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SUCCESSFUL APPLICATION OF NATURAL ORGANIC NUTRIENT TO PRODUCE SAFETY YIELD OF GARLIC (*Allium sativum* L.)

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ABSTRACT

Two field experiments were conducted during the two successive winter seasons of 2012 / 2013 and 2013/ 2014 at Al-Bramoon experimental Farm, Hort. Res. Institute, El-Dakahlia Governorate to study the suitable time for soaking garlic cloves in compost tea before planting and the effect of foliar applications numbers with compost tea on garlic plants for one or twice or three times at 30, 60 and 90 days after planting and soil application with irrigation on garlic cv. (Sids 40). The used experimental design was split plot with three replicates. Soaking garlic cloves in compost tea before planting treatments represented the main plots for control, 12 and 24 hours, and the subplots were assigned to the foliar spraying by compost tea, once at 30 days after planting, twice times at 30 and 60 days after planting , three times at 30, 60 and 90 days after planting and soil application at rate of 200 L./fed with irrigation water.

Results showed that soaking garlic cloves in compost tea before planting significantly increased the most of studied parameters, vegetative parameters i.e., plant height, neck and bulb diameters, leaves number/plant, fresh and dry weight/plant and concentration of chlorophyll in both seasons of study. This treatment also, significantly increased the total yield (tones/fed), fresh weight/bulb, clove weight and significantly decreased cloves number/bulb and significantly increased the concentration of chemical composition i.e., N%, P%, K%, and volatile oils% and significantly decreased the nitrate contents in garlic bulbs in both seasons.

Foliar spraying by compost tea on garlic plants three times at 30, 60 and 90 days after planting significantly increased the most of studied parameters, vegetative parameters i.e., plant height, bulb diameter, fresh and dry weight/plant and concentration of chlorophyll in both seasons, yield parameters i.e., the total yield (tones/fed), fresh weight/bulb, clove weight and significantly decreased cloves number/bulb and significantly increased the concentration of chemical composition i.e., N%, P%, K%, and volatile oils% and significantly decreased the nitrate contents in garlic bulbs in both seasons.

Regarding to the interaction soaking garlic cloves in compost tea before planting and foliar spraying by compost tea on garlic plants three times at 30, 60 and 90 days after planting significantly increased the most of studied parameters vegetative parameters i.e., plant height, bulb diameter, fresh and dry weight/plant and concentration of chlorophyll in both seasons, yield parameters i.e., the total yield (tones/fed), fresh weight/bulb, clove weight and significantly decreased cloves number/bulb and significantly increased the concentration of chemical composition i.e., N%, P%, K%, and volatile oils% and significantly decreased the nitrate contents in garlic bulbs in both seasons. Therefore, the treatment (soaking garlic cloves in compost tea for 24 hours and foliar spraying by compost tea on garlic plants three times at 30, 60 and 90 days after planting) could be recommended for raising garlic safety yield and improving bulb quality under similar conditions to this work

INTRODUCTION

Garlic (*Allium sativum L.*) is one of the most important bulb vegetable crops and is next to onion in importance. It is commonly used as a spice or in the medicinal purposes. In Egypt, it has been generally cultivated for both local consumption and export. Therefore, increasing garlic yield and improving bulb quality are essential aims for both growers and consumers, but it usually depends on many factors especially that influence the plant growth throughout the growth period.

The simplest definition of compost tea is a brewed water extract of compost. Compost tea production is therefore, a cold brewing process, allowing growth of the organisms extracted from the compost. Plant growth is typically improved, although the correct mixes of beneficial organisms need to be matched to the type of plant (Ingham *et al.* 1985). Compost is the main ingredient in compost tea, but in order to increase organism biomass and activity, other foods are added at the beginning of the brewing period. New recipes are always being tested with the goal of achieving higher microbial biomass, better plant production, better soil structure, better nutrient cycling and less disease. Different kinds of aerated and non-aerated compost tea will provide the proper biology for different situations and will be ever-more integral parts of sustainable agriculture. Compost teas high in nutrients are often applied as a fertilizer through foliar sprays or soil drenches(Ingham, 2005). Naidu *et al*. (2010) indicate that compost tea contains different microbial population, included Pseudomonas spp (10^7 to 10^8), Lactic acid bacteria (10^7 to 10^8), Actinomycete ($10^7$to 10^8), Yeasts (10^4 to 10^7), Trichoderma spp (10^5 to 10^7), other fungi (10^4 to 10^5) and bacteria (10^7 to 10^9). The concept of compost tea is becoming increasingly popular in organic agriculture. Compost tea is simply a liquid solution form of compost that has been soaked in water. The solution produced from the soaking contains nutrient is known as compost tea. Research has documented that compost teas suppress diseases in organic systems (Haggag and Saber, 2007; Hibar *et al*., 2006). Other benefits of compost tea are the stimulation of root and vegetative growth (Hibar *et al*., 2006). Compost teas have been also found to increase crop yields and produce quality (Haggag and Saber, 2007). Compost tea also produced plant hormones; mineralize plant available nutrients, fixes nitrogen and providing useful microorganisms that colonize leaf surface (Edris *et al*., 2003). Using compost tea as a seed soaking might begin at 1967 according to Rodale(1967). Schmitz (2002) showed that compost tea is proper than solid compost, because it can be used as a seed treatment (soaking) for seed or propagation materials before planting. Scharven (2004) mentioned that compost tea reduces the plant stress and suppress the pathogen numbers in soil or on the plant areal parts. Also, it is not toxic and save to human and pits. Soaking the seeds in the compost tea performed by Zucconi *et al.* (1981) also, Smith and Hughes (2001), all of them found a positive response.

Warman (1999) studied three types of compost tea on the seed germination of beans, corn, cucumber, sunflower, broccoli, Chinese cabbage,

radish, tomato, cress, amaranths, carrot and lettuce. He found that vegetables seeds give a good germination with all type of compost tea.

The main object of this work was to study the effect of soaking garlic cloves in compost tea at two different times and the most effective times of foliar application and/or soil application of compost tea with irrigation on garlic plants cv. Sids- 40.

MATERIALS AND METHODS

Two field experiments were conducted at Al-Bramoon Experimental Farm, Hort. Res. Institute, El-Dakahlia Governorate during the two successive winter seasons of 2012/2013 and 2013/2014 to study the suitable time for soaking garlic cloves in compost tea and the effect of foliar application numbers with compost tea on garlic plants for one or twice or three times at 30, 60 and 90 days after planting and soil application with irrigation on garlic cv. (Sids 40).

Randomized samples were collected from the experimental soil at 0.0 to 30.0 cm depth, before planting to determine the physical and chemical properties in accordance to the method of Page (1982). Data of soil analysis is presented in Table (1).

Table (1): Some physical and chemical of the experimental soil surface layer (at the depth of 0 – 30 cm) before planting in 2012/13 (S1) and 2013/14 (S2) seasons.

Properties	Values		Properties	Values	
	S1	S2		S1	S2
Sand (%)	26.5	26.7			
Silt (%)	32.1	32.2	pH*	7.6	7.8
Clay (%)	41.4	41.1	EC (dSm^{-1} at25°c)**	0.7	0.7
Texture class	Clay-loam	Clay- loam	Total N (%)	0.15	0.16
$CaCo_3$	3.2	3.4	Available P (ppm)	10.5	11.1
OM (%)	2.2	2.4	Exchangeable K (ppm)	289	295

***pH: (1:2.5 soil extract). ** EC : soil paste**

A split plot design in a randomized complete block with three replicates was used. The main plots were assigned to: soaked garlic cloves in:-

-Tap water only.
- Compost tea extract for 12h.
- Compost tea extract for24 h.

The subplots were devoted to five treatments with: -

-Foliar application with tap water only.
- Foliar application with compost tea one time after 30 days from planting.
-Foliar application with compost tea twice times after 30 and 60 days from planting.
- Foliar application with compost tea three times after 30, 60 and 90 days from planting.
- Soil application with irrigation at rate of 200 L /fed.

The subplot area was 10.5 m^2 (included 5 ridges 3.5 m. long and 0.6 m. width). Each treatment was separated by two guard ridges.

Preparation of compost tea

Compost tea was prepared from matured compost made from rice straw, farmyard manure, bentonite, rock phosphate, elemental sulfur and urea which had been composted in an aerobic heap for three months. To prepare the compost tea, ten Kg of matured compost blended with one Kg molass, 500g $(NH_4)_2$ SO_4, 50g $MgSO_4.7H_2O$ and 10g NaCl in a 150 litter plastic barrel, these ingredients in 100 litter tap water (previously stored to avoid the harmful effect of Cl_2 on microbial load of compost). This mixture had been allowed to stand in a shaded place for 7 days with a suitable daily stirring by an air compressor using a PVC pipe dipped in the barrel. After elapsing of incubation time, liquid mixture was filtered on a 100 mesh screen and became ready to use. The main traits of the produced compost tea are shown in table (2) Abdel-Wahab *et al*. (2007). The source of compost was from The Egyptian Company Agricultural for Recycling Organic wastes (ECAROW). The chemical properties of the compost used for preparation of compost tea was as follow:-

Moisture 24%, OM 23.26%, Ash 76.74%, Total N 0.78%, Total P 0.48%, Total K 0.82%, C/N Ratio 17.29 : 1, EC 2.68 and pH 7.87

Table (2) chemical and microbiological traits of compost tea

Trait	Compost tea
pH	6.94
E. C. (d s m^{-1} at 25° c)	3.95
Total- N %	0.82
Total –P %	0.14
NH_4^+ - N ppm	84.7
NO_3^- - N ppm	11.5
Total soluble N ppm	97.6
Available P ppm	21.7
Available K ppm	194
Extractable Fe ppm	19.1
Extractable Zn ppm	6.9
Extractable Mn ppm	3.2
Extractable Cu ppm	1.9
Total count of bacteria cfu/ml	$7.5x10^7$
Total count of fungi cfu/ml	$7.4x10^5$
Total count of actinomycetes cfu/ml	$1.2x10^6$

Garlic cloves were planted in the first week of October in both seasons. The uniform garlic cloves were cultivated by hand –planted at 10 cm apart on two sides of each ridge. All the plants were fertilized with ammonium sulfate (20.6% N) at rate of 120 kg N /fed., calcium super phosphate (15.5 % P_2O_5) at rate of 75 kg P_2O_5 /fed. and potassium sulfate (48 % K_2O) at rate of 72 kg K_2O/fed. Fertilizers were added in two equal portions. The first portion of calcium super phosphate and potassium sulfate were broadcasted during soil preparation and the second portion of calcium super phosphate was added with the first portion of N at 30 and

60 days after planting and the second portion of potassium sulfate was added at 60 days after planting. The other agricultural practices for garlic commercial production were conducted according to the recommendations of the Ministry of Agric. in Egypt. The harvest time was in the first week of April for both seasons.

Data recorded:

1-Growth parameters : a random samples of ten plants was taken from each plot after 120 days from planting, cleaned from the dust, and dried at 70 °C till constant weight to estimate plant height, number of leaves /plant, neck diameter /plant, bulb diameter /plant, fresh weight /plant, dry weight /plant and bulbing ratio, It was measured as reported by Mann(1952).

$$\text{Bulbing ratio} = \frac{\text{Neck diameter (cm)}}{\text{Bulb diameter (cm)}}$$

Diameters of both plant neck and bulbs were determined by caliper, and total chlorophyll (was measured as SPAD units using Minolta SPAD -501 chlorophyll Meter, Minolta Co. Ltd. Japan).

2-Yield and its components : at harvest time , marketable bulbs of each plot were cured, 15 days after harvest weighted in kg and converted to record as total yield (ton/fed). A random sample (5 bulbs) was taken from each treatment to determine bulb fresh weight (g) , as well as number of cloves/bulb and clove weight (g).

3-Chemical analysis : samples of dried cloves were ground, wet digested as described by Hesse (1971) and their nitrogen (N), phosphorus (P) and potassium (K) contents were determined according to the methods described by Bremner and Mulvaney (1982), Olsen and Sommers (1982) and Jackson (1970), respectively. The volatile oils percent was determined according to the method of Guenther (1961).

The statistical analysis : all data were analyzed statistically by the analysis of variance using CoStat software(CoHort Software,Monterey,USA). Mean comparisons were conducted using an ANOVA utilizing the least significant difference (LSD) ($P<0.05$)test.

RESULTS AND DISCUSSION

1- Vegetative growth :-

Data presented in (Tables 3 and 4) show that the effect of compost tea on garlic cloves soaked in. Soaking garlic cloves in compost tea for 24 hours before planting significantly increased the vegetative growth parameters i.e. plant height, neck diameter/plant, bulb diameter/plant, leaves number/plant, plant fresh weight, plant dry weight and chlorophyll SPAD units in both seasons and this treatment significantly decreased the cloves number/bulb . The highest value of cloves number obtained by soaking garlic cloves in water treatment in both seasons. These results were in agreement with those of Warman (1999), Smith and Hughes (2001) and Haggag and Saber, (2007).

Table(3) plant height, neck diameter, bulb diameter and bulbing ratio as affected by compost tea seed soaking and foliar application on garlic plants at 2012/2013 (S1) and 2013/2014 (S2).

Treatments		Plant height cm		Neck diameter cm		Bulb diameter cm		Bulbing ratio	
		S 1	S 2	S 1	S 2	S 1	S 2	S 1	S 2
Factor A									
Soaking in water		66.28	66.54	0.59	0.62	2.84	2.76	0.21	0.22
Soaking in compost tea 12 h.		67.84	69.01	0.59	0.67	3.30	3.38	0.18	0.20
Soaking in compost tea 24 h.		71.01	71.90	0.69	0.77	3.75	3.81	0.18	0.20
L S D 0.05		0.50	0.44	0.02	0.04	0.10	0.12	0.01	0.01
Factor B									
Without		63.02	62.91	0.51	0.52	2.73	2.76	0.19	0.19
Spray 1 time		65.95	66.27	0.58	0.65	3.03	3.07	0.19	0.21
Spray 2 times		69.40	70.01	0.64	0.68	3.36	3.32	0.19	0.21
Spray 3 times		71.96	73.39	0.70	0.76	3.54	3.55	0.20	0.22
Soil appl. With irrigation		71.55	73.15	0.70	0.81	3.83	3.87	0.18	0.21
L S D 0.05		0.37	0.46	0.05	0.05	0.10	0.10	0.01	0.02
Factor A	Factor B	Interaction							
Soaking in water	Without	61.09	62.00	0.46	0.43	2.16	2.20	0.21	0.19
	Spray 1 t.	64.72	64.40	0.56	0.60	2.53	2.46	0.22	0.24
	Spray 2 t.	67.18	67.43.	0.63	0.63	2.86	2.60	0.22	0.24
	Spray 3 t.	68.83	69.54	0.66	0.70	3.06	2.90	0.21	0.24
	Soil appl.	68.75	69.30	0.63	0.73	3.60	3.63	0.17	0.20
Soaking in compost tea 12 hours	Without	63.13	62.99	0.50	0.56	2.66	2.66	0.18	0.21
	Spray 1 t.	65.58	66.67	0.53	0.63	3.00	3.06	0.18	0.21
	Spray 2 t.	68.93	70.76	0.56	0.66	3.43	3.53	0.16	0.19
	Spray 3 t.	70.85	72.44	0.66	0.73	3.53	3.66	0.19	0.20
	Soil appl.	70.70	72.16	0.70	0.76	3.90	4.00	0.18	0.19
Soaking in compost tea 24 hours	Without	64.02	63.74	0.56	0.56	3.36	3.43	0.17	0.17
	Spray 1 t.	67.56	67.74	0.63	0.73	3.56	3.70	0.18	0.20
	Spray 2 t.	72.07	71.83	0.73	0.76	3.80	3.83	0.19	0.20
	Spray 3 t.	76.18	78.18	0.76	0.86	4.03	4.10	0.19	0.21
	Soil appl.	75.21	77.99	0.76	0.93	4.00	4.00	0.19	0.23
L S D 0.05		0.63	0.80	0.09	0.09	0.18	0.17	0.03	0.03

Without= foliar application with water, spray 1 t. = foliar application with compost tea one time, spray 2 t. = foliar application with compost tea twice times, spray 3 t. = foliar application with compost tea three times, soil appl.= soil application with irrigation water.

Also, data presented in (Tables 3 and 4) show that the foliar application of compost tea three times at 30, 60 and 90 days after planting treatment significantly increased vegetative growth parameters, i.e. plant height, bulbing ratio, plant fresh weight in both seasons and leaves number/plant in the second season, plant dry weight in the first season and chlorophyll SPAD units in the second season. Meanwhile, the highest value of leaves number/plant in the first season obtained by foliar application of compost tea twice times at 30 and 60 days after planting treatment, the highest value of plant dry weight in the second season obtained by soil application of compost tea at rate of 200 L./fed with water irrigation and the highest value of chlorophyll SPAD unit in the first season. These were in agreement with Abd

El-Aal (2012) on ananas melon and Shaheen *et al*. (2013) on onion. They found that these increment may be due to both supply nutrients macro and micronutrients in compost tea substrate which including N, P, Fe, Zn, Mn, and Cu and microbial functions(as useful microorganisms increase the time stomata stay open, then reducing less from the leaf surface). It can provide chelated microelements and make them easier for plants to absorb and increasing soil aeration and acidity.

Table (4) Leaves number, plant fresh weight, plant dry weight and chlorophyll SPAD units as affected by compost tea seed soaking and foliar application on garlic plants at 2012/2013 (S1) and 2013/2014 (S2).

Treatments		Leaves number		Plant fresh weight g		Plant dry weight g		Chlorophyll SPAD unit	
		S 1	S 2	S 1	S 2	S 1	S 2	S 1	S 2
Factor A									
Soaking in water		9.65	9.73	51.55	52.27	15.50	15.96	96.12	95.56
Soaking in compost tea 12 h.		9.82	9.89	53.97	54.51	16.73	17.02	97.40	96.95
Soaking in compost tea 24 h.		10.25	10.16	59.14	59.08	18.72	18.23	98.59	98.18
L S D 0.05		0.29	0.50	0.64	0.31	0.36	0.12	0.20	0.13
Factor B									
Without		9.09	9.24	47.85	48.61	14.75	14.92	96.10	95.97
Spray 1 time		9.84	9.80	51.53	52.86	16.00	16.12	97.10	96.53
Spray 2 times		10.29	10.11	55.54	56.30	17.23	17.27	97.57	96.97
Spray 3 times		10.11	10.31	59.90	59.93	18.60	18.38	98.02	97.64
Soil appl. With irrigation		10.22	10.17	59.61	58.72	18.34	18.65	98.07	97.54
L S D 0.05		0.24	0.24	0.52	0.71	0.18	0.23	0.24	0.08
Factor A	Factor B	Interaction							
Soaking in water	Without	8.20	8.53	43.98	44.28	12.89	13.28	94.90	94.79
	Spray 1 t.	9.26	9.26	48.37	49.69	14.51	14.90	95.87	95.21
	Spray 2 t.	10.06	10.00	53.12	54.34	15.90	16.29	96.32	95.56
	Spray 3 t.	10.20	10.46	56.38	57.32	16.91	17.19	96.60	95.90
	Soil appl.	10.53	10.40	55.90	55.72	17.27	18.11	96.91	96.32
Soaking in compost tea 12 hours	Without	9.26	9.20	48.78	49.76	15.12	15.42	96.15	96.08
	Spray 1 t.	9.60	9.60	51.22	51.71	15.87	15.94	97.23	96.55
	Spray 2 t.	10.00	10.13	52.84	53.72	16.38	16.65	97.59	97.02
	Spray 3 t.	9.93	10.00	58.49	59.64	18.13	18.43	98.06	97.59
	Soil appl.	10.33	10.53	58.50	57.91	18.14	18.67	97.98	97.52
Soaking in compost tea 24 hours	Without	9.80	10.00	50.79	51.79	16.25	16.05	97.25	97.04
	Spray 1 t.	10.66	10.53	55.00	57.20	17.60	17.53	98.21	97.82
	Spray 2 t.	10.80	10.20	60.66	60.84	19.41	18.85	98.78	98.32
	Spray 3 t.	10.20	10.46	64.83	63.03	20.74	19.54	99.39	98.91
	Soil appl.	9.80	9.60	64.42	62.54	19.61	19.17	99.30	98.79
L S D 0.05		0.42	0.42	0.90	1.23	0.31	0.40	0.42	0.14

Without= foliar application with water, spray 1 t. = foliar application with compost tea one time, spray 2 t. = foliar application with compost tea twice times, spray 3 t. = foliar application with compost tea three times, soil appl.= soil application with irrigation water.

Regarding to the interaction between soaking garlic cloves for 24 hours before planting in compost tea and foliar application of compost tea on garlic

plants for three times 30, 60 and 90 days after planting data presented in Tables(3 and 4) show that there were significant increasing of vegetative growth parameters i.e. plant height, bulb diameter/plant, fresh and dry weight/plant and chlorophyll SPAD unit. The highest value of leaves number/plant in the first season had been obtained by foliar application of compost tea twice times at 30 and 60 days after planting treatment , the highest value of leaves number/plant in the second season was obtained by foliar application of compost tea one time treatment, the highest value of neck diameter/plant in the both seasons was obtained by soaking garlic seed in compost tea for 24 hours and soil application of compost tea treatment and the highest value of bulbing ratio in both seasons obtained by soaking garlic seed in water and foliar application of compost tea one or two times. These increment may be due to both supply nutrients and microbial functions. These results were in agreement with Tartoura and El-Saaei(2006) on garlic and Azza and Hendawy(2010)on borage plants.

2- Yield and its components :-

Data presented in Table (5) demonstrate that soaking garlic cloves for 24 hours in compost tea before planting significantly increased the total yield tones/fed, fresh weight/bulb and clove weight in both seasons. This treatment significantly decreased cloves number/bulb and the highest value of cloves number/bulb was obtained by soaking garlic seeds in the water treatment. These results were in agreement with those of Warman (1999), Smith and Hughes (2001) and Haggag and Saber,(2007).

Concerning to foliar application of compost tea on garlic plants, the data presented in Table (5) show that spraying garlic plants with compost tea three times significantly increased the total yield tones/fed, fresh weight/bulb and clove weight in both seasons and significantly decreased the cloves number/bulb in both seasons. The highest value of cloves number/bulb was obtained by spraying garlic plants with water in both seasons.

These increment may be due to both supply nutrients and microbial functions. These results were in agreement with Tartoura and El-Saaei(2006) on garlic , Azza and Hendawy(2010)on borage plants and Abd El- Aal (2012) on ananas melon.

Table(5)Total yield, fresh weight/bulb, cloves number/bulb and clove weight as affected by compost tea seed soaking and foliar application on garlic plants at 2012/2013 (S1) and 2013/2014 (S2).

Treatments		Total yield Ton/ fed		Fresh weight/bulb g		Cloves number/bulb		Clove weight g	
		S 1	S 2	S 1	S 2	S 1	S 2	S 1	S 2
Factor A									
Soaking in water		5.632	5.607	46.93	46.72	18.04	17.81	2.61	2.62
Soaking in compost tea 12 h.		6.286	6.263	52.38	52.19	17.33	17.36	3.04	3.01
Soaking in compost tea 24 h.		6.812	7.025	56.76	58.44	15.71	15.70	3.64	3.76
L S D 0.05		0.101	0.091	0.84	0.77	0.21	0.10	0.04	0.06
Factor B									
Without		5.514	5.619	45.94	46.66	18.19	17.97	2.54	2.60
Spray 1 time		5.947	5.923	49.55	49.36	17.48	17.39	2.85	2.85
Spray 2 times		6.279	6.329	52.32	52.74	16.97	16.99	3.10	3.12
Spray 3 times		6.849	6.833	57.07	56.93	16.00	16.04	3.61	3.60
Soil appl. With irrigation		6.628	6.787	55.23	56.56	16.50	16.39	3.37	3.48
L S D 0.05		0.059	0.084	0.49	0.64	0.18	0.12	0.04	0.04
Factor A	Factor B	Interaction							
Soaking in water	Without	4.969	4.990	41.40	41.58	18.87	18.31	2.19	2.26
	Spray 1 t.	5.271	5.262	43.92	43.84	18.26	18.06	2.40	2.42
	Spray 2 t.	5.538	5.644	46.15	47.03	17.91	17.82	2.57	2.63
	Spray 3 t.	6.278	5.932	52.31	49.43	17.47	17.33	2.99	2.85
	Soil appl.	6.103	6.205	50.85	51.71	17.69	17.52	2.87	2.95
Soaking in compost tea 12 hours	Without	5.469	5.542	45.57	46.18	18.47	18.17	2.47	2.53
	Spray 1 t.	6.228	6.035	51.89	50.29	18.10	18.00	2.86	2.79
	Spray 2 t.	6.548	6.414	54.57	53.44	17.43	17.57	3.12	3.01
	Spray 3 t.	6.731	6.743	56.09	56.19	16.18	16.42	3.46	3.42
	Soil appl.	6.454	6.579	53.78	54.82	16.46	16.61	3.26	3.29
Soaking in compost tea 24 hours	Without	6.104	6.326	50.86	52.21	17.23	17.41	2.95	3.00
	Spray 1 t.	6.341	6.473	52.84	53.94	16.07	16.12	3.28	3.34
	Spray 2 t.	6.751	6.928	56.25	57.75	15.56	15.58	3.61	3.70
	Spray 3 t.	7.538	7.822	62.81	65.18	14.34	14.36	4.38	4.53
	Soil appl.	7.326	7.577	61.04	63.14	15.35	15.04	3.97	4.19
L S D 0.05		0.103	0.146	0.86	1.11	0.32	0.21	0.08	0.08

Without= foliar application with water, spray 1 t. = foliar application with compost tea one time, spray 2 t. = foliar application with compost tea twice times, spray 3 t. = foliar application with compost tea three times, soil appl.= soil application with irrigation water.

Data in Table (5) emphasize that most of the measured parameters gave significantly increased except of cloves number/bulb. The highest value of total yield tones/fed, fresh weight/bulb and clove weight were obtained by soaking garlic cloves in compost tea for 24 hours and spraying garlic plants with compost tea three times and decreased the cloves number/bulb in both seasons. The highest value of cloves number/bulb was obtained by spraying garlic plants with water in both seasons. The interaction between soaking garlic cloves in compost tea for 24 hours and spraying garlic plants with compost tea three times significantly increased the total yield tones/fed by 47.43 % and 51.84% increment in the first and second seasons, respectively.

These results were in agreement with Tartoura and El-Saaei(2006) on garlic and Azza and Hendawy(2010)on borage plants.

3- Chemical constituents :-

Data presented in Table (6) show that soaking garlic cloves for 24 hours in compost tea before planting significantly increased the concentration of N%, P%,K% and volatile oils% and significantly decreased the concentration of nitrate (NO_3=) in both seasons. The highest value of nitrate was obtained by soaking garlic seeds in the water treatment. These results were in harmony with those of Smith and Hughes (2001) and Haggag and Saber,(2007).

Table(6)N %, P %, K %, nitrate ppm and volatile oils as affected by compost tea seed soaking and foliar application on garlic plants at 2012/2013 (S1) and 2013/2014 (S2).

Treatments		N %		P %		K %		NO_3 ppm		Volatile oils %	
		S 1	S 2	S 1	S 2	S 1	S 2	S 1	S 2	S 1	S 2
Soaking in water		2.85	2.85	0.392	0.418	1.95	1.93	308.0	312.0	0.388	0.395
Soaking in compost tea 12 h.		3.00	2.99	0.451	0.468	2.07	2.06	300.0	299.2	0.400	0.397
Soaking in compost tea 24 h.		3.05	3.12	0.518	0.530	2.20	2.18	292.8	291.4	0.423	0.417
L S D 0.05		0.02	0.03	0.014	0.011	0.03	0.02	1.1	1.4	0.002	0.001
Without		2.82	2.81	0.378	0.400	1.92	1.91	310.4	311.3	0.388	0.395
Spray 1 time		2.95	2.97	0.430	0.441	2.07	2.05	301.4	303.0	0.399	0.399
Spray 2 times		2.99	3.03	0.470	0.483	2.12	2.09	299.0	298.5	0.407	0.405
Spray 3 times		3.04	3.09	0.514	0.526	2.20	2.18	292.1	292.4	0.418	0.412
Soil appl. With irrigation		2.98	3.02	0.478	0.496	2.06	2.06	298.1	299.2	0.404	0.404
L S D 0.05		0.01	0.03	0.008	0.011	0.02	0.02	1.6	1.5	0.001	0.001
Factor A	Factor B										
Soaking in water	Without	2.79	2.71	0.346	0.370	1.84	1.83	317.0	322.6	0.381	0.392
	Spray 1 t.	2.84	2.82	0.370	0.410	1.92	1.91	311.0	316.6	0.386	0.393
	Spray 2 t.	2.85	2.87	0.400	0.420	1.97	1.97	308.0	310.0	0.388	0.396
	Spray 3 t.	2.94	2.93	0.436	0.460	2.03	2.00	301.3	303.0	0.393	0.399
	Soil appl.	2.82	2.90	0.410	0.430	2.00	1.96	303.0	308.0	0.391	0.395
Soaking in compost tea 12 hours	Without	2.82	2.79	0.366	0.390	1.93	1.95	312.0	310.6	0.386	0.393
	Spray 1 t.	2.97	2.97	0.430	0.430	2.07	2.05	299.3	301.3	0.395	0.396
	Spray 2 t.	3.02	3.05	0.466	0.483	2.11	2.10	297.6	296.3	0.403	0.398
	Spray 3 t.	3.04	3.08	0.513	0.510	2.18	2.14	293.3	291.0	0.412	0.402
	Soil appl.	3.01	3.03	0.480	0.490	2.07	2.07	298.0	297.0	0.403	0.396
Soaking in compost tea 24 hours	Without	2.85	2.93	0.420	0.440	1.99	1.96	302.3	300.6	0.396	0.400
	Spray 1 t.	3.04	3.12	0.490	0.483	2.21	2.18	294.0	291.0	0.417	0.408
	Spray 2 t.	3.10	3.16	0.543	0.546	2.27	2.21	291.3	289.3	0.430	0.421
	Spray 3 t.	3.15	3.25	0.593	0.610	2.38	2.39	283.0	283.3	0.450	0.434
	Soil appl.	3.11	3.12	0.546	0.570	2.13	2.16	293.3	292.6	0.420	0.420
L S D 0.05		0.03	0.05	0.015	0.019	0.04	0.03	2.8	2.6	0.002	0.002

Without= foliar application with water, spray 1 t. = foliar application with compost tea one time, spray 2 t. = foliar application with compost tea twice times, spray 3 t. = foliar application with compost tea three times, soil appl.= soil application with irrigation water.

Data presented in Table (6) indicate that the foliar application of compost tea three times at 30, 60 and 90 days after planting treatment significantly increased the concentration of N%, P%, K% and volatile oils %,

and this treatment significantly decreased the concentration of nitrate in both seasons. . The highest value of nitrate was obtained by spraying garlic plants by the water treatment. These results were in harmony with Tartoura and El-Saaei(2006) on garlic , Azza and Hendawy(2010)on borage plants and Abd El- Aal (2012) on ananas melon.

Concerning to the interaction between soaking garlic cloves in compost tea for 24 hours before planting and foliar application of garlic plants by compost tea three times at 30,60 and 90 days after planting gave the highest concentration of N%, P%, K% and volatile oils and this treatment significantly decreased the nitrate concentration in both seasons. These results were in harmony with Tartoura and El-Saaei(2006) they mentioned that these increment are the best, may be due to that the compost tea gives the garlic plants most of essential nutrients and may be gross regulators and Azza and Hendawy(2010)on borage plants, Shaheen *et al*. (2013) on onion. They found that these increment may be due to both supply nutrients and microbial functions(as useful microorganisms increase the time stomata stay open, then reducing less from the leaf surface).

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إستعمال منشط عضوى طبيعى لإنتاج محصول آمن من نباتات الثوم

أنور الدسوقى على إسماعيل جودة و محمود نبيه محمد على جحوش.
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أجريت تجربتان حقليتان خلال الموسمين الشتويين ٢٠١٢/٢٠١٣ و٢٠١٣/٢٠١٤ بالمزرعة البحثية بالبرامون محافظة الدقهلية مصر والتابعة لمعهد بحوث البساتين مركز البحوث الزراعية وذلك لدراسة تأثير استخدام شاى الكمبوست على نباتات الثوم بنقع فصوص الثوم فى شاى الكمبوست لمدة ١٢ ساعة أو ٢٤ ساعة أو(معاملة المقارنة) النقع فى الماء وكذلك إستخدام شاى الكمبوست للرش على نباتات الثوم مرة أو مرتين أو ثلاث مرات بعد ٣٠ و ٦٠ و ٩٠ يوم من الزراعة وكذلك إستعمال شاى الكمبوست أرضيا مع ماء الرى بمعدل ٢٠٠ لتر للفدان وتأثير ذلك على نمو نباتات الثوم والمحصول ومكوناته وكذلك تركيزالمكونات الكيماوية وتركيز الزيوت الطيارة وتركيز النترات لبصلة الثوم.

وكان التصميم التجريبى المستخدم للتجربة هو القطع المنشقة مرة واحدة وتم إستخدام معدلات نقع فصوص الثوم فى الماء(معاملة المقارنة) أو فى شاى الكمبوست لمدة ١٢ ساعة أو ٢٤ ساعة فى القطع الرئيسية واستخدام الرش بالماء (معاملة المقارنة) أو الرش بشاى الكمبوست على نباتات الثوم مرة بعد ٣٠ يوم من تاريخ الزراعة أو مرتين بعد ٣٠، ٦٠ يوم من تاريخ الزراعة أو ثلاث مرات بعد ٣٠ و ٦٠ و ٩٠ يوم من الزراعة وكذلك إستعمال شاى الكمبوست أرضيا مع ماء الرى بمعدل ٢٠٠ لتر للفدان فى القطع الشقية.

وكانت أهم النتائج كمايلى :-

- أدى نقع فصوص الثوم قبل الزراعة فى شاى الكمبوست لمدة ٢٤ ساعة الى زيادة معنوية فى معظم الصفات الخضرية المدروسة مثل إرتفاع النبات وقطر العنق للنبات وقطر البصلة للنبات وعدد الاوراق للنبات والوزن الطازج والجاف للنبات وتركيز الكلوروفيل فى كلا موسمى الدراسة . كما أحدثت هذه المعاملة زيادة معنوية فى المحصول الكلى والوزن الطازج للبصلة ووزن الفص وقللت عدد الفصوص فى أبصال الثوم . كما أحدثت زيادة معنوية فى تركيز النسبة المئوية لكل من النتروجين والفسفور والبوتاسيوم والزيوت الطيارة وقللت تركيز النترات فى أبصال الثوم فى موسمى الدراسة.
- أدى أستخدام الرش بشاى الكمبوست ثلاث مرات على نباتات الثوم فى ٣٠، ٦٠ و ٩٠ يوم بعد الزراعة إلى زيادة معنوية فى معظم الصفات المدروسة الخضرية منها إرتفاع النبات وبسبة التبصيل والوزن الطازج للنبات فى كلا موسمى الدراسة وكذلك عدد الاوراق للنبات فى الموسم الثانى فقط وتركيز الكلوروفيل فى الموسم الثانى. كما أحدثت هذه المعاملة زيادة معنوية فى صفات المحصول الكلى للفدان والوزن الطازج للبصلة ووزن الفص وقللت عدد الفصوص فى أبصال الثوم. كما أحدثت هذه المعاملة زيادة معنوية فى الصفات الكيماوية مثل تركيز النسبة المئوية للنتروجين والفوسفور والبوتاسيوم والزيون الطيارة وقللت تركيز النترات فى أبصال الثوم.
- أدى التفاعل بين نقع فصوص الثوم قبل الزراعة والرش بمستخلص شاى الكمبوست ثلاث مرات على نباتات الثوم فى ٣٠ ، ٦٠ و٩٠ يوم بعد الزراعة إلى إحداث زيادات معنوية فى معظم الصفات المدروسة الخضرية منها مثل إرتفاع النبات وقطر البصلة والوزن الطازج والجاف للنبات وتركيز الكلوروفيل والصفات المحصولية منها مثل المحصول الكلى طن/فدان والوزن الطازج للبصلة ووزن الفص وقللت هذه المعاملة عدد الفصوص فى أبصال الثوم والصفات الكيماوية منها تركيز النسبة المئوية لكل من النتروجين والفوسفور والبوتاسيوم والزيوت الطيارة وقللت هذه المعاملة نسبة تركيز النترات فى أبصال الثوم .
- وعليه توصى هذه الدراسة بإستخدام معاملة نقع فصوص الثوم لمدة ٢٤ ساعة فى مستخلص شاى الكمبوست قبل الزراعة والرش بمستخلص شاى الكمبوست ثلاث مرات فى ٣٠ ، ٦٠ و٩٠ يوم من تاريخ الزراعة لإنتاج محصول عالى وآمن من أبصال الثوم وتحسين جودة أبصال الثوم تحت الظروف المشابهة لهذه الدراسة.