^{b}	28.10^{b}	9.74^{b}	18749^{ab}
LSD $_{at\ 5\%}$	0.79	0.17	0.30	0.13	541.05

3.Soil nutrients availability:

Concentration of available N, P, K as well as DTPA-extractable Fe, Zn and Cu mg.kg^{-1} found in the experimental soil after cropping with carrot as affected with soil addition, are showed in Figures (1 to 6).

Concentration of N and P in the soil after cropping as indicated in Figures (1, 2 and 3) were generally decreased less than the control as affected by adding treatments. Using CTR as source of organic manure after control recorded the highest values of available N, P and K.

In the following Figures (4, 5 and 6), the interaction effect of different treatments was significantly affected concentration of DTPA-extractable Fe, Zn and Cu mg kg^{-1} in the soil after harvesting carrot crop. The highest mean values were recorded with control, all treatments under investigation decreased concentration of Fe, Zn and Cu, treatment of town refuse came after control recorded the highest mean values.

These results may be due to the effect of roots activity on decreasing of soil pH, consequently increase the availability of these metals. On the other hand, the content of elements increased with adding the studied organic manure, which already contained moderately amount of these elements, but the average values of nutrients in the soil tended to be over that obtained.

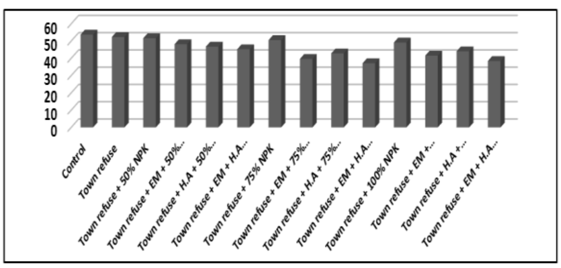

Fig 1: Interaction effect of mineral fertilization, foliar application of humic acid and EM under compost town refuse on available N

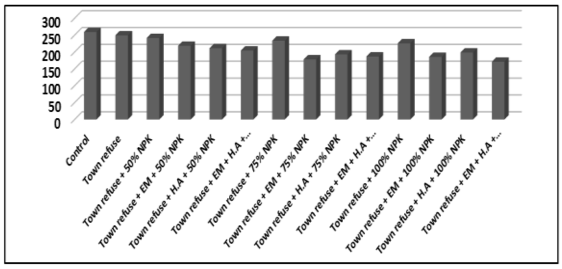

Fig 2: Interaction effect of mineral fertilization, foliar application of humic acid and EM under compost town refuse on available K

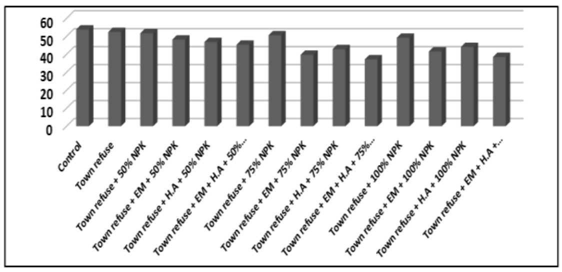

Fig 3: Interaction effect of mineral fertilization, foliar application of humic acid and EM under compost town refuse on available P

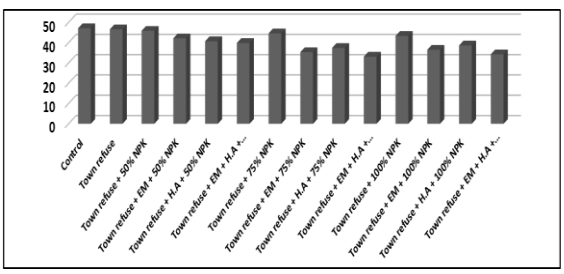

Fig 4: Interaction effect of mineral fertilization, foliar application of humic acid and EM under compost town refuse on DTPA extractable Fe mg.kg-1

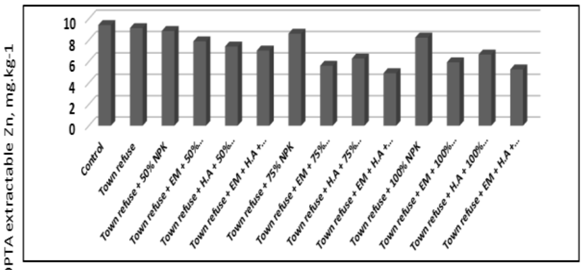

Fig 5: Interaction effect of mineral fertilization, foliar application of humic acid and EM under compost town refuse on DTPA extractable Zn mg.kg-1

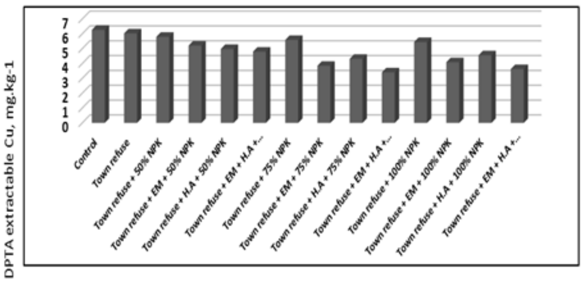

Fig 6: Interaction effect of mineral fertilization, foliar application of humic acid and EM under compost town refuse on DTPA extractable Cu mg.kg-1

In this respect, Kara *et al.*, (2004) indicated that the addition of CRT to the soil could be enriched soil fertility if it is found applicable and feasible. Moreover, minerals will prefer to be chelated form with organic acids compounds. By this way, extractable elements concentrations will be minimized by using organic material. Similar results were recorded by Awokunmi *et al*., (2015).

Obtained results can be discussed by clarifying the direct and indirect effects of used treatments on chemical content, quality, yield and its component of carrot roots as follows:

Effect of compost fertilization:

Addition of organic manures in form of compost town refuse under this investigation in single form gained less vigor comparing with interaction with other treatments on plant chemical content, quality, yield and its components of carrot as compared to (control). These outcomes could be clarified on the basis of; mineral fertilizers are available forms of soil nutrients, which can be moved much and be more mobilized and readily than organic manure. Organic manure as compost town refuses release nutrients very slowly to the plants. In this way, it is unable for supply excess required amount of nutrients in the critical period of plant growth. This may be due to the probable reason for the higher yield produced by the inorganic fertilizer applied for carrot plant. On a smiler line, the positive effects of compost on chemical, physical and biological properties of soil, where organic matter improves ventilation, soil drainage and increases the soil ability to water retention. It is known that compost is used as a soil amendment which increases availability of elements and improves holding capacity of soils which in turn influences the growth and increases plants production. Due to all these positive effects of compost on yield and its components of carrot,which were significantly improved. Our findings are in agreement with those obtained by Oroka, (2012); Abdel Naby *et al.*, (2013).

Effect of bio-fertilizers (effective microorganisms):

EM consists of Lactic acid bacteria, Yeasts, Actinomycetes and Photosynthetic bacteria (Xu 2000). The positive impacts of EM may be due to its components of these microorganisms and its performance on enhancing growth and yield of carrot plants whether directly or indirectly. Siqueira *et al.*, (2012), Abdel Naby *et al.*, (2013).

Effect of Humic acid:

Using humic acid as growth regulator may have a lot biochemical impacts either at cell wall membrane permeability level or the cytoplasm including increment respiration rates and photosynthesis in plants leading to promoting the nutrients uptake through the stimulation of microbiological activity.

These results matched well with those obtained by Abou El-Nasr and Ibrahim, (2011); Dinu *et al*., (2012).

Effect of NPK:

It can attribute these results, to the indirect and direct influences of NPK nutrients on vegetative growth parameters of carrot which reflected on improvement of yield and quality.

The addition of 75% from used NPK gave the highest values of yield. The obtained results may be due to the positive effects of N, P and K elements on plant growth and translocation of carbohydrates from the leaves to carrot roots which reflected on yield and quality. Our findings are in agreement with those obtained by Ashwini kumar *et al.*, (2007), Abdel Naby *et al.*, (2013).

The interactive effect between compost, bio-fertilizer (EM), humic acid and 75% NPK as well as compost gave the highest values of aforementioned parameters. These results can be attribute to the positive collection effects of organic, bio and mineral fertilization on vegetative growth and yield of carrot plants. These results are in the same line with those obtained by Bruno *et al.* (2007), Abdel Naby *et al.*, (2013).

CONCLUSION

From the above mentioned results it was noticed that fertilization with compost town refuse plus bio-fertilizer (EM) + humic acid and 75% NPK gave the highest values of yield of carrot roots, also, the economical, environmental and quality parameters point of view, and gave the highest values of carrot quality parameters.

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تأثير الرش بالهيوميك أسيد والكتلة الحيوية والتسميد المعدني على المحصول وجوده الجزر تحت التسميد العضوي

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تم اجراء التجربة في مزرعة كليه الزراعة جامعه المنصورة خلال ٢٠١٨ للتحقق من نمو ومحصول وجوده نبات الجزر صنف كوريا تحت تأثير معاملات مختلفة من التفاعل المشترك لإضافة التسميد المعدني بمعدلات (٥٠، ٧٥ و١٠٠% من الموصي به) والرش بحمض الهيوميك والكتلة الحيوية جميعها تحت الإضافة الثابتة من السماد العضوي (سماد قمامه المدن) خلال موسم ٢٠١٧-٢٠١٨. صممت التجربة في قطاعات كامله العشوائية لـ ١٤ معامله مختلفة كررت ٣ مرات. انتهت الدراسة إلى أن إضافة سماد القمامة مع ٧٥% من التسميد المعدني والرش بحمض الهيوميك والكتلة الحيوية أدى للحصول على اعلى قيم للصفات طول، قطر، وزن الجذر والمحصول الكلى كذلك محتوى الجذر من النيتروجين، الفوسفور، البوتاسيوم، الحديد، الزنك، النحاس، الكادميوم بالإضافة الى صفات الجودة من الاملاح الكلية الذائبة، الكاروتين، الكربوهيدرات الكلية، السكريات الكلية وفيتامين أ جميعها كمصدر لحلاوة الجذر مقارنه بالكونترول. أما بالنسبة لمحتوى التربة بعد الحصاد من النيتروجين والفوسفور والحديد والنحاس والزنك كانت اعلى المستويات عند إضافة سماد قمامه المدن كمعامله مدروسة بعد معامله الكونترول التي سجلت اعلى القيم.