Minia J. of Agric. Res. & Develop.
Vol. (34), No. 1, pp. 49-67, 2014

FACULTY OF AGRICULTURE

RESPONSE OF SWEET BASIL PLANTS TO SOME AGRICULTURAL TREATMENTS

Abdou, M. A. H.; Badran, F.S.; El-Sayed, A.A.; Taha, R.A. and Abd El-Salam, N. M. K.
Hort. Dept. Fac. Agric., Minia Univ.

Received: 26 March 2014 Accepted 28 April 2014

ABSTRACT

A field experiment was carried out during 2012 and 2013 seasons at the Experimental Farm, Fac. of Agric., Minia Univ. to investigate the effect of compost, some vitamins and active yeast on the yield of herb and essential oil productivity, as well as, chemical composition of sweet basil plants. The obtained data revealed that the fresh and dry weights of herb and all studied oil production (oil %, oil yield/plant and /fed. /season), as well as, chemical constituents (total chlorophylls and N, P and K %) were significantly increased due to the application of all levels of compost over those of control treatments. The maximum values were recorded at the high level of compost (15 ton/fed.). Yield of herb and oil productivity parameters, as well as chemical determinations were significantly augmented as a result of using the different treatments of vitamins (C, E and B_1) and active yeast. The most effective treatments in this concern were vit. C (50 ppm) followed by active yeast (5 g/l.). It could be recommended to supply *Ocimum basilicum* plants with compost at 15 ton/fed. in combination with vit. C at 50 ppm or active yeast at 5 g/l. to maximize yield of herb and oil productivity.

INTRODUCTION

Sweet basil (*Ocimum basilicum*, L.) belonging to Family Labiatae (Lamiaceae) which occupied an interesting position in many industrial purposes for scenting meat products, soap, beverages and canned foods and to overcome undesirable odour for which it is used in the tooth pastes and pharmaceuticals (Singh *et al*., 1971 and Pascual-Villalobos and Ballesta-Acosta, 2003).

The present study was carried out for an investigation the effect of compost and some vitamins (C, E and B_1), as well as, active yeast on the yield of herb and essential oil of sweet basil plants.Compost as organic fertilization is the most important factor affecting the growth, oil production and chemical constituents of aromatic plants. Many authors studied the effect of compost on the vegetative growth traits, oil production and some chemical constituents (pigments and N, P and K %) and obtained positive response, i.e. Abd El-Raouf (2001), Baeck and Park (2001)

and El-Gendy *et al.* (2001) on sweet basil, Brien and Barker (1996), Khalil and El-Sherbeny (2003) and Abdou *et al.* (2012a) on *Mentha* spp., Herrera *et al.* (1997), Ateia *et al*. (2009) and Hendawy *et al.* (2010) on *Thymus vulgaris*, El-Ghadban *et al*. (2003) and Gharib *et al.* (2008) on marjoram plants. Many investigators have studied the effect of active yeast on growth, oil production and chemical constituents of aromatic plants. Salman (2006) on sweet basil, Badran *et al.* (2002) and El-Hindi and El-Boraie (2005) on marjoram plants, Heikal (2005) on *Thymus vulgaris* and Massoud (2006) and Abdou *et al.* (2012b) on sage plants reported that the application of active yeast at 5 g/l. increased vegetative growth (plant height, number of branches and herb fresh and dry weights per plant, per cut and per plant per season), oil productivity (oil % and oil yield), as well as, chemical constituents (total chlorophyll and percentages of N, P and K).

Recently, great attention has been focused on the possibility of using some vitamins (E, B_1 and C) as natural substances in order to improve plant growth and oil production. Khalil *et al.* (2010) on sweet basil, found that vit. C at 150 ppm increased all vegetative growth and oil yield. Refaat and Balbaa (2001) on lemongrass concluded that foliar application of thiamine (vit. B_1) increased herbage yield and essential oil %, as well as, the contents of chlorophylls. Abdou *et al.* (2012a) on mint plants, mentioned that a significant increase in all vegetative growth traits, essential oil % and yield, as well as, the contents of chlorophylls and NPK elements was detected as a result of treating plants with ascorbic acid (vit. C) and alpha-tocopherol (vit. E). On the meantime, Botros (2013) on caraway plants, found that the highest values of essential oil (% and yield), chlorophyll a, b and carotenoids contents, as well as, N, P and K % in the leaves resulted from the treatment of vit. B_1 comparing with vit. E or vit. C.

MATERIALS AND METHODS

This experiment was carried out during the two successive seasons of 2012 and 2013 at the Experimental Farm, Fac. of Agric., Minia Univ. to investigate the effect of compost, some vitamins and active yeast, as well as, their interaction on the yield of herb and essential oil production and chemical composition of *Ocimum basilicum*, L. plants.

The seedlings of sweet basil at the stage of 4-5 leaves and 11-12 cm in height were transplanted in the experimental filled on the first day of March in the both seasons.

The experiment was arranged in a randomized complete block design in a split-plot design with three replicates. The main plots (A) included four levels of compost, while nine treatments of vitamins and active yeast, as well as, control occupied the sub plots (B). The experimental unit (plot) was 2×2 m and containing 5 rows, 40 cm apart. The seedlings were cultivated in hills, 40 cm apart, therefore, each plot contained 25 plants.

Treatments :

1- The main-plots (A) :

a_1- $Compost_0$ (without compost), a_2- $Compost_1$ (compost at 5 ton/fed.), a_3- Compost (compost at 10 ton/fed.) and a_4- $Compost_3$ (compost at 15 ton/fed.). Compost was added during preparing the soil to cultivation in the two experimental seasons. Physical and chemical properties of the used compost (compost El-Neel) are shown in Table (b).

2- The sub-pots (B) :

Control (spray with tap water), Alpha-tocopherol (vit. E) at 10 and 20 ppm, Thiamine (vit. B_1) at 25 and 50 ppm, Ascorbic acid (vit. C) at 50 and 100 ppm and Active dry yeast at 2.5 and 5.0 g/l. Chemical analysis of yeast (*Saccharomyces cervisia*) extract are shown in Table (c). The yeast suspension was prepared by dissolving dry yeast and sugar together (1:1 w/w) in warm water (about 35-37 ^{o}C) and kept at room temperature for two hours to enhance yeast activity according to Skoog and Millar (1957).

Each of vitamins and suspension of yeast were applied by hand sprayer, 3 times for each cut. The first one was added after 5 weeks from planting date (April 6th) or two weeks after first cut (July 10th) and two weeks thereafter. The plants were sprayed till run off. All agricultural practices were performed as usual, in the region for the production of sweet basil plants.

Table (a) : The physical and chemical analysis of the used soil in both seasons.

Soil Character	Value		Soil Character		Value	
	2012	2013			2012	2013
Sand %	28.30	28.78	Available P %		15.13	15.57
Silt %	29.99	30.55	Exch. K^{+} mg/100 g		2.12	2.81
Clay %	41.71	40.67	Exch. Ca^{++} mg/100 g		31.76	31.14
Soil type	Clay loam	Clay loam	Exch. Na^{+} mg/100 g		2.42	2.50
Organic matter %	1.54	1.62		Fe	8.51	8.21
					2.07	2.01
Ca CO_3 %	1.58	1.54	DTPA	Cu	2.76	2.89
pH (1 : 2.5)	7.84	7.71	Ext. ppm	Zn	8.24	8.12
E. C. (m mhos / cm)	1.08	1.04		Mn		
Total N %	0.07	0.08				

Table (b): Physical and chemical properties of the used compost (compost El-Neel)

Properties	Value	Properties	Value
Dry weight of 1 m^3	450 kg	C/N ratio	18.5-14.1
Fresh weight of 1 m^3	650-700 kg	NaCl (%)	1.10-1.75
Moisture (%)	25-30	Total P (%)	0.50-0.75
pH 1:10	7.5-8	Total K (%)	0.8-1.0
E.C. (m mhose/cm)	2-4	Fe (ppm)	150-200
Total N (%)	1-1.4	Mn (ppm)	25-56
Organic matter (%)	32-34	Cu (ppm)	75-150
Organic carbon (%)	18.5-19.7	Zn (ppm)	150-225

Harvesting :

During each experimental season, the plants were harvested twice as approximately full flowering. In each harvest, the plants were cut leaving about 10 cm above the soil surface. The first cut was done on 25th of June. Meanwhile, the second cut was done on October 25th in the two growing seasons.

Data recorded and calculated :

Fresh and dry weights of herb/plant/cut (g) and yield fresh and dry weights of herb/plant/season (g)/fed. (ton).

Chemical composition:

Essential oil % in air-dried herb (60 g) of each treatment was carried out in each cut during both seasons according to method described by British Pharmacopoeia (1963) and essential oil yield/plant (ml) and /fed. (liter) were calculated. Total chlorophylls contents in the fresh leaves were extracted and calculated according to Moran (1982).The percentages of N, P and K in the dry herb were estimated according to Page *et al.* (1982).

All obtained data were tabulated and statistically analyzed according to MSTAT-C (1986) and the L.S.D. test at 5 % was followed to compare between the means.

Table (c) : Chemical analysis of yeast extract according to Khedr and Farid (2000). (weight/100 g.d.w.).

Minerals				Amino acids mg.		Vitamins mg.		Enzymes mg.	Carbohyd. mg.
Macro. g.		Micro. mg.							
P_2O_5	7.23	Al	650.2	Arginine	1.99	Vit. B_1	2.23	Cytochrome	Carbohyd.
		B	175.6	Histidine	2.63	Vit. B_2	1.31	(0.35)	(23.2)
K_2O	51.68	Co	67.8	Isoleucine	2.31	Riboflavin	4.96	Oxidase	Glucose
		Pb	438.6	Leucine	3.09	Nicotinic acid	39.88	(0.29)	(13.33)
N	34.39	Mn	81.3	Lysine	2.95	Panthothenic acid	19.56		
		Sn	223.9	Methionine	0.72	Biotin	0.09		
		Zn	335.6	Phenylalanine	2.01	Vit. B_6	1.25		
		N_4O	0.35	Thereonine	2.09	Folic acid	4.36		
		Mg	5.76	Tryptophan	0.45	Thiamine	2.71		
		CaO	3.05	Valine	2.19	Pyridoxine	2.9		
		SiO_2	1.55	Glutamic acid	2.0	Vit. B_{12}	153		
		SO_2	0.49	Serine	1.59	Inositol	203		
		Cl	0.06	Asparatic acid	1.33	P-amino benzoic acid	9.23		
		FeO	0.92	Cystine	0.23				
		NaCl	0.30	Proline	1.53				
				Tyrosine	1.49				

RESULTS AND DISCUSSION

1-Herb fresh and dry weights:

Data presented in Tables (1, 2, 3 and 4) cleared that a significant and positive influence of application of three levels of compost (5, 10 and 15 ton/fed.) on the herb fresh and dry weights per plant in the two cuts and per plant and per fed./season during the two growing seasons facing the control. Moreover, such herb fresh and dry weights in both cuts and yield of herb (fresh and dry) per plant or per fed./season were gradually increased due to each increase in compost up to 15 ton/fed. which resulted in the heaviest weight (fresh and dry). The positive effect of improvement results when plants received the different rates of compost, may be due to the effective role of compost which improve soil physical, chemical and biological properties (Zheljazkov and Warman, 2004). These results are in agreement with Abd El-Raouf (2001) on sweet basil, Khalil and El-Sherbeny (2003) on three *Mentha* species, Gharib *et al.* (2008) on marjoram plants and Hendawy *et al.* (2010) on *Thymus vulgaris*.

The obtained results presented in Tables (1, 2, 3 and 4) proved that the fresh

and dry weights of herb /plant/cut and /plant/season, as well as, per fed./season significantly increased by all used concentrations of active yeast and some vitamins (C, E and B_1) treatments comparing with control. The heaviest weight (fresh and dry) resulted from the treatments of vit. C at 50 ppm followed by active yeast at 5 g/l. with significant differences between such two treatments in all cases, except in the first cut in the first season and the second cut during the second season for herb dry weight/plant/cut. The stimulatory effects of ascorbic acid on the growth and yield of herb were attributed to its roles of stress effect (temperature or poisons), antioxidant and protection of chloroplast (Oertli, 1987). These results are harmony with Khalil *et al*. (2010) on sweet basil and Abdou *et al.* (2012a) on mint plants. Regarding the effect of active yeast, Heikal (2005) found that yeast stimulates the plant to build up dry matters. Similar results were obtained by Salman (2006) on sweet basil and Abdou *et al*. (2012b) on sage plants.

The interaction between main and sub plots (A×B) was significant for the six traits in both seasons. The heaviest weight of herb were produced due to supplying sweet basil plant with compost at 15 ton/fed. in combination with any of vit. C at 50 ppm, active yeast at 5 g/l. (in all cases) and vit. E at 10 ppm (in most cases) or addition of compost at 10 ton/fed. in combination with vit. C at 50 ppm or ADY at 5 g/l.

2- Essential oil production :

Data in Tables (5, 6 and 7) revealed that the three levels of compost treatments significantly improved essential oil % and yield/plant/cut, as well as, essential oil yield/plant/season (ml) and per fed./season (liter) during both seasons in comparison with unfertilized control plants. The most effective treatment, which gave the greatest essential oil % and yield was the high level (15 ton/fed.) of compost.

The plants which received compost as organic fertilizer contained the highest oil percentage as this result may be due to that, fertilization enhances oil biosynthesis. Also, the stimulatory effect of the compost treatments on oil yield may be due to the increase in both the essential oil percentage and weight of herb. These results are in accordance with those reported by Abd El-Raouf (2001), Baeck and Park (2001) and El-Gendy *et al.* (2001) on sweet basil, El-Ghadban *et al*. (2003) on marjoram plants, Ateia *et al.* (2009) on *Thymus vulgaris* and Abdou *et al*. (2012a) on *Mentha piperita*. Data in Tables (5, 6 and 7) indicated that the treatments of active yeast and three vitamins (C, E and B_1), each at two concentrations significantly increased essential oil production (oil % and oil yield/plant/cut and oil yield/plant/season and per fed. /season) compared with the control in both seasons.

The treatment of vit. C (50 ppm) resulted the highest essential oil % in all cuts, except in the first cut for the first season, where the treatment of vit. E (10 ppm) produced the highest essential oil % (Table, 5). The greatest essential oil yield/plant in the two cuts during both seasons resulted from the treatments of vit. C (50 ppm) followed by ADY (5 g/l.) without significant differences between them in all cases, except in the first cut during the first season (Table, 6). Among such eight treatments, vit. C (50 ppm) followed by ADY (5 g/l.) gave highest values in the two seasons for oil yield/plant/season and /fed./season. Moreover, there were non significant differences between such two superior treatments in both seasons, except in the first season for oil yield/plant.

The stimulatory effect of the aforementioned treatments in the contents of essential oil may be due to the roles of ascorbic acid which stimulate respiration, photosynthesis, manage enzymes activities, promotion of lipase, catalase, as well as, increase vegetative growth and oil % (Oertli, 1987, Dewick, 2000, Reda *et al*., 2005 and Eid *et al.*, 2010). Also, alpha-tocopherol can be considered a major antioxidant protecting membrane lipids from photo-oxidation especially those of chloroplast that reflect on chemical composition of medicinal plants (Zhang *et al.*, 2000). Similar results were obtained by Botros (2013) on caraway plants. Yeast extract is a source of many natural plant growth substances, large amount of vit. B and most nutritional elements, as well as, organic compounds (protein, carbohydrates, nucleic acid and lipids), so yeast can play a very significant role in growth and oil production of plant. Similar results were obtained by Salman (2006) on sweet basil, Badran *et al*. (2002) and El-Hindi and El-Boraie (2005) on marjoram plants.

The interaction between main and sub-plots (A×B) treatments was significant for essential oil % and oil yield/plant/cut and oil yield/plant and /fed./season (Tables, 5, 6 and 7). The best interaction treatments were compost at 15 ton/fed. with vit. C (50 ppm) or with ADY (5 g/l.) or with vit. E (10 ppm) for oil % and compost at 15 ton/fed. with vit. C (50 ppm) or with ADY (5 g/l.) or vit. E (10 ppm) or compost at 10 ton/fed. with vit. C (50 ppm) or with ADY (5 g/l.) for oil yield/plant/cut, as well as, compost at 15 or 10 ton/fed. in combination with vit. C (50 ppm) or ADY (5 g/l.) or compost at 15 ton/fed. in combination with vit. E (10 ppm) for oil yield/plant and /fed. / season.

3- Chemical composition:

Total chlorophylls:

Data recorded in Table (8) indicated that the contents of total chlorophylls in the fresh leaves of sweet basil was considerably improved as a result of fertilization with different levels of compost when compared with control. The highest values resulted from plants received compost at 15 ton/fed. Similar results were obtained by El-Ghadban *et al.* (2008) on lavender plants and Abdou *et al.* (2012b) on sage plants.

A significant and positive influence of active yeast and vitamins treatments on total chlorophylls contents were recorded in the present study (Table, 8). The highest contents were obtained from plants treated with vit. E (10 ppm) followed by vit. C (50 ppm) similar results were obtained by El-Leithy *et al.* (2011) on geranium plants and Abdou *et al.* (2013a and 2013b) on caraway and guar plants.

The interaction between main and sub-plots (A×B) was significant for total chlorophylls. The best interaction treatment was obtained due to compost (15 ton/fed.) with vit. E (10 ppm) in both seasons.

Nitrogen, phosphorus and potassium % :

Data presented in Tables (8 and 9) showed that the increases in N, P and K % in the dry herb of sweet basil plants were parallel to the increase in compost level from 5 to 15 ton/fed. The stimulatory effect of the treatments of compost gave more N, P and K % than the control treatments which may be due to increasing available of nitrogen, phosphorus and potassium in root zone of plants as a result of adding of compost which reflected on NPK uptake. These results are in agreement with those mentioned by El-Gendy *et al*. (2001) on sweet basil and Abdou *et al.* (2012a) on *Mentha piperita*.

Table (1): Effect of compost, active dry yeast and some vitamins on herb fresh weight (g/plant) of *Ocimum basilicum*, L., in the first and second cuts during the first and second seasons 2012 and 2013.

Yeast and vitamins treatments (B)	Compost levels (ton/fed.) at									
	1st Season					2nd Season				
	0	5	10	15	Mean (B)	0	5	10	15	Mean (B)
	1st Cut									
Control	309.0	366.9	421.5	482.0	394.9	338.8	400.6	461.5	529.5	432.6
(ADY) at 2.5 g/l.	383.5	468.3	537.0	582.8	492.9	416.0	512.0	580.3	621.5	532.5
(ADY) at 5 g/l.	602.9	713.6	801.8	807.5	731.5	639.4	760.4	842.3	857.9	775.0
Vit. C at 50 ppm	630.2	748.0	827.7	831.0	759.2	676.5	793.8	871.2	885.6	806.8
Vit. C at 100 ppm	347.3	415.4	472.7	524.1	439.9	376.9	448.5	515.1	572.2	478.2
Vit. E at 10 ppm	577.8	684.4	772.0	782.1	704.1	610.4	732.5	817.5	824.0	746.1
Vit. E at 20 ppm	458.1	562.4	634.0	672.9	581.9	491.8	605.2	680.6	698.5	619.0
Vit. B_1 at 25 ppm	482.8	652.4	736.2	757.2	657.2	569.5	701.6	784.4	785.0	710.1
Vit. B_1 at 50 ppm	437.4	542.3	611.8	653.1	561.2	466.0	584.2	658.2	680.9	597.3
Mean (A)	469.9	572.6	646.1	677.0	591.4	509.5	615.4	690.1	717.2	633.1
L.S.D. at 5 %	A :13.2		B :15.5		AB :31.1	A :15.0		B :23.0		AB :46.0
	2nd Cut									
Control	403.8	477.6	547.0	621.3	512.4	438.8	515.8	593.0	676.4	556.0
(ADY) at 2.5 g/l.	497.9	604.8	690.0	747.5	635.0	535.4	655.4	727.9	790.5	677.3
(ADY) at 5 g/l.	773.0	910.1	1021.0	1029.1	933.3	817.9	966.0	1067.4	1088.6	985.0
Vit. C at 50 ppm	805.4	953.8	1053.6	1058.6	967.8	864.6	1007.6	1103.1	1121.8	1024.3
Vit. C at 100 ppm	451.4	539.1	610.1	674.3	568.7	486.1	575.6	658.6	741.6	615.5
Vit. E at 10 ppm	741.4	875.1	984.0	996.5	899.3	778.0	930.6	1036.8	1045.1	947.6
Vit. E at 20 ppm	591.1	721.5	811.6	860.5	746.2	631.9	771.8	865.6	887.9	789.3
Vit. B_1 at 25 ppm	705.3	835.6	939.1	965.5	861.4	727.0	891.5	995.5	1004.9	904.7
Vit. B_1 at 50 ppm	565.5	692.6	784.0	835.1	719.3	597.6	745.4	837.0	867.3	761.8
Mean (A)	615.0	734.5	826.7	865.4	760.4	653.0	784.4	876.1	913.8	806.8
L.S.D. at 5 %	A :18.1		B :18.5		AB :37.0	A :14.3		B :22.2		AB :44.4

Table (2): Effect of compost, active dry yeast and some vitamins on herb dry weight (g/plant) of *Ocimum basilicum*, L., in the first and second cuts during the first and second seasons 2012 and 2013.

Yeast and vitamins treatments (B)	Compost levels (ton/fed.) at									
	1st Season					2nd Season				
	0	5	10	15	Mean (B)	0	5	10	15	Mean (B)
	1st Cut									
Control	52.0	61.9	70.9	81.0	66.4	57.2	67.4	77.6	88.9	72.8
(ADY) at 2.5 g/l.	64.5	78.8	90.2	97.8	82.9	70.2	86.0	97.4	104.0	89.4
(ADY) at 5 g/l.	101.3	119.6	134.3	135.3	122.6	107.5	127.3	140.9	143.5	129.8
Vit. C at 50 ppm	105.5	125.2	139.1	139.4	127.3	113.9	133.3	145.7	148.2	135.3
Vit. C at 100 ppm	58.5	69.7	79.5	88.4	74.0	63.4	75.4	86.6	96.0	80.3
Vit. E at 10 ppm	97.0	114.7	129.3	131.0	118.0	102.6	122.6	136.9	139.1	125.0
Vit. E at 20 ppm	77.0	94.3	106.3	112.7	97.6	82.3	101.2	114.2	117.1	103.7
Vit. B_1 at 25 ppm	92.3	109.4	123.1	126.8	112.9	95.6	107.9	131.2	132.7	116.9
Vit. B_1 at 50 ppm	73.6	90.5	102.7	109.4	94.1	78.6	97.1	110.2	114.2	100.0
Mean (A)	80.2	96.0	108.4	113.5	99.5	85.7	102.0	115.6	120.3	105.9
L.S.D. at 5 %	A :5.6		B :6.2		AB :12.4	A :7.0		B :4.7		AB :9.4
	2nd Cut									
Control	68.4	80.6	92.0	104.4	86.3	73.8	86.7	99.6	113.4	93.4
(ADY) at 2.5 g/l.	83.8	101.6	116.0	125.6	106.7	90.0	110.7	122.1	132.8	113.9
(ADY) at 5 g/l.	129.7	152.5	171.2	172.5	156.5	137.2	161.7	178.6	182.6	165.0
Vit. C at 50 ppm	135.3	159.8	176.6	177.4	162.3	145.0	168.8	184.7	187.9	171.5
Vit. C at 100 ppm	76.4	90.7	102.7	113.6	95.8	82.0	96.8	110.6	125.0	103.6
Vit. E at 10 ppm	125.0	146.9	165.2	167.3	151.1	129.8	156.2	173.6	175.0	158.6
Vit. E at 20 ppm	99.5	121.1	136.1	144.2	125.2	106.1	129.5	145.0	148.7	132.3
Vit. B_1 at 25 ppm	118.7	140.3	157.7	161.7	144.6	121.9	149.3	166.4	168.2	151.4
Vit. B_1 at 50 ppm	95.3	116.3	131.5	140.3	120.8	100.5	125.1	140.4	145.4	127.9
Mean (A)	103.6	123.3	138.8	145.2	127.7	109.6	131.6	146.8	153.2	135.3
L.S.D. at 5 %	A :1.8		B :5.1		AB :10.2	A :2.31		B :6.5		AB :13.0

Table (3): Effect of compost, active dry yeast and some vitamins on total herb fresh weight/plant and /feddan of *Ocimum basilicum*, L., during the first and second seasons 2012 and 2013.

Yeast and vitamins treatments (B)	Compost levels (ton/fed.) at									
	1st Season					2nd Season				
	0	5	10	15	Mean (B)	0	5	10	15	Mean (B)
	Total fresh weight /plant (kg/plant)									
Control	0.71	0.84	0.97	1.10	0.91	0.78	0.92	1.05	1.21	0.99
(ADY) at 2.5 g/l.	0.88	1.07	1.23	1.33	1.13	0.95	1.17	1.31	1.41	1.21
(ADY) at 5 g/l.	1.38	1.62	1.82	1.84	1.66	1.46	1.73	1.91	1.95	1.76
Vit. C at 50 ppm	1.44	1.70	1.88	1.89	1.73	1.54	1.80	1.97	2.01	1.83
Vit. C at 100 ppm	0.80	0.95	1.08	1.20	1.01	0.86	1.02	1.17	1.31	1.09
Vit. E at 10 ppm	1.32	1.56	1.76	1.78	1.60	1.39	1.66	1.85	1.87	1.69
Vit. E at 20 ppm	1.05	1.28	1.45	1.53	1.33	1.12	1.38	1.55	1.59	1.41
Vit. B_1 at 25 ppm	1.19	1.49	1.68	1.72	1.52	1.30	1.59	1.78	1.79	1.61
Vit. B_1 at 50 ppm	1.00	1.23	1.40	1.49	1.28	1.06	1.33	1.50	1.55	1.36
Mean (A)	1.08	1.31	1.47	1.54		1.16	1.40	1.57	1.63	
L.S.D. at 5 %	A :0.02		B :0.06		AB :0.12	A :0.03		B :0.07		AB :0.14
	Total fresh weight /fed. (ton/fed.)									
Control	17.82	21.11	24.21	27.58	22.68	19.44	22.91	26.36	30.15	24.72
(ADY) at 2.5 g/l.	22.04	26.83	30.68	33.26	28.20	23.79	29.19	32.71	35.30	30.25
(ADY) at 5 g/l.	34.40	40.59	45.57	45.92	41.62	36.43	43.16	47.74	48.66	44.00
Vit. C at 50 ppm	35.89	42.55	47.03	47.24	43.18	38.53	45.04	49.36	50.19	45.78
Vit. C at 100 ppm	19.97	23.86	27.07	29.96	25.22	21.58	25.60	29.34	32.85	27.34
Vit. E at 10 ppm	32.98	38.99	43.90	44.47	40.09	34.71	41.58	46.36	46.73	42.34
Vit. E at 20 ppm	26.23	32.10	36.14	38.34	33.20	28.09	34.43	38.66	39.66	35.21
Vit. B_1 at 25 ppm	29.70	37.20	41.88	43.07	37.97	32.41	39.83	44.50	44.75	40.37
Vit. B_1 at 50 ppm	25.07	30.87	34.90	37.21	32.01	26.59	33.24	37.38	38.71	33.98
Mean (A)	27.12	32.68	36.82	38.56		29.06	35.00	39.16	40.78	
L.S.D. at 5 %	A :1.71		B :1.39		AB :2.78	A :1.61		B :1.73		AB :3.46

Table (4): Effect of compost, active dry yeast and some vitamins on total herb dry weight/plant and /feddan of *Ocimum basilicum*, L., during the first and second seasons 2012 and 2013.

Yeast and vitamins treatments (B)	Compost levels (ton/fed.) at									
	1st Season					2nd Season				
	0	5	10	15	Mean (B)	0	5	10	15	Mean (B)
	Total dry weight /plant (g/plant)									
Control	120.4	142.4	162.9	185.4	152.8	131.0	154.1	177.2	202.3	166.1
(ADY) at 2.5 g/l.	148.3	180.4	206.2	223.4	189.6	160.2	196.7	219.5	236.8	203.3
(ADY) at 5 g/l.	230.9	272.0	305.5	307.8	279.1	244.7	289.0	319.5	326.2	294.8
Vit. C at 50 ppm	240.8	285.1	315.7	316.8	289.6	258.9	302.1	330.4	336.1	306.8
Vit. C at 100 ppm	134.9	160.4	182.2	202.0	169.9	145.4	172.1	197.2	221.0	183.9
Vit. E at 10 ppm	222.1	261.7	294.5	298.4	269.1	232.4	278.8	310.4	314.0	283.7
Vit. E at 20 ppm	176.5	215.5	242.5	256.9	222.8	188.4	230.6	259.1	265.8	236.0
Vit. B_1 at 25 ppm	211.0	249.8	280.9	288.5	257.5	217.5	257.2	297.5	300.9	268.3
Vit. B_1 at 50 ppm	168.9	206.8	234.1	249.8	214.9	179.1	222.2	250.6	259.6	227.9
Mean (A)	183.8	219.3	247.1	258.7		195.3	233.6	262.4	273.5	
L.S.D. at 5 %	A :9.1		B :9.2		AB :18.4	A :7.3		B :11.5		AB :23.0
	Total dry weight /fed. (ton/fed.)									
Control	3.01	3.56	4.07	4.64	3.82	3.28	3.85	4.43	5.06	4.15
(ADY) at 2.5 g/l.	3.71	4.51	5.16	5.59	4.74	4.01	4.92	5.49	5.92	5.08
(ADY) at 5 g/l.	5.77	6.80	7.64	7.70	6.98	6.12	7.23	7.99	8.15	7.37
Vit. C at 50 ppm	6.02	7.13	7.89	7.92	7.24	6.47	7.55	8.26	8.40	7.67
Vit. C at 100 ppm	3.37	4.01	4.55	5.05	4.25	3.63	4.30	4.93	5.53	4.60
Vit. E at 10 ppm	5.55	6.54	7.36	7.46	6.73	5.81	6.97	7.76	7.85	7.09
Vit. E at 20 ppm	4.41	5.39	6.06	6.42	5.57	4.71	5.77	6.48	6.65	5.90
Vit. B_1 at 25 ppm	5.27	6.24	7.02	7.21	6.44	5.44	6.43	7.44	7.52	6.71
Vit. B_1 at 50 ppm	4.22	5.17	5.85	6.24	5.37	4.48	5.55	6.27	6.49	5.70
Mean (A)	4.59	5.48	6.18	6.47		4.88	5.84	6.56	6.84	
L.S.D. at 5 %	A :0.21		B :0.24		AB :0.48	A :0.27		B :0.29		AB :0.58

Table (5): Effect of compost, active dry yeast and some vitamins on essential oil % of *Ocimum basilicum*, L., (air dried herb) in the first and second cuts during the first and second seasons 2012 and 2013.

Yeast and vitamins treatments (B)	Compost levels (ton/fed.) at									
	1st Season					2nd Season				
	0	5	10	15	Mean (B)	0	5	10	15	Mean (B)
	1st Cut									
Control	0.694	0.702	0.707	0.714	0.704	0.702	0.710	0.717	0.723	0.713
(ADY) at 2.5 g/l.	0.700	0.708	0.714	0.720	0.711	0.718	0.727	0.729	0.737	0.728
(ADY) at 5 g/l.	0.723	0.731	0.740	0.750	0.736	0.744	0.753	0.757	0.760	0.754
Vit. C at 50 ppm	0.727	0.735	0.744	0.758	0.741	0.748	0.758	0.763	0.766	0.759
Vit. C at 100 ppm	0.704	0.713	0.719	0.726	0.716	0.713	0.722	0.725	0.732	0.723
Vit. E at 10 ppm	0.727	0.740	0.749	0.772	0.747	0.740	0.751	0.752	0.756	0.750
Vit. E at 20 ppm	0.716	0.721	0.728	0.735	0.725	0.728	0.738	0.740	0.746	0.738
Vit. B_1 at 25 ppm	0.718	0.725	0.733	0.742	0.730	0.734	0.744	0.746	0.751	0.744
Vit. B_1 at 50 ppm	0.714	0.717	0.724	0.732	0.722	0.723	0.732	0.731	0.743	0.732
Mean (A)	0.714	0.721	0.729	0.739	0.726	0.728	0.737	0.740	0.746	0.738
L.S.D. at 5 %	A :0.003		B :0.004		AB :0.009	A :0.003		B :0.003		AB :0.007
	2nd Cut									
Control	0.711	0.720	0.728	0.735	0.724	0.704	0.715	0.723	0.730	0.718
(ADY) at 2.5 g/l.	0.724	0.733	0.743	0.761	0.740	0.717	0.733	0.745	0.756	0.738
(ADY) at 5 g/l.	0.746	0.756	0.776	0.791	0.767	0.739	0.759	0.775	0.793	0.767
Vit. C at 50 ppm	0.751	0.760	0.780	0.795	0.772	0.741	0.765	0.780	0.802	0.772
Vit. C at 100 ppm	0.720	0.728	0.737	0.753	0.735	0.711	0.727	0.737	0.748	0.731
Vit. E at 10 ppm	0.741	0.751	0.772	0.787	0.763	0.737	0.751	0.768	0.782	0.760
Vit. E at 20 ppm	0.734	0.743	0.753	0.768	0.750	0.727	0.742	0.756	0.769	0.749
Vit. B_1 at 25 ppm	0.738	0.747	0.768	0.782	0.759	0.732	0.747	0.761	0.775	0.754
Vit. B_1 at 50 ppm	0.729	0.738	0.749	0.765	0.745	0.722	0.739	0.752	0.763	0.744
Mean (A)	0.733	0.742	0.756	0.771	0.750	0.726	0.742	0.755	0.769	0.748
L.S.D. at 5 %	A :0.002		B :0.003		AB :0.006	A :0.003		B :0.004		AB :0.008

Table (6): Effect of compost, active dry yeast and some vitamins on essential oil yield/plant/cut (ml/plant) of *Ocimum basilicum*, L., in the first and second cuts during the first and second seasons 2012 and 2013.

Yeast and vitamins treatments (B)	Compost levels (ton/fed.) at									
	1st Season					2nd Season				
	0	5	10	15	Mean (B)	0	5	10	15	Mean (B)
					1st Cut					
Control	0.36	0.43	0.50	0.58	0.47	0.40	0.48	0.56	0.64	0.52
(ADY) at 2.5 g/l.	0.45	0.56	0.64	0.70	0.59	0.50	0.63	0.71	0.77	0.65
(ADY) at 5 g/l.	0.73	0.87	0.99	1.01	0.90	0.80	0.96	1.07	1.09	0.98
Vit. C at 50 ppm	0.77	0.92	1.03	1.06	0.94	0.85	1.01	1.11	1.14	1.03
Vit. C at 100 ppm	0.41	0.50	0.57	0.64	0.53	0.45	0.54	0.63	0.70	0.58
Vit. E at 10 ppm	0.71	0.85	0.97	1.01	0.88	0.76	0.92	1.03	1.05	0.94
Vit. E at 20 ppm	0.55	0.68	0.77	0.83	0.71	0.60	0.75	0.84	0.87	0.77
Vit. B_1 at 25 ppm	0.66	0.79	0.90	0.94	0.82	0.70	0.80	0.98	1.00	0.87
Vit. B_1 at 50 ppm	0.53	0.65	0.74	0.80	0.68	0.57	0.71	0.81	0.85	0.73
Mean (A)	0.57	0.69	0.79	0.84	0.72	0.62	0.75	0.86	0.90	0.78
L.S.D. at 5 %	A :0.05		B :0.05		AB :0.10	A :0.04		B :0.05		AB :0.10
					2nd Cut					
Control	0.49	0.58	0.67	0.77	0.63	0.52	0.62	0.72	0.83	0.67
(ADY) at 2.5 g/l.	0.61	0.75	0.86	0.96	0.79	0.65	0.81	0.91	1.00	0.84
(ADY) at 5 g/l.	0.97	1.15	1.33	1.36	1.20	1.01	1.23	1.38	1.45	1.27
Vit. C at 50 ppm	1.02	1.21	1.38	1.41	1.25	1.07	1.29	1.44	1.51	1.32
Vit. C at 100 ppm	0.55	0.66	0.76	0.86	0.70	0.58	0.70	0.81	0.94	0.76
Vit. E at 10 ppm	0.93	1.10	1.28	1.32	1.15	0.96	1.17	1.33	1.37	1.21
Vit. E at 20 ppm	0.73	0.90	1.03	1.11	0.94	0.77	0.96	1.10	1.14	0.99
Vit. B_1 at 25 ppm	0.88	1.05	1.21	1.26	1.10	0.89	1.12	1.27	1.30	1.14
Vit. B_1 at 50 ppm	0.69	0.86	0.98	1.07	0.90	0.73	0.92	1.06	1.11	0.95
Mean (A)	0.76	0.91	1.05	1.12	0.96	0.80	0.98	1.11	1.18	1.01
L.S.D. at 5 %	A :0.06		B :0.05		AB :0.10	A :0.07		B :0.07		AB :0.14

Table (7): Effect of compost, active dry yeast and some vitamins on essential oil yield/plant/season and /fed./season of *Ocimum basilicum*, L., during the first and second seasons 2012 and 2013.

Yeast and vitamins treatments (B)	Compost levels (ton/fed.) at									
	1st Season					2nd Season				
	0	5	10	15	Mean (B)	0	5	10	15	Mean (B)
	Essential oil yield/plant/season (ml/plant)									
Control	0.85	1.01	1.17	1.35	1.09	0.92	1.10	1.28	1.47	1.19
(ADY) at 2.5 g/l.	1.06	1.30	1.51	1.66	1.38	1.15	1.44	1.62	1.77	1.49
(ADY) at 5 g/l.	1.70	2.03	2.32	2.38	2.10	1.81	2.19	2.45	2.54	2.24
Vit. C at 50 ppm	1.78	2.14	2.41	2.47	2.20	1.93	2.30	2.55	2.64	2.35
Vit. C at 100 ppm	0.96	1.16	1.33	1.50	1.23	1.03	1.25	1.44	1.64	1.34
Vit. E at 10 ppm	1.63	1.95	2.24	2.33	2.03	1.72	2.09	2.36	2.42	2.14
Vit. E at 20 ppm	1.28	1.58	1.80	1.94	1.65	1.37	1.71	1.94	2.02	1.76
Vit. B_1 at 25 ppm	1.54	1.84	2.11	2.21	1.92	1.59	1.92	2.24	2.30	2.01
Vit. B_1 at 50 ppm	1.22	1.51	1.73	1.87	1.58	1.29	1.64	1.86	1.96	1.68
Mean (A)	1.33	1.61	1.84	1.96		1.42	1.73	1.96	2.08	
L.S.D. at 5 %	A :0.11		B :0.09		AB :0.18	A :0.12		B :0.13		AB :0.26
	Essential oil yield/fed./season (liter/fed.)									
Control	21.17	25.36	29.28	33.64	27.32	23.03	27.47	31.91	36.76	29.73
(ADY) at 2.5 g/l.	26.45	32.57	37.65	41.51	34.48	28.73	35.92	40.49	44.25	37.28
(ADY) at 5 g/l.	42.49	50.67	58.05	59.48	52.57	45.34	54.65	61.27	63.48	56.11
Vit. C at 50 ppm	44.58	53.38	60.31	61.67	54.91	48.16	57.54	63.81	66.05	58.78
Vit. C at 100 ppm	24.06	28.93	33.21	37.42	30.86	25.87	31.19	36.07	40.95	33.45
Vit. E at 10 ppm	40.80	48.81	56.09	58.21	50.86	42.90	52.35	59.06	60.49	53.59
Vit. E at 20 ppm	32.04	39.50	44.98	48.40	41.17	34.26	42.68	48.52	50.43	43.90
Vit. B_1 at 25 ppm	38.46	46.04	52.85	55.13	48.05	39.85	47.95	56.12	57.50	50.29
Vit. B_1 at 50 ppm	30.51	37.68	43.20	46.87	39.49	32.35	40.88	46.54	48.95	42.09
Mean (A)	33.30	40.18	45.98	48.96		35.49	43.21	49.09	51.90	
L.S.D. at 5 %	A :2.58		B :2.85		AB :4.70	A :2.41		B :2.78		AB :5.56

Table (8): Effect of compost, active dry yeast and some vitamins on total chlorophylls (mg/g f.w.) and nitrogen percentage of *Ocimum basilicum*, L., during the first and second seasons 2012 and 2013.

Yeast and vitamins treatments (B)	Compost levels (ton/fed.) at									
	1st Season					2nd Season				
	0	5	10	15	Mean (B)	0	5	10	15	Mean (B)
	Total chlorophylls (mg/g f.w.)									
Control	3.109	3.163	3.179	3.217	3.167	3.215	3.271	3.315	3.345	3.287
(ADY) at 2.5 g/l.	3.148	3.200	3.240	3.257	3.211	3.257	3.345	3.372	3.393	3.342
(ADY) at 5 g/l.	3.290	3.353	3.394	3.392	3.357	3.386	3.461	3.519	3.547	3.478
Vit. C at 50 ppm	3.318	3.381	3.414	3.427	3.388	3.403	3.497	3.533	3.560	3.499
Vit. C at 100 ppm	3.164	3.218	3.257	3.271	3.227	3.278	3.373	3.394	3.423	3.367
Vit. E at 10 ppm	3.335	3.403	3.434	3.452	3.403	3.434	3.516	3.546	3.578	3.518
Vit. E at 20 ppm	3.240	3.302	3.327	3.342	3.303	3.335	3.419	3.481	3.511	3.437
Vit. B_1 at 25 ppm	3.270	3.330	3.354	3.378	3.333	3.368	3.433	3.508	3.539	3.462
Vit. B_1 at 50 ppm	3.208	3.252	3.288	3.298	3.261	3.295	3.399	3.421	3.455	3.392
Mean (A)	3.231	3.289	3.323	3.335		3.330	3.413	3.454	3.484	
L.S.D. at 5 %	A :0.012		B :0.012		AB :0.024	A :0.007		B :0.014		AB :0.028
	N %									
Control	1.827	1.851	1.876	1.893	1.862	1.831	1.863	1.887	1.906	1.872
(ADY) at 2.5 g/l.	1.862	1.893	1.918	1.939	1.903	1.873	1.906	1.929	1.948	1.914
(ADY) at 5 g/l.	2.008	2.043	2.070	2.093	2.054	2.022	2.061	2.085	2.114	2.070
Vit. C at 50 ppm	2.023	2.055	2.083	2.114	2.069	2.041	2.069	2.099	2.125	2.084
Vit. C at 100 ppm	1.841	1.871	1.926	1.917	1.889	1.850	1.883	1.928	1.890	1.888
Vit. E at 10 ppm	1.977	2.008	2.034	2.056	2.019	1.992	2.021	2.051	2.069	2.033
Vit. E at 20 ppm	1.910	1.941	1.966	1.987	1.951	1.925	1.956	1.978	1.998	1.964
Vit. B_1 at 25 ppm	1.941	1.974	1.989	2.011	1.979	1.958	1.994	2.004	2.023	1.995
Vit. B_1 at 50 ppm	1.885	1.916	1.941	1.962	1.926	1.898	1.929	1.953	1.974	1.939
Mean (A)	1.919	1.950	1.978	1.997		1.932	1.965	1.990	2.005	
L.S.D. at 5 %	A :0.008		B :0.010		AB :N.S.	A :0.002		B :0.003		AB :0.006

Table (9): Effect of compost, active dry yeast and some vitamins on phosphorous and potassium percentages of *Ocimum basilicum*, L., during the first and second seasons 2012 and 2013.

Yeast and vitamins treatments (B)	Compost levels (ton/fed.) at									
	1st Season					2nd Season				
	0	5	10	15	Mean (B)	0	5	10	15	Mean (B)
	P %									
Control	0.111	0.127	0.141	0.153	0.133	0.122	0.138	0.150	0.161	0.143
(ADY) at 2.5 g/l.	0.140	0.161	0.172	0.181	0.164	0.149	0.173	0.181	0.188	0.173
(ADY) at 5 g/l.	0.195	0.219	0.238	0.249	0.225	0.207	0.231	0.249	0.261	0.237
Vit. C at 50 ppm	0.198	0.221	0.245	0.259	0.231	0.218	0.244	0.262	0.276	0.250
Vit. C at 100 ppm	0.132	0.150	0.161	0.168	0.153	0.141	0.161	0.170	0.175	0.162
Vit. E at 10 ppm	0.185	0.214	0.226	0.235	0.215	0.194	0.226	0.241	0.248	0.227
Vit. E at 20 ppm	0.161	0.186	0.198	0.207	0.188	0.172	0.199	0.209	0.218	0.200
Vit. B_1 at 25 ppm	0.174	0.202	0.212	0.219	0.202	0.183	0.214	0.226	0.231	0.214
Vit. B_1 at 50 ppm	0.152	0.174	0.186	0.198	0.178	0.163	0.186	0.195	0.202	0.187
Mean (A)	0.161	0.184	0.198	0.208		0.172	0.197	0.209	0.218	
L.S.D. at 5 %	A :0.001		B :0.004		AB :0.008	A :0.001		B :0.005		AB :0.009
	K %									
Control	1.323	1.352	1.378	1.395	1.362	1.327	1.357	1.386	1.399	1.367
(ADY) at 2.5 g/l.	1.358	1.404	1.408	1.429	1.400	1.362	1.410	1.419	1.435	1.407
(ADY) at 5 g/l.	1.423	1.478	1.485	1.502	1.472	1.431	1.489	1.501	1.515	1.484
Vit. C at 50 ppm	1.436	1.489	1.500	1.517	1.486	1.447	1.501	1.519	1.530	1.499
Vit. C at 100 ppm	1.347	1.371	1.395	1.415	1.382	1.353	1.379	1.406	1.427	1.391
Vit. E at 10 ppm	1.408	1.462	1.475	1.481	1.457	1.420	1.477	1.488	1.496	1.470
Vit. E at 20 ppm	1.371	1.427	1.439	1.448	1.421	1.380	1.438	1.453	1.462	1.433
Vit. B_1 at 25 ppm	1.389	1.441	1.452	1.461	1.436	1.399	1.458	1.469	1.482	1.452
Vit. B_1 at 50 ppm	1.366	1.414	1.420	1.436	1.409	1.374	1.425	1.433	1.441	1.418
Mean (A)	1.380	1.426	1.439	1.454		1.388	1.437	1.453	1.465	
L.S.D. at 5 %	A :0.004		B :0.005		AB :0.010	A :0.001		B :0.003		AB :0.006

Concerning the treatments of active yeast and some vitamins (C, E and B_1) each at two concentrations, data presented Tables (8 and 9) clearly revealed that all used treatments considerably increased N, P and K % in the dry herb in both seasons. The treatments of vit. C (50 ppm) followed by ADY (5 g/l.) then vit. E (10 ppm) resulted the highest percentages of N, P and K with significant differences among them in both seasons.

Many researches came to similar results that vitamins augmented N, P and K % in the dry leaves and herbs of different plants such as *Nigella sativa* (Ismail, 2008 and Al-Shareif, 2012), guar plants (Abdou *et al*., 2013b). The role of active yeast in promoting N, P and K % was also, reported by Badran *et al*. (2002) on marjoram plants, Heikal (2005) on *Thymus vulgaris* and Abdou *et al*. (2012b) on sage plants.

The interaction between the main and sub-plots (A×B) was significant for N, P and K % in both seasons, except N % in the first season. The highest N, P and K % were obtained due to compost at high level (15 ton/fed.) in combination with vit. C (50 ppm).

REFERENCES

Abd El-Raouf, R. M. S. (2001): Production of sweet basil (*Ocimum* ., Minia Univ., Egypt.

and Meawad, A.E.A. (2009) : Effect of organic fertilization on yield and active constituents of *Thymus vulgaris*, L. under North Sinai conditions. Research Journal of Agriculture and Biological Sciences, 5 (4) : 555 – 565.

Badran, F.S. ; Zayed, A.A. and Hussain, M.A. (2002) : Response of vegetative growth and yield of herb *Majorana hortensis*, Moench, plants to potassium fertilization and active

basilicum, L.) in the new reclaimed lands under different levels of biofertilizers and plant density. M.Sc. Thesis, Fac. Agric., Ain Shams Univ., Egypt.

Abdou, M.A.H.; Abdalla, M.Y.; Helaly, A. and Mosaad, S. (2012b) : Physiological studies on sage plant. Minia J. of Agric. Res. & Develop., 32 (2) :161-186.

Abdou, M.A.H. ; Attia, F.A. ; Ahmed, E.T.; El-Sayed, A.A. and Abd-El-Naeem L.M. (2012a) : Physiological studies on mint plants. Proc. Second Inter. Conf. of Physiol. Microb. and Ecological Plant Sci. (29-30 April, 2012) Fac. of Science, Minia Univ., pp : 207-228.

Abdou, M.A.H.; El-Sayed, A.A.; Attia, F.; Taha, R. and Shehata , A. (2013b) : Effect of organic fertilization and natural substances on guar plants. Minia J. of Agric. Res. & Develop., 33 (2) : 221-242.

Abdou, M.A.H. ; El-Sayed, A.A. ; Taha, R.A. and Botros, W.S. (2013a) : Physiological studies on caraway plants. Proc. 1st Inter of Hort. Agric. Assuit, February 2013.

Al-Shareif, A.M.O. (2012) : Physiological studies on black cumin plant. Ph. D. Thesis, Fac. of Agric

Ateia, E.M.; Osmam, Y.A.H. yeast. Proc. Sec. Conf. of Sustainable Agric. Dev. May, 2002, Fayoum Branch, Cairo Univ., Egypt.

Baeck, H.W. and Park, K.W. (2001) : Effect of substrate and nutrient solution concentration on growth and essential oil content of sweet basil (*Ocimum basilicum*). Korean Journal of Horticultural Science & Technology, 19 (1): 92–97 (Hort. Abst., 72 (6) : 5947).

Botros, W.S.E. (2013) : Physiological studies on caraway plants. M.Sc. Thesis, Fac. Agric., Minia Univ., Egypt.

Brien, T.A. and Barker, A.V. (1996) : Growth of peppermint in compost. J. Herbs, Spices & Medicine plants, 4 (1) : 19 – 27.

British Pharmacopoeia (1963) : Determination of volatile oil in drugs. The Pharmaceutical Press, London.

Dewick, P.M. (2000) : Medicinal Natural Products. A Biosynthetic Approach 2nd Ed., John Wiley & Sons, N.Y., 306-356.

Eid, R.A. ; Taha, L.S. and Ibrahim, S.M.M (2010) : Physiological studies on essential oil properties of *Jasminum grandiflorum*, L. as affected by some vitamins. Ozean Journal of Applied sciences, 3 (1) : 87-96.

El-Gendy, S. A.; Hosni, A. M.; Ahmed, S. S. and Saber, R. M. (2001) : Sweet basil (*Ocimum basilicum* L.) productivity under different organic fertilization and inter-plant spacing levels in a newly reclaimed land in Egypt. Ann. Agric. Sci. Ain Shams Univ., 46 (1) : 319 – 338.

El–Ghadban, E. A. E.; El–Tobgy, K.M.K. and Soliman, S.G.I. (2008) : Response of lavender plant (*Lavandula multifida*, L.) to compost and active dry yeast. J. Product. & Dev., 13 (1) : 79 – 99.

El–Ghadban, E. A. E.; Ghallab, A.M. and Abdel – Wahab, A.F. (2003) : Effect of some organic fertilizer and biofertilization on growth, yield and chemical composition of marjoram plants under newly reclaimed soil conditions. J. Agric. Sci. Mansoura Univ., 28 (9) : 6957 – 6973.

El–Hindi, K.M. and El–Boraie, E.A. (2005) : Effect of some biofertilizers on the growth, essential oil and chemical composition of marjoram plants. J. Agric. Sci. Mansoura Univ., 30 (12) : 7912 – 7928.

El-Leithy, S. ; Ayad, H. and Reda, F. (2011) : Effect of riboflavin, ascorbic acid and dry yeast on vegetative growth, essential oil pattern and antioxidant activity of geranium (*Pelargonium graveolens*, L.). American-Eurasian J. Agric. And Enveron. Sci., 10 (5) : 781-786.

Gharib, F.A. ; Moussa, L.A. and Massoud, O.N. (2008) : Effect of compost and bio-fertilizers on growth, yield and essential oil of sweet marjoram (*Majorana hortensis*) plant. Int. J. Agric. Biol., 10 : 381-388.

Heikal, A.M. (2005) : Effect of some organic and biofertilization on the growth production and composition of thyme (*Thymus vulgaris*, L.) plants. M.S.c. Thesis. Fac. Agric. Minia Univ., Egypt.

Hendawy, S.F.; Azza, A.; Ezz El-Din, E. and Omer, E.A. (2010): Productivity and oil quality of *Thymus vulgaris*, L. under organic fertilization conditions. Ozean Journal of Applied Sciences, 3 (2) : 203-216.

Herrera, E.; Tremblay, N.; Desroches, B. and Gosselin, A. (1997) : Optimization of substrate and nutrient solution for organic cultivation of medicinal transplants in multi cell flats. J. of Herbs, Spices, Medicinal Plants, 4 (4) : 69 – 82, (Hort. Abst., 67: 9837).

Ismail, S.I.I. (2008) : Anatomical and physiological studies on *Nigella sativa*, L. plant. Ph.D. Dess., Fac. Agric., Mansoura Univ., Egypt.

Khalil, M.Y. and El-Sherbeny, S.E. (2003) : Improving the productivity of three *Mentha* species recently cultivated

under Egyptian conditions. Egypt, J. Appl. Sci., 18 (1) : 285-300.

Khalil, S.E.; Abd El-Aziz, N.G. and Abou Leil, B.H. (2010) : Effect of water stress and ascorbic acid on some morphological and biochemical composition of *Ocimum basilicum* plant. Journal of American Science, 6 (12) : 33-44.

Khedr, Z.M.A. and Farid, S. (2000) : Response of naturally virus infected tomato plants to yeast extract and phosphoric acid application. Annals Agric. Sci., Moshtohor, 38 (2) : 927-939.

Massoud, H.Y.A. (2006) : Effect of phosphorus fertilization levels and foliar application with active dry yeast on growth, herb yield, essential oil productivity and chemical components of sage (*Salvia officinalis*, L.) J. Agric. Sci. Mansoura Univ., 31 (10) : 6649-6665.

Moran, R. (1982) : Formula determination of chlorophylls pigments extracted with N-N dimethyl-formamide. Plant Physiological, 69 : 1376-1381.

MSTAT-C (1986) : A Microcomputer Program for the Design, Management and Analysis of Agronomic Research Experiments (Version 4.0), Michigan Stat Univ., U.S.

Oertli, J. J. (1987) : Exogenous application of vitamins as regulators for growth and development of plant. A review Z. planzenernahr. Bodenk., 150 : 375 – 391.

Page, A.L.; Miller, R.H. and Kenney, D.R. (1982) : Methods of Soil Analysis, Part II. Amer. Soc. Agron. Inc, Madison, Wisconism, USA.

Pascual-Villalobos, M.J. and Ballesta-Acosta, M.C. (2003) : Chemical variation in an *Ocimum basilicum* germoplasm collection and activity of the essential oils on *Callosobruchus maculatus*. Biochem. Syst. Ecol., 31: 673-679.

Reda, F. ; Abdel-Rahim, E.A. ; El-Baroty, G.S. and Ayd, H.S. (2005) : Response of essential oils, phenolic compounds and polyphenyl oxidase activity of thyme (*Thymus vulgaris*) to some bioregulators and vitamins. International J. Agric and Biol., 7 (5) : 735-739.

Refaat, A.M. and Balbaa, L.K. (2001) : Yield and quality of lemon grass plants (*Cymbopogon flexuous*, Stapt.) in relation to foliar application of some vitamins and micro-elements. Egypt Journal of Horticulture, 28 (1) : 41-57.

Salman, A.S. (2006) : Effect of biofertilization on *Ocimum basilicum*, L. plant. Egypt J. Agric. Res., 79 (2): 587-606.

Singh, H.S.; Bhagat, H.S.; Matkur, T.K; Gopinath, R.K. and Ganquly, D. (1971) : Cultivation of basil (*Ocimum basilicum*, L.) at Jorhata Assam and chemical composition of its oil. The flavour Industry, 481.

Skoog, F. and Millar, C. (1957) : Biological action of growth substances. Cambridge Univ. Press, Camb., P. 200.

Zhang, R. ; Schmidt, E. and Zhang, X.Z. (2000) : Hormone containing products impact on antioxidants status of tall fescue and creeping betagrass subjected to drought. Crop. Sci., 40 : 1344-1349.

Zheljazkov, V.D. and Warman, P.R. (2004) : Source-Separated municipal Solid Waste Compost application to Swiss chard and basil. J. of Environmental Quality, 33 : 542-552.

الملخص العربي

استجابة نباتات الريحان الحلو لبعض المعاملات الزراعية

محمود عبد الهادي حسن عبده، فاروق صلاح الدين بدران، أحمد عبد المنعم السيد، رجاء على طه، نورا محمود كامل عبد السلام

قسم البساتين – كلية الزراعة – جامعة المنيا

تم إجراء تجربة حقلية خلال موسمي 2012 و2013 بمزرعة كلية الزراعة – جامعة المنيا لاختبار تأثير الكمبوست وبعض الفيتامينات والخميرة النشطة على إنتاجية العشب والزيت الطيار والمكونات الكيماوية لنباتات الريحان الحلو.

وقد أظهرت النتائج أن الوزن الطازج والجاف للعشب (وزن العشب/نبات/الحشة والوزن/نبات/موسم وللفدان/موسم) وكل صفات إنتاج الزيت (النسبة المئوية و محصول الزيت/نبات/حشة ومحصول الزيت /نبات/موسم وللفدان/موسم) وكذلك المكونات الكيماوية (الكلوروفيلات الكلية والنسبة المئوية للنتروجين والفوسفور والبوتاسيوم) زادت معنوياً نتيجة استعمال كل معاملات الكمبوست مقارنة بالكنترول. وكانت أعلى قيم سجلت نتيجة استعمال المستوى العالي من الكمبوست (15 طن/فدان).

وقد سجلت النتائج زيادة معنوية في قيم صفات محصول العشب والزيت والمكونات الكيماوية نتيجة استعمال مختلف معاملات الفيتامينات (ج و ه و ب$_1$) والخميرة النشطة وكانت أكثرها كفاءة هي معاملة فيتامين ج (50 جزء/مليون) تليها معاملة الخميرة النشطة (5 جم/لتر).

يمكن التوصية بإمداد نبات الريحان الحلو بالكمبوست عند 15 طن/فدان مع فيتامين ج عند 50 جزء/مليون أو مع الخميرة النشطة عند 5 جم/لتر وذلك للحصول على أعلى إنتاج لمحصول العشب والزيت.