EFFECT OF APPLYING BOIFERTILIZER IN COMBINATION WITH SOME ORGANIC OR MINERAL ONES ON GROWTH AND CHEMICAL CONSTITUENTS OF MARJORAM "*ORIGANUM MAJORANA L.*," PLANTS

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ABSTRACT

A filed experiments was carried out during two successive seasons of 2005/2006 and 2006/2007 to study the effect of applying biofertilizer (active dry yeast) as foliar spray at rates 0, 1, 2 and 3 g/L, alone or with the recommended doses of "NPK" as mineral fertilizers at the rates of (400 Kg/fed ammonium sulphate + 200 Kg/ fed calcium super-phosphate+ 100kg/fed. potassium sulphate) or three forms of organic manure (farmyard "FYM"; poultry "PM" and sheep manures "SM") at a rate 25 m^3/fed. on growth and chemical constituents of marjoram (*Origanum majorana* L.,) plants which grown by terminal cuttings.

The obtained results indicated that growth parameters (i.e., plant height, number of branch, fresh weight of herb, yield of herb dried air weight /plant, yield of leaves dried air weight /fed., number of roots/plant) as well as chemical constituents (essential oil %, oil yield per plant or feddan, total carbohydrates, N, P, K, Fe and Zn content of the herb) were significantly increased by applying biofertilizer (active dry yeast spray), mineral "NPK" and organic manures. Similar results were observed by using combined treatments of active dry yeast with the organic manures. Application of both mineral "NPK" or poultry manure gave the best values of growth parameters (plant height, number of branch, fresh weight of herb, herb dried air yield weight/plant, leaves dried air yield weight/fed. number of roots/plant) as well as chemical constituents (essential oil percentage, oil yield per plant and per feddan). Poultry manure gave the best results for N, P and K (%), Fe and Zn (mg/g). and total carbohydrate contents in the cuts than the other treatments. In addition the effect of active dry yeast combined with either mineral "NPK" or poultry manure was statistically insignificant on all studied growth parameters. So it could be recommended with using biofertilizer (active dry yeast spray) at rate 2 g/L. combined with poultry manure at rate 25 m^3/fed. to get the highest growth rate of marjoram with favorable chemical constituents.

Key words: Marjoram (*Origanum majorana* L.,) terminal cuttings, biofertilizers, spray active dry yeast, organic manures.

INTRODUCTION

Marjoram (*Origanum majorana* L.) is a popular aromatic, medicinal spices plant of Lamiaceae and is well known for it is highly aromatic ingredient used for cough-relieving, stomachache, diuretic, carminative tea blends used in food industries. It is most important species being utilized as a source of essential oil.

Marjoram can be grown from seeds as usually in any area, and Tamia district, Fayoum Governorate is famous for cultivate the marjoram with

terminal cuttings. So, this study was carried out to evaluate this professional method as well as the role of farmers for maximizing marjoram yield among balanced mineral, organic and biofertilization to keep human and animal health through faraway from the chemical cultural or used at least smallest amount of it.

Active dry yeast is know for their high contents of different nutrients, high percentage of protein, large amounts of vitamin B and natural plant growth regulators such as cytokinins. In addition if have soluble phosphate which will readily combine with cations in soil solution to form low solubility substance called phosphate fixation that is dominant with high soil pH and greater percentage of calcium carbonate. Also microorganisms play an important role in supplying the plants with available phosphorus through converting the nonsoluble form of phosphorus to soluble one. **(Ahmed *et al.*, 1997).** Dry yeast fertilization also provides a means for alleviating the problem of chemical residues in the export market

N.R.P. (1977) reported the analysis of active dry yeast showed that it contains dry matter 93%, protein 47.2%, arginine 2.6%, glycine2.6%, histidine 1.4% ,iso-laysine2.9%, lauicine3.5%, lysine 3.8%, methionine cystine 0.6%, phenyl alanme3.6%, tyrosine 2.1%, threonine 2.6%, tryptophan 0.5%, and vitamin B2.9%,.

Many investigations were carried out on different experiments dealing with active dry yeast spray and its effect on growth and yield of medicinal and aromatic plants. In this respect, **Ahmed *et al.* (1997)** on red romy grapevines, **Akl *et al.* (1997)** on berry set, **Ahmed, Shadia *et al.*(1998)** and **Somida *et al.* (2005)** on *Hibiscus sabdariffia* L., **Nagiub, Nabila,** and **Khalil, Mona, (2002)** and **El –Yazal Sawasan** and **Somida (2007)** on *Nigella sativa* plants.

Concerning the experiments dealing with the effect of organic manure and mineral fertilization on growth and yield of medicinal and aromatic plants. Several investigations carried out by **El-Ghadban (1998)** and **Mansour *et al.* (1999) and El-Gendy *et al.* (2001)** on *Ocimum basilicum* L, **Matter and Mohamed (2001)** on *Calendula officinalis* L. plants, **Mohamed and Matter (2001)** on *Tagetes minuta* L plants, **Sakr (2001)** on *Mentha piperita*, **Somida, (2002)** on *Tagetes minuta* L plants **El-Yazal, *et al.* (2005)** and **Matter** and **Somida (2006)** on *Ocimum basilicum* L., **Mohamed (2006) on** *Hibiscus sabdariffia* L., plants, **El –Yazal Sawasan** and **Somida (2007)** on *Nigella sativa* plant and **El –Yazal Sawasan** and **Somida (2008) on** *Tagetes patula* L., plants.

Frequent and application of biofertilizer and organic manure are necessary to maintain soil fertility and to provide the growing plants with their nutritional requirements without having an undesirable impact on the environment, bio and organic fertilization also provides a means for alleviating the problem of chemical residues in the exporting market.

This study aims to evaluate the effect of dry yeast spray combined with mineral "NPK" or organic manure fertilization on growth and yield of herb, leaves and oil and chemical constituents of marjoram (*Origanum majorana* L.,) plants.

MATERIAL AND METHODS

The present investigation was carried out during two successive seasons of 2005/2006 and 2006/2007 at a private farm in Tamia, district Fayoum Governorate a sandy loam soil cultivated with marjoram (Majorana *marjoram* L.,) plants to study the effect of biofertilizer of active dry yeast as foliar spray alone or with the recommended NPK mineral fertilizers or organic manure in

three types (farmyard "FYM"; poultry "PM" and sheep manures "SM") on growth (i.e. plant height etc.) and chemical constituents (i.e. Chlorophyll a, b and caroteniods etc.). Local terminal cuttings of 15 cm length from marjoram farm were transplanted on December 1st in the two seasons. The experiment comprised 20 treatments in three replicates; each replicate occupied one plot had an area of (2x2 m) and, 4 rows (50 cm apart)) and 32 plants with a distance of 25 cm between plants

Biofertilizer of active dry yeast (Y) "*Sccharomyces cerevsiae*" was used as foliar spray at rates 0, 1, 2 and 3 g/L, and (NK) mineral fertilizers in six equal doses, were applied as basal dressing. The first dose was added after five weeks from transplanting, the second dose after four weeks from the first dose, the third dose after two weeks from the first cut, the fourth dose after three weeks from the third dose, the five dose after two weeks from the second cut and six dose after three weeks from the five dose.

Organic manures were obtained from private farms in the forms of farmyard manure "FYM"; poultry manure and "PM' sheep manure "SM" at rate 25 m^3/fed, which were applied in three doses. The first dose at a rate of 15 m^3/fed. was incorporated with the soil before planting about two weeks; the second dose at a rate of 5 m^3/fed was applied as basal dressing after the first cut and the third dose at a rate of 5 m^3/fed was applied as basal dressing after the second cut.

The plants of control treatment were treated with the recommended mineral fertilizers, i.e., 400 kg/ fed of ammonium sulphate (20.5%N), 200 kg/fed of calcium super phosphate15.5%P2O5 and, 100 kg/fed of potassium sulphate 48% **(Mansour *et al.*, 1999).** Calcium super phosphate was added during soil preparing; nitrogen and potassium fertilizers were added as foliar spray with the biofertilizer. Some physical and chemical properties of the experimental soil and organic fertilizers are analyzed according to the methods described by **Black *et al.* (1965)** and **Jackson, (1973)** and shown in Table (1).

Table (1): Physical and chemical analysis of used soil and organic fertilizers

Properties	Soil	Organic fertilizers			
		Properties	FYM	SM	PM
Sand%	70.08	Weight of 1 m^3 kg	755	459	510
Silt%	27.12				
Clay%	2.80	Organic carbon%	22.80	10.73	23.32
Texture grade	Loamy sand	Organic matter%	39.22	18.46	40.12
pH	7.52	C/N ratio %	15.30	13.25	11.72
ECe (ds/m)	1.48	pH	7.42	7.35	6.95
Total N %	0.08	Total N %	1.49	0.81	1.99
P %	0.11	P %	0.52	0. 88	0.83
K %	1.41	K %	1.09	0.75	1.32
Zn %	0.97	Zn mg/kg	154	173	195
Mn ppm	1.28	Mn mg/kg	425	610	85.12
Cu ppm	0.74	Cu mg/kg	65	142	24.15
Fe ppm	6.12	Fe mg/kg	995	1498	2225

The experimental was designed as factorial experiment in complete randomized block, with three replicate; each replicate included three organic treatments plus the mineral treatment.

Three cuts were taken after flowering, the first, second and third were taken on 15th may, 1th August and 15th October, respectively in which plant height, number of branch, fresh weight of herb, herb dry air yield weight/plant, leaves dry air yield weight/fed, number of roots/plant were recorded. The essential oil percentage was determined in the herb according to **British Pharmacopoeia method (1983)** by using Clevenger apparatus for the determining of essential oil, oil yield (ml)/plant, oil yield (liter)/fed.

$$\text{Essential oil percentage} = \frac{\text{Essential oil quantity (ml)}}{\text{Fresh weight of sample (100 g)}}$$

Chlorophyll a, b and caroteniods (mg/100g fresh leaves) were determined according to **Welburn and Lichtenthaler (1984)**. Nutrient contents were determined after wet digestion according to the method described by **Chapman and Paratt (1978)**. Nitrogen and phosphorus % was determined according to **A.O.A.C (1995),** Potassium was determined by Flame Photometer, Parkin–Elmer model 52 with acetylene burner according to **Page *et al.* (1982)**. Fe and Zn were determined (in dry herb) using Automatic Absorption according to **(Chapman** and **Paratt 1978)**. Total carbohydrates (mg/g D.W) were determined colorimetric according to the method described by **Herbert, *et al.* (1971).** Data were statistically analyzed according to **Gomez, and Gomez, (1983).** Data presented in the Tables of this investigation represent the mean of the two experimental seasons.

RESULTS AND DISCUSSIONS

A - Vegetative growth parameters:

1.– Plant height:

The data in Table (2) indicated that applying active dry yeast at all different rates significantly increased the plant height as compared to the untreated plants in the different cuts of the two seasons. In the meantime, the medium rate of 2.g/L and highest one(3g /L), were statistically, equal in producing significant higher plants than that of the low rate (1g/L) at the different cuts of the studied two seasons. These results are in conformity with the findings reported by **Ahmed Shadia, *et al.* (1998), Shalan *et al.* (2001)** and **Mohamed (2006)** on roselle plants and **Nagiub Nabila,** and **Khalil Mona, (2002)** on *Nigella sativa* L., plants.

The mineral fertilization "NPK" also significantly increased plant height as compared to the untreated plants and surpassed both the farmyard &sheep manures by 3.03 & 7.53, 0.93 & 3.62 and 1.96 & 3.79%, respectively in three cuts as indicated the data shown in Table (2) during the two studied experimental seasons. Similar results were obtained by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on ***Origanum majorana*** L., **El-Yazal, *et al.* (2005)** on *Ocimum basilicum* L. **Mohamed (2006)** on roselle plant and **Badran, *et al.* (2007)** on cumin plants.

All organic manures used in the current study significantly increased the plant height as compared to the control plants in the three cuts. Application of poultry manure significantly surpassed farmyard & sheep manures by 3.82 & 8.36, 1.42 & 4.13 and 3.38 & 5.24 %, respectively in three cuts of the tallest plants. At the meantime both mineral "NPK" and poultry manure (PM) were

statistically equal in producing significant plant height in the three cuts. So, the highest values were obtained when *Origanum majorana* L., plants received poultry manure at rate of 25 m^3/fed. These results are in agreement with the findings reported by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on ***Origanum majorana***, **El-Gendy *et al.* (2001)** and **El-Yazal, *et al.* (2005)** on *Ocimum basilicum* L., **Mohamed (2006)** on roselle plants and **El–Yazal Sawasan** and **Somida (2007)** on *Nigella sativa* plant

Concerning the interaction effect between active dry yeast and mineral "NPK" fertilization or organic manure fertilization there was significant increased in plant height as compared to the control plants in the three cuts of both studied seasons. The most effective treatment from the statistical and economical point of view that gave the tallest plants due to the use of active dry yeast at 2.g/L., in combination mineral "NPK" or poultry manure. The corresponding relative percentages reached 42.07 & 43.21, 37.45 and 37.57 and 20.05 & 21.72 %, respectively, in the three cuts of both seasons over the control. Both mineral "NPK" and poultry manure (PM) combined with active dry yeast at rate 2g/L., were statistically equal in producing a significant increase in plant height in the three cuts as compared to the other treatments. These results are in agreement with the findings reported by **Shalan *et al.* (2001)** and **Somida *et al.* (2005)** on roselle plants and **Mohamed (2005)** on *Phaseolus vulgaris* L., plants.

2- Number of branches per plant:

Data in Table (2) show clearly that number of branches/plant of ***Origanum majorana***, L., plants, was gradually increased with increasing active dry yeast rates up to 2g /L, then slightly increase up 3g/L in the three cuts of both seasons as compared with other treatments. The increases in number of branches/plant reached 21.65 & 25.93, 15.27 & 16.20 and 26.26 & 32.09% for the three cuts in the both seasons, due to the use of medium and high rates as compared to the unfertilized. Both medium and high rates of active dry yeast were statistically equal in producing significant number of branches in the three cuts of both seasons. These results are in conformity with the findings reported by **Ahmed Shadia, *et al.* (1998)** and **Shalan, *et al.* (2001)** on *Hibiscus sabdariffia.*, **Nagiub Nabila,** and **Khalil Mona (2002)** on *Nigella sativa* and **Amer, (2004)** and **Mohamed, (2005)** on *Phaseolus vulgaris* L., plants.

Data in Table (2) showed that number of branches/plant of ***Origanum majorana*** L., significantly increased as a result of applied by mineral "NPK" treatments as compared to the untreated plants in the three cuts of the two experimental seasons. Mineral "NPK" fertilization surpassed both the farmyard & sheep manures by 6.85 & 8.35, 3.31 & 6.91 and 9.63 & 10.57%, respectively in three cuts during the two experimental seasons. Similar results were obtained by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on marjoram plants, **El-Yazal, *et al.* (2005)** on sweet basil plants and **Mohamed (2006)** on roselle plants.

Organic manures in this study also significantly increased the number of branches/plant as compared to the control plants in the three cuts .Application of Poultry manure surpassed than the farmyard & sheep manures where the relative increasing in the number of branches/plant reached by 8.54 &10.07, 4.34 & 7.96 and 10.17 & 11.12 %, respectively in three cuts. At the meantime, both mineral "NPK" and poultry manure (PM) were statistically equal in producing significant number of branches/plant in the three cuts. So, the highest values were obtained when *Origanum majorana* L., plants received poultry manure at rate of 25 m^3/fed from poultry manure (PM). These results are in

agreement with the findings reported by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on marjoram plants, **Abd EL-Raouf (2001)** and **El-Yazal, *et al.* (2005)** on *Ocimum basilicum* L., **Mohamed (2006)** on roselle plants and **El – Yazal Sawasan** and **Somida (2007)** on *Nigella sativa* plant

The interaction effect between active dry yeast and mineral "NPK" or organic fertilization were significantly increased as compared to the control plants in the three cuts of both seasons. The most effective interaction treatments that gave the high number of branches/plant due to the use of active dry yeast at 2.g/L in combination mineral "NPK" or poultry manure with relative increases of 53.97 & 55.67, 34.00 & 34.73 and 58.78 & 59.37 %, respectively in the three cuts of both seasons over the control ones. Both mineral "NPK" and poultry manure (PM) combined with active dry yeast at rate 2g/L were statistically equal in producing significant number of branches/ plant in the three cuts mineral as compared to the other treatments. These results are in agreement with the findings reported by **Shalan *et al.* (2001)** and **Somida *et al.* (2005)** on roselle plants and **Mohamed (2005)** on *Phaseolus vulgaris* L., plants.

3 – Herb fresh weight plant (g.):

The obtained data in Table (2) show that active dry yeast treatments at all rates used resulted in a significant increase in the herb fresh weight/plant. Supplying the plants with the rates of 1, 2 and 3 g/L., increased herb fresh weight/plant by 8.80, 16.97, and 18.53% in the first cut 3.98, 8.13 and 9.59% in the second cut and 5.76, 11.97 and 12.48 in the third cut, respectively over the control plants. It is worth to mention that, the medium and high rates were equally effective in raising herb fresh weight/plant as compared with either the low rate or the control in the three cuts of both seasons. So, it is advised, from the economical point of view, to supply marjoram plants with 2g /L of active dry yeast. The increase in herb fresh weight/plant as a result of active dry yeast fertilization was reported by **Ahmed, Shadia *et al.* (1998)** and **Nagiub Nabila,** and **Khalil Mona (2002)** on *Nigella sativa* L., plants and **Mohamed (2005)** on *Phaseolus vulgaris* L., plants.

Mineral fertilization "NPK" significantly increased the herb fresh weight/plant as compared to the control, farmyard manure and sheep manures by 19.30, 4.49 and 10.26% for 1st cut; 17.79, 4.51 and 5.62% for 2nd cut or 10.70, 2.30 and 3.87% for 3rd cut in the three cuts of the two experimental seasons as indicate the data in Table (2). These results are in agreement with the findings reported by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on ***Origanum majorana***, **El-Yazal, *et al.* (2005)** *on Ocimum basilicum* L. **Mohamed (2006)** on roselle plants.

Organic manure significantly increased herb fresh weight/plant as compared to the control plants in the three cuts of both seasons. Application of poultry manure at the applied rates gave heavy plant than the other treatments by 20.02, 0.60, 5.117 and 10.92; 18.63, 0.71, 5.26 and 6.37 or 12.61, 1.72, 4.06 and 5.66 %, respectively for the three cuts. At the meantime both mineral "NPK" and poultry manure (PM) were statistically equal in producing significant herb fresh weight/plant in the first and second cuts during treated both seasons. So, the highest values were obtained when *Origanum majorana* L., plants with poultry manure at a rate of 25 m^3/fed .These results are in agreement with the findings reported by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on ***Origanum majorana***, **Abd El-Raouf (2001); El-Gendy *et al.***

Table (2): Effect of biofertilizers (active dray yeast spray) ,chemical NPK and organic manures on plant height, number of branches/plant and herb fresh weight/plant of *Majorana marjoram* L.' plant.

Treatments	Plant height (cm)					Number of branches / plant					Herb fresh weight g/ plant				
	First cut														
	Biofertilizer														
	Y 0	Y 1	Y 2	Y 3	Mean	Y 0	Y 1	Y 2	Y 3	Mean	Y 0	Y 1	Y 2	Y 3	Mean
Control	52.19	55.12	57.12	57.89	55.58	14.12	16.25	18.89	20.12	17.34	225.95	245.45	268.63	271.12	252.78
NPK	65.44	69.28	74.15	74.78	70.91	18.58	20.58	21.74	22.12	20.75	275.88	295.88	316.23	318.36	301.58
FYM	63.45	67.55	71.63	72.64	68.82	16.66	18.66	20.89	21.49	19.42	250.70	290.70	305.13	307.99	288.63
PM	65.49	69.89	74.74	75.70	71.45	18.93	20.93	21.98	22.48	21.08	280.79	296.79	315.66	320.36	303.40
SM	61.10	64.19	68.28	70.21	65.94	16.93	18.43	20.13	21.11	19.15	245.45	262.45	290.21	295.99	273.52
Mean	61.53	65.21	69.18	70.24		17.04	18.97	20.73	21.46		255.75	278.25	299.17	303.16	
LSD	A:1.51		B:1.09		AB:2.18	A:0.75		B:0.40		AB:0.81	A:4.45		B:2.40		AB:4.80
Second cut															
Control	52.92	54.99	56.14	56.85	55.22	22.23	24.56	26.56	27.23	25.14	333.61	352.66	368.21	372.22	356.67
NPK	66.06	68.99	72.74	73.25	70.26	25.33	28.19	29.79	29.98	28.32	399.89	414.91	429.86	435.86	420.13
FYM	67.09	68.09	71.08	72.18	69.61	24.99	26.89	28.82	28.96	27.41	381.23	394.08	412.81	419.81	401.98
PM	67.03	69.03	72.80	73.56	70.60	25.89	28.58	29.95	29.99	28.60	403.21	420.86	431.86	436.56	423.12
SM	65.07	67.07	69.07	69.99	67.80	24.99	26.49	27.19	27.29	26.49	378.79	389.79	408.25	414.23	397.76
Mean	63.63	65.63	68.37	69.17		24.69	26.94	28.46	28.69		379.34	394.46	410.19	415.73	
LSD	A:1.19		B:0.63		AB:1.23	A:0.54		B:0.29		AB:60	A:8.44		B:4.49		AB:8.98
Third cut															
Control	50.91	52.12	54.19	54.75	52.99	12.11	13.23	15.53	17.17	14.51	201.33	217.29	222.56	223.33	216.12
NPK	57.48	59.43	61.12	61.78	59.95	15.55	17.68	19.22	19.94	18.10	222.12	236.18	248.71	249.99	239.25
FYM	55.84	58.84	59.99	60.55	58.80	13.63	15.65	17.97	18.79	16.51	218.23	228.44	243.87	244.96	233.87
PM	58.98	60.15	61.97	62.09	60.79	15.95	17.55	19.30	19.99	18.19	224.45	240.53	253.70	254.85	243.38
SM	54.14	57.91	59.15	59.85	57.76	13.97	15.45	17.87	18.18	16.37	215.12	221.19	241.95	243.12	230.34
Mean	55.47	57.69	59.28	59.80		14.24	15.91	17.98	18.81		216.25	228.72	242.15	243.25	
LSD	A:0.95		B:0.51		AB:1.02	A:0.42		B:0.23		AB:0.46	A:3.89		B:2.10		AB:4.20

A: Active dry yeast (Y), B: Fertilizer sources, AB: Active dry yeast (Y) x Fertilizer sources,

Data of this table represents the mean of the two growing seasons.

(2001) and **El-Yazal, *et al.* (2005)** on *Ocimum basilicum* L. and **Mohamed (2006)** on roselle plants and **El-Yazal Sawasan** and **Somida (2007)** on *Nigella sativa* plant.

The interaction effect between active dry yeast and mineral "NPK" fertilization or organic manure caused significant increase in herb fresh weight/ plants as compared to the control plants in the three cuts of both seasons. The most effective treatment that gave the greatest values of herb fresh weight/plant due to the use of active dry yeast at 2.g/L in combination mineral "NPK" or poultry manure, with relative increase of 39.95 & 39.70, 28.70 & 29.45 and 23.53 & 26.01%, respectively in the three cuts of both seasons over the control. Both mineral "NPK" and poultry manure (PM) combined with active dry yeast at rate 2g/L were statistically equal in producing significant plant height in the three cuts as compared to the control. So, it is advisable to supply marjoram plants with 2g/L of active dry yeast and poultry manure fertilizer to increase the herb fresh weight/plant. These results are in agreement with the findings reported by **Shalan *et al.* (2001)** and **Somida *et al.* (2005)** on roselle plants and **Mohamed, (2005)** on *Phaseolus vulgaris* L., plants.

4- Herb dried air yield weight g/ plant:

Data in Table (3) show clearly that herb dried air yield weight/plant of ***Origanum majorana***, L., plants, was gradually and significantly increased with increasing active dry yeast rate up to 2 g /L then slightly increase up to 3g /L in the three cuts of both seasons as compared with other treatments. The relative increase of herb dried air yield weight/plant were by 21.85 & 23.08; 13.71 & 14.55 and 22.18 & 24.14%, respectively in the three cuts of both seasons, due to use of the medial & high rates of active dry yeast as compared to the control plants. Both medium and high rates of active dry yeast were statistically equal in producing significant herb dried air yield weight/plant in the three cuts of both seasons. The increase in herb dry air yield weight/plant in response to active dry yeast treatments has been reported by **Ahmed, Shadia *et al.*, (1998)** on roselle, **Nagiub, Nabila,** and **Khalil, Mona (2002)** on *Nigella sativa* L., and **Amer (2004)** and **Mohamed (2005)** on *Phaseolus vulgaris* L., plants.

Data in Table (3) recorded that herb dried air yield weight/plant of marjoram plants. significantly increased by treating plants with mineral "NPK" fertilization as compared to the untreated plants in the three cuts of the both seasons. Mineral "NPK" fertilization surpassed the farmyard manure &sheep manures by 5.01& 9.19; 5.79 & 8.35 and 9.37 & 14.77 %, respectively in three cuts of the both seasons. Similar results were obtained by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on marjoram plants **El-Yazal, *et al,* (2005)** on sweet basil plants and **Mohamed (2006)** on roselle plants.

Organic manure also significantly increased the herb dried air yield weight/plant as compared to the control plants in the three cuts. Poultry manure surpassed the control, mineral NPK, farmyard and sheep manures by 28.35, 0.35, 5.38 & 38.95; 0.41, 6.22 & 8.79 and 42.64, 1.061, 11.13 & 16.61%, respectively in three cuts of both seasons. At the meantime, both mineral "NPK" and poultry manure (PM) were statistically equal in producing significant herb dried air yield weight/plant in the three cuts. So, the highest values were obtained when *Origanum majorana* L., plants received poultry manure at rate of 25 m^3/fed poultry manure (PM). These results are in agreement with the findings reported by **El-Ghadban (1998)** and **Mansour *et***

al. **(1999)** on ***Origanum majorana***, L., **Abd El-Raouf (2001); El-Gendy *et al.* (2001)** and **Mohamed (2006)** on roselle plants

The interactions effect between biofertilizer as active dry yeast and mineral "NPK" fertilizer or organic manures were significant increased as compared to the control plants in the three cuts of both seasons. Active dry yeast at 2.g/L in combination with mineral "NPK" or poultry manure gave the best result than the other combined treatments from economical point of view. Both mineral "NPK" and poultry manure (PM) combined with active dry yeast at rate 2g/L were statistically equal in producing significant herb dried air yield weight/plant in the three cuts mineral compared to the other treatments. Similar results were obtained by **Mohamed (2005)** on *Phaseolus vulgaris* L., plants.

5-Leaves dry air yield weight (kg) / fed.

Table (3) show that at all rates of active dry yeast spray treatments used resulted in a significant increase in the leaves dried air yield weight/fed. Spraying the plants with the rates of 1, 2 and 3 g/L increased leaves dried air yield weight/fed by 3.35, 10.61, and 11.33% for the first cut 2.25, 6.30 and 6.44 % for the second cut and 3.76, 13.01 and 13.39 for the third cut ,respectively, over the control plants. It is worth to mention that, medium and high rates were equally effective for raising leaves dried air yield weight/fed as compared with either the low rate or control in the three cuts of both seasons. So, it is advised, from the economical point of view, to supply marjoram plants with 2 g/L of active dry yeast on marjoram plants this is in harmony with, **Mohamed (2005)** on *Phaseolus vulgaris* L., plants.

Mineral "NPK" fertilization significantly increased the leaves dried air yield weight/fed as compared to the control, farmyard and sheep manures by 33.43, 5.12 and 8.34; 53.63, 5.41 and 7.83 or 22.08, 7.41 and 11.62% in the three cuts of the both seasons as indicate the data in Table (3) on marjoram plants. **Mohamed (2005)** on *Phaseolus vulgaris* L., plants.

The applied organic manure significantly increased the leaves dried air yield weight/fed. as compared to the control plants in the three cuts of two seasons. Application of poultry manure gave the highest leaves dried air yield weight/fed than the control, mineral NPK, FYM &sheep manures by rates 33.99, 0.42, 5.57 & 8.80; 53.78, 0.10, 5.51 &7.94 and 22.27, 0.14, 7.57 & 11.79 %, respectively in three cuts of both seasons. Both mineral "NPK" and poultry manure (PM) were statistically equal in producing significant leaves dried air yield weight/fed in the three cuts of both seasons on marjoram plants. So, the highest values were obtained when *Origanum majorana* L. plants received poultry manure at rate of 25 m^3/fed from poultry manure (PM). These results are in agreement with these obtained by **Mohamed (2005)** on *Phaseolus vulgaris* L., plants.

The interaction effects between active dry yeast fertilization and mineral "NPK" fertilization or organic fertilization were significantly increased as compared to the control plants in the three cuts of both seasons. The heavy of leaves dried air yield weight/fed. was obtained from the use active dry yeast at 2 and 3.g/L in combination with mineral "NPK" or poultry manure fertilization which recorded 1045.33 and 1049.92; 1353.9285 and 1355.85 or 796.55 and 797.72 kg/fed, respectively in the three cuts of both seasons. No significant difference were found between active dry yeast at 2 or 3 g/L. plus mineral "NPK" or poultry manure, also active dry yeast plus mineral "NPK" and active dry yeast plus poultry manure. The most effective treatment which gave the highest leaves dried air yield weight/fed, was due to the used of active dry yeast

at 2.g/L in combination with mineral "NPK" or poultry manure, where the relative increase percentages reached 39.95 and 39.70, 28.70 and 29.45 or 23.53 and 26.01%, respectively in the three cuts of both seasons over the control. So, it is advised, form the healthy point of view, to supply marjoram plants with 2g /L of active dry yeast spray plus poultry manure to increase the leaves dry air yield weight/fed of marjoram plants. Similar results were obtained by **Mohamed (2005)** on *Phaseolus vulgaris* L., plants.

6- Number of roots per plant:

Table (3) reported that number of roots per plant which showed significantly increased as a result of applied active dry yeast. spraying active dry yeast at rates 2 and 3 g/L. gave the highest number of roots/plant than the control and low rates of dry yeast by13.30, 2.34, 13.88 & 2.87; 24.68, 2.37, 24.86 & 2.87 and 24.68, 3.13, 24.66 & 3.90% respectively in the three cuts of both seasons on marjoram plants.

Mineral "NPK" fertilization significantly increased the number of roots/plant as compared to the control, farmyard manure and sheep manures by 19.87, 2.82 and 10.52; 22.93, 5.96 and 8.26 or 13.12, 3.12 and 12.13 % for the three cuts of the studied two seasons.

Organic manure fertilization significantly increased number of roots/ plant on marjoram plants L., in the three cuts of both studied seasons. Poultry manure surpassed the other treatments by 21.72, 1.55, 4.42 & 12.24; 22.64, 0.11, 6.09 & 8.38 and13.41, 0.26, 3.39 & 12.41 %, respectively in the three cuts of both studied seasons. It is worthy to mention that, the mineral "NPK and poultry manure were equally effective in increasing number of roots/plant as compared to the control in the three cuts of both seasons. These results are in harmony with those reported by **Abd El-Kader (1999)** on fennel and anise plants and **Matter, and Somida (2006)** on *Ocimum basilicum* L. plants.

The interactions between biofertilizer as active dry yeast and mineral "NPK" fertilizers or organic manure were significantly increased as compared to the control plants in the three cuts of both seasons. Active dry yeast at 2.g/L., plus mineral "NPK" or poultry manure gave the best result than the other combinations from statistical and economical sides. Both mineral "NPK" and poultry manure (PM) combined with active dry yeast were statistically equal in producing significant number of roots/plant in the three cuts of both seasons as compared to the other treatments.

In order to discuss and explain the promoting affects by active dry yeast augmenting an vegetative growth characters of marjoram plants. It represents a natural source of cytokinins, which had stimulatory effects on cell division and enlargement, so far increasing the leaf area surface as well as enhancing the accumulation of soluble metabolites as mentioned about the role of cytokinins **(Muller and Leoped 1966).** Also yeast is a natural source of many growth substance (i.e., thiamine, riboflavin, niacin, pyridoxine, panthothenate, bioten, cholin, folic acid and vit.B12), and most nutritional elements (i.e., Na, Ca, Fe, Mg, K, P,S, Zn and Si) as well as organic compounds (i.e., portion, carbohydrate, nucleic acid and lipids), phloem loading and phloem transport etc. Such important physiological roles enable potassium to perform its functions, which lead to an increase in various vegetative growth and yield **(Nagodawithana, 1991).**

Table (3): Effect of biofertilizers (active dray yeast spray) ,chemical NPK and organic manures on herb dry air yield weight/plant, leaves dry air yield weight/fed., and number of roots/plant of *Majorana marjoram* L., plant.

Treatments	Herb dry air yield weight g/ plant					Leaves dry air yield weight (kg) / fed.,					Number of roots / plant				
	First cut														
	Biofertilizer														
	Y 0	Y 1	Y 2	Y 3	Mean	Y 0	Y 1	Y 2	Y 3	Mean	Y 0	Y 1	Y 2	Y 3	Mean
Control	81.89	87.45	93.56	95.36	89.56	715.20	750.56	785.35	798.81	762.48	16.65	17.89	19.14	19.25	18.23
NPK	99.56	114.97	121.59	122.11	114.55	970.23	1003.71	1045.33	1050.21	1017.37	19.89	22.11	22.65	22.75	21.85
FYM	95.19	103.60	118.30	119.23	109.08	892.33	911.42	1030.83	1036.54	967.78	19.44	21.66	21.89	21.96	21.25
PM	99.55	115.22	121.92	123.12	114.95	975.23	1009.53	049.92	1052.21	1021.72	20.47	22.67	22.74	22.89	22.19
SM	90.18	102.38	112.88	114.18	104.90	875.23	901.54	986.81	992.50	939.02	17.90	20.12	20.49	20.59	19.77
Mean	93.27	104.72	113,65	114.80		885.64	915.35	979.65	986.05		18.87	20.89	21.38	21.49	
LSD	A:1.39		B:0.75		AB:1.50		A:7.12	B:3.79		AB:7.57	A:0.39		B:0.21		AB:0.42
	Second cut														
Control	105.12	116.56	122.12	123.15	116.73	824.21	854.27	888.95	891.51	864.73	18.99	20.12	21.99	22.12	20.80
NPK	149.91	161.94	166.65	167.67	161.54	1289.76	1314.95	1353.92	1355.41	1328.51	23.68	25.90	26.21	26.48	25.57
FYM	136.91	150.98	160.92	161.99	152.70	1200.63	1225.92	1306.72	1308.22	1260.37	22.19	24.41	24.93	24.99	24.13
PM	150.54	162.44	167.01	168.82	162.20	1290.55	1315.62	1355.85	1357.33	1329.85	23.69	25.93	26.25	26.53	25.60
SM	135.99	149.99	154.82	155.56	149.09	1192.75	1217.96	1257.84	1259.35	1231.97	21.87	24.09	24.13	24.41	23.62
Mean	135.69	148.38	154.30	155.44		1159.58	1185.74	1232.65	1234.36		22.08	24.09	24.70	24.91	
LSD	A:1.85		B:0.98		AB:1.96		A:7.09	B:3.79		AB:7.59	A:0.47		B:0.26		AB:0.52
	Third cut														
Control	60.52	70.56	77.72	79.89	72.17	600.33	624.66	644.58	651.86	630.37	15.25	16.56	17.89	17.99	16.92
NPK	90.98	99.97	106.09	108.26	101.32	729.82	754.95	796.55	797.06	769.59	17.72	19.22	19.76	19.88	19.14
FYM	79.64	88.60	99.90	102.45	92.64	637.65	662.92	781.95	783.4	716.48	17.27	18.77	19.00	19.20	18.56
PM	91.24	102.22	108.92	109.23	102.95	730.38	755.65	797.72	799.23	770.74	17.82	19.27	19.78	19.89	19.19
SM	77.36	83.38	95.88	96.52	88.28	627.58	652.82	737.92	739.43	689.45	15.73	17.23	17.60	17.74	17.07
Mean	79.96	88.96	97.70	99.27		665.15	690.20	751.74	754.19		16.76	18.21	18.81	18.94	
LSD	A:1.72		B:0.92		AB:1.84		A: 4.89	B:2.63		AB:5.26	A:0.31		B:0.18		AB:0.36

A: Active dry yeast (Y), **B:** Fertilizer sources, **AB:** Active dry yeast (Y) x Fertilizer sources,

Data of this table represents the mean of the two growing seasons.

As for the effect of organic manure that contained macro and microelements as shown in Table (1) on different vegetative growth characters, as well as other yield components and oil production of marjoram plants, it is necessary to refer the physiological roles of the nutrients such as nitrogen and potassium in plant growth and development. Nitrogen is a constituent of most organic compounds such as amino acids, many enzymes and energy transfer materials such as chlorophyll, ADP and ATP. Growing plants must have nitrogen to form new cells and the rate of growth is proportional to the rate at which nitrogen is supplied.

Photosynthesis can produce carbohydrate from CO_2 and H_2O but the process cannot go on to the production of proteins. Thus, a severe shortage of nitrogen will affect on the processes of growth and production. The other macronutrient involved in the present study is potassium. **Beringer (1978) and Mengel and Kirkby (1987)** reported that K plays an important role in metabolism, growth and yield formation, where it represents an activator of enzymes as well as K^- ions are very mobile within the plant due to it is transported through biological membranes with high rate and specificity. More than 60 enzymes are known to require K^+ as an activator. The high mobility of K^+ on photosynthates phloem loading and phloem transport. Such two nutrients are among the major essential elements needed in large quantities for all plants. They participate directly or indirectly in much important physiological process carried on simultaneously within plant cells, tissues and organs differentiation. Plant supplement with these macronutrients is necessary because the soil is usually in deficient of them or they are not readily available for plants. Such important physiological roles enable potassium to perform its functions, which lead to an increase in various vegetative growth parameter, yield and oil aspects. Micronutrients in sort of fertilizers are necessary because the soil is usually in deficient move the elements and their spray make them readily to plants.

Terminal cuttings of propagation is more easily methods of propagation to gave higher product because contained the maximum number of roots **(Matter and Somida, 2006)** and in turn increasing the absorption coefficient from the soil. Therefore, ***Origanum majorana*** L., plants enhanced different vegetative characters and chemical components by this treated method.

B-Chemical composition

1 – Volatile oil percentage of herb:

Results in Table (4) showed that applying active dry yeast was significantly affected volatile oil percentage/plant. It was clear from the results that active dry yeast rates gave the highest oil percentage/plant of marjoram plants than control plants by 3.68, 6.35 & 7.02; 0.99, 1.66 and 1.99 or 1.03, 2.08 and 2.42% respectively in the three cuts of both seasons.

Mineral "NPK" fertilization increased the volatile oil percentage/plant as compared to the control, farmyard and sheep manures by 7.45, 0.31 & 1.28 ; 9.12, 0.97 & 1.30 and 9.12, 0.67 & 1.01% respectively in the three cuts of the both seasons. No significance between the mineral NPK fertilizer and farmyard manure, poultry manure or sheep manure fertilizer in raising volatile oil percentage/plant was achieved as indicate by the data in Table (4) on marjoram plants. These results are in harmony with those reported by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on marjoram plants and **Somida (2002)** on ***Tagetes minuta*** L. plants.

Organic manure fertilization significantly increased number of volatile oil percentage/plant of marjoram plants L., in the three cuts of both seasons as compared to the control. Poultry manure surpassed the other treatments by 7.79, 0.61, 0.63 & 1.59; 9.47, 0.32, 1.29 & 1.62 and 9.42, 0.33, 1.01 & 1.35%, respectively in the three cuts of both seasons. It is worth, to mention that the mineral "NPK, farmyard, poultry and sheep manures were equally effective in raising volatile oil percentage/plant as compared to the control in the three cuts of both seasons. These results are in harmony with those reported by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on marjoram plants and **Abd El-Raouf (2001), El-Gendy *et al.*, (2001), El-Yazal, *et al.*, (2005)** and **Matter and Somida (2006)** on *Ocimum basilicum* L. and **El–Yazal Sawasan** and **Somida (2007)** on *Nigella sativa* plant

The interactions between biofertilizer as active dry yeast and mineral "NPK" fertilizer or organic manure were significantly increased the volatile oil percentage/plant as compared to the control in the three cuts of both seasons. Active dry yeast at 2 and 3.g/L., plus mineral "NPK" or poultry manure fertilization gave the best result than the other combination. Both mineral "NPK" and poultry manure combined with active dry yeast were statistically equal in producing significant effect on oil percentage/plant as compared to the control in the three cuts of both seasons.

2 - Volatile oil yield of herb per plant (ml) :

The data listed in Table (4) show that volatile oil yield/plant in the herb of ***Origanum majorana*** L., plants was significantly affected by different rates of active dry yeast. Spraying plants with the rates of 1, 2 and 3 g/L., increased volatile oil yield/plant by 12.33, 24.80 & 27.82% in the first cut, 5.08, 9.89 & 11.99% in the second cut and 6.88, 14.24 & 15.20% in the third cut, respectively, over the control plants. It is worthy to mention that, the medium and highest rates were equally effective in raising volatile oil yield/plant in the herb, as compared with both the low rate and control in the three cuts of both seasons.

Mineral "NPK" fertilization significantly increased the volatile oil yield/plant in the herb as compared to the control, farmyard manure and sheep manure fertilization by 28.05, 4.26 & 11.31; 28.64, 5.57 & 7.04 and 20.77, 3.02 & 4.84 %, respectively in the three cuts of the two experimental seasons as indicated in Table (4) on marjoram plants. These results are in harmony with those reported by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on *Origanum majorana* L., and **Somida (2002)** on ***Tagetes minuta*** L. plants

Organic manure fertilization significantly increased the volatile oil yield/plant in the herb as compared to the control plants in the three cuts of two seasons. Application of organic manure such as poultry manure gave the highest volatile oil yield/plant in the herb., than the other treatments by 28.32, 0.21, 4.48 & 11.55; 29.92, 0.99, 6.62 & 8.10 and 23.31, 2.09, 5.18 & 7.04 %, respectively in three cuts of both seasons. Both mineral "NPK" and poultry manure (PM) were statistically equal in producing significant volatile oil yield/plant in the herb, in the three cuts of both seasons on marjoram plants. The highest value of oil yield/plant was obtained when *Origanum majorana* L., plants received poultry manure at rate of 25 m^3/fed .The increase in volatile oil yield/plant in response to poultry manure treatments has been observed by **El-Ghadban (1998)** and **Mansour *et al.*(1999)** marjoram plants, **El-Yazal, *et al.* (2005)** and **Matter** and **Somida (2006)** on sweet basil plants and **Mohamed**

and **Matter (2001)** and **Somida (2002)** on ***Tagetes minuta*** L and **El –Yazal Sawasan** and **Somida (2007)** on *Nigella sativa* plant

Concerning the interactions between active dry yeast and mineral "NPK" fertilization or organic manure, there was a significant increased in volatile oil yield/plant of the herb as compared to the control plants in the three cuts of both seasons. The best result of volatile oil yield/plant in the herb in this study obtained from using of active dry yeast at 2 and 3.g/L., in combination with mineral "NPK" or poultry manure fertilization which recorded 1.021 & 1.037; 1.026 & 1.051 ml/plant for the first cut; 1.341 & 1.364; 1.351 & 1.371 ml/plant for the second cut and 0.748 & 0.755; 0.764 & 0.772 ml/ plant, respectively, for the third cut in the both seasons. No significant differences were noticed between active dry yeast at 2 or 3 g/L. plus mineral "NPK" or poultry manure, also active dry yeast plus mineral "NPK" and active dry yeast plus poultry manure.

3-Volatile oil yield of herb per feddan (Liter):

Table (4) clearly shows that the effect of dry yeast rates on total volatile oil yield of herb/fed took almost the same trend observed for total volatile oil yield of herb/plant. Spraying marjoram plants with the active dry yeast at rates 2 and 3 g/L., resulted in highly significant promotion in total volatile oil yield of herb/plant as compared to the control and low treatment of active dry yeast in the three cuts of both seasons. Moreover, no significant differences between the use of middle and high rates of active dry yeast in the three cuts of both seasons.

The obtained results in Table (4) also revealed that the mineral "NPK" fertilization increased significantly volatile oil yield of herb/fed. than the control, farmyard manure and sheep manure by 28.00,4.23 & 11.28; 28.64, 5.57 & 7.04 and 20.80, 2.99 & 4.92% ,respectively in the three cuts of the both seasons on marjoram plants. These results took the same trend with **Mohamed and Matter (2001)** and **Somida (2002)** on ***Tagetes minuta*** L. and **Sakr (2001)** on *Mentha piperta* L.

Volatile oil yield per feddan significantly increased over the control plants by the use of organic manure by 22.80, 28.30 & 15.02 in the first cut; 21.85, 29.92 & 20.17in the second cut and 17.29, 23.30 & 15.14 in the third cut %, respectively in both seasons. In the meantime poultry manure surpassed the farmyard manure and sheep manure by 4.47 & 11.54; 6.62 & 8.11 and 5.11 & 7.08%, respectively in the three cuts of the first & second seasons. Mineral fertilizers and poultry manure were really statistically equal in producing significant volatile oil yield/fed in the three cuts of both seasons. So, the highest values of volatile oil yield/fed. were obtained when ***Origanum majorana*** L.,. plants received organic manure at rates of 25 m^3/fed from poultry manure .These results are in agreement with the findings reported by **Abd El-Raouf (2001); El-Gendy *et al.* (2001) and El-Yazal, *et al.* (2005)** and **Matter** and **Somida (2006)** on *Ocimum basilicum* L. and **Mohamed and Matter (2001)** and **Somida (2002)** on ***Tagetes minuta*** L. and **El –Yazal Sawasan** and **Somida (2007)** on *Nigella sativa* plant

The data in Table (4) show that volatile oil yield/fed in the herb of ***Origanum majorana*** L., plants took almost the same trend observed for total volatile oil yield of herb/plant. It was significantly affected by interaction among the studied factors except the interaction between active dry yeast x mineral or organic manure as compared to the control plants in the three cuts. The active dry yeast at rates of 2and 3g/L., combined with mineral NPK or

Table (4): Effect of biofertilizers (active dray yeast spray) ,chemical NPK and organic manures on oil % of fresh herb oil yield (ml) /plant, and oil yield (liter)/fed.., of *Majorana marjoram* L., plant.

Treatments	Oil % of fresh herb					Oil yield(ml)/plant					Oil yield (liter)/fed.				
	First cut														
	Biofertilizer														
	Y 0	Y 1	Y 2	Y 3	Mean	Y 0	Y 1	Y 2	Y 3	Mean	Y 0	Y 1	Y 2	Y 3	Mean
Control	0.289	0.294	0.298	0.299	0.295	0.650	0.721	0.800	0.811	0.745	20.800	23.072	25.600	25.952	23.856
NPK	0.303	0.315	0.324	0.327	0.317	0.830	0.929	1.021	1.037	0.954	26.560	29.728	32.672	33.184	30.536
FYM	0.302	0.314	0.323	0.326	0.316	0.750	0.916	0.982	1.014	0.915	24.000	29.312	31.424	32.448	29.296
PM	0.304	0.316	0.325	0.328	0.318	0.850	0.899	1.026	1.051	0.956	27.200	28.768	32.832	33.632	30.608
SM	0.299	0.311	0.320	0.323	0.313	0.730	0.816	0.928	0.956	0.857	23.360	26.112	29.696	30.592	27.440
Mean	0.299	0.310	0.318	0.320		0.762	0.856	0.951	0.974		24.384	27.398	30.445	31.162	
LSD	A:0.010		B:0.006		AB:0.012	A:0.026		B:0.015		AB:0.030	A:0.82		B:0.46		AB:0.92
	Second cut														
Control	0.281	0.284	0.288	0.289	0.285	0.937	1.001	1.060	1.075	1.016	29.984	32.032	33.920	34.400	32.512
NPK	0.308	0.310	0.312	0.313	0.311	1.231	1.286	1.341	1.364	1.307	39.392	41.152	42.912	43.648	41.824
FYM	0.305	0.308	0.310	0.311	0.308	1.162	1.213	1.279	1.305	1.238	37.184	38.816	40.928	41.760	39.616
PM	0.309	0.311	0.313	0.314	0.312	1.245	1.308	1.351	1.371	1.320	39.840	41.856	43.232	43.872	42.240
SM	0.304	0.307	0.309	0.310	0.307	1.151	1.196	1.261	1.284	1.221	36.832	38.272	40.368	41.088	39.072
Mean	0.301	0.304	0.306	0.307		1.142	1.200	1.255	1.279		36.544	38.400	40.160	40.928	
LSD	A:0.009		B:0.005		AB:0.010	A:0.038		B:0.021		AB:0.042	A:0.95		B:0.52		AB:1.04
	Third cut														
Control	0.269	0.272	0.276	0.277	0.274	0.542	0.591	0.614	0.619	0.592	17.330	17.312	19.656	19.795	18.949
NPK	0.296	0.298	0.301	0.302	0.299	0.657	0.704	0.748	0.755	0.715	21.039	21.024	23.956	24.159	22.891
FYM	0.293	0.296	0.298	0.299	0.297	0.639	0.676	0.726	0.732	0.694	20.461	20.448	23.255	23.437	22.227
PM	0.297	0.299	0.301	0.303	0.300	0.668	0.719	0.764	0.772	0.730	21.331	21.344	24.436	24.710	23.364
SM	0.292	0.295	0.297	0.298	0.296	0.628	0.652	0.718	0.724	0.682	20.100	20.096	22.995	23.183	21.818
Mean	0.289	0.292	0.295	0.296		0.625	0.668	0.714	0.720		19.998	20.000	22.859	23.040	
LSD	A:0.007		B:0.004		AB:0.008	A:0.038		B:0.020		AB:0.040	A:0.59		B:0.31		AB:0.62

A: Active dry yeast (Y), **B:** Fertilizer sources, **AB:** Active dry yeast (Y) x Fertilizer sources,

Data of this table represents the mean of the two growing seasons.

poultry manure gave the higher volatile oil yield fed than the other combined ones in three cuts.

4 – Leaf plastid pigments content (mg/100g):

Table (5) showed that leaf plastid pigments (chlorophyll a, b and caroteniods) contents in the leaves were significantly increased as a result of applied different rates of active dry yeast. Active dry yeast spray increased chl a, b and caroteniods contents over the seedlings by 3.96, 6.77 & 7.76; 4.34, 6.77 & 8.16 and 4.90, 7.35 & 8.49 %, respectively in three cuts for chlorophyll a ; 5.36, 8.85 and 10.26 ; 6.11, 9.04 and 10.51 or 6.72, 10.92 and 12.60%, respectively in three cuts for chlorophyll b or 6.08, 9.27 and 11.01; 7.08, 9.85 and 11.69 or 7.19, 12.23 and 14.03%, respectively in three cuts for caroteniods. Moreover, it was no significant difference between the middle and high rates of active dry yeast in the three cuts of both seasons. These results are agreement with **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on ***Origanum majorana*** L. and **Somida *et al* . (2005)** on roselle plants.

Data in Table (5) also show that application of mineral fertilizers significantly increased chl a, b and caroteniods contents *of* ***Origanum majorana*** L., as compared to the control, farmyard and sheep manures by 5.53, 2.36 &4.86 ; 11.78 , 2.79 & 5.56 and 8.05, 3.59 & 6.85%, respectively in three cuts for chlorophyll a ; 7.29, 3.52 and 7.90; 5.67, 2.29 and 6.69 or 11.39, 3.62 and 8.09%, respectively in the three cuts for chlorophyll b or 12.35, 2.69 and 6.41; 7.21, 1.13 and 5.93 or 11.82, 1.62 and 7.96 respectively in three cuts for caroteniods by with **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on ***Origanum majorana*** L., and **Matter and Somida (2006)** on *Ocimum basilicum* L.

In addition, the obtained data revealed that chlorophyll a, b and caroteniods contents were significantly affected by organic manure rates. Chlorophyll a, b and caroteniod contents were significantly increased by treating plants with poultry than farmyard manure and sheep manure fertilizers. The highest values of chlorophyll a, b and caroteniods content were obtained when ***Origanum majorana*** L., plants treated with poultry manure at rate 25 m^3/fed. These results are in agreement with the findings reported by **Abd EL-Raouf (2001)** and **El-Gendy *et al.* (2001)** and **Matter and Somida (2006)** *on Ocimum basilicum* L., **Mohamed and Matter (2001)** on ***Tagetes minuta*** L. and **Sakr (2001)** *Mentha piperta* L. plants and **El –Yazal Sawasan** and **Somida (2007)** on *Nigella sativa* plant

Data in table (5) show that the active dry yeast combined with mineral NPK or organic manure gave the best chlorophyll a, b and caroteniods content *than* the control plants or combined with organic manure in both cuts. The most effective treatments that gave the highest chlorophyll a, b and caroteniods content were active dry yeast at rates 2 and 3 g/L., combined the poultry manure, which surpassed the other combined ones in both cuts. These results are agreement with **Mohamed (2005)** on *Phaseolus vulgaris* L., plants.

5– Mineral NPK contents:

A- Nitrogen, phosphorus and potassium percentage:

The results tabulated in Table (6) show that leaf mineral NPK contents were significantly increased by the application of spraying of active dry yeast) over the untreated plants. There was no significant effect between the use of both middle and high rates of active dry yeast and leaf contents of nitrogen, phosphorus and potassium percentages as compared to the low rate and control

plants. These results are in agreement with those obtained by **Somida *et al.* (2005)** on roselle plants.

Data in table (6) show that application of mineral NPK significantly increased leaf contents of mineral N, P and K as compared to the control ones in three cuts of both seasons. Mineral NPK surpassed the farmyard & sheep manures by 6.33 & 16.17; 6.32 & 18.95 and 6.72 & 19.74 %, respectively in three cuts for nitrogen percentage; 16.58 and 31.90, 20.00 and 36.17 or 24.58 and 48.48 %, respectively for phosphorus percentage and 8.86and 16.16, 8.83 and 17.88 or 8.19 and 18.16 %, respectively for potassium percentage. The results are in agreement with those obtained by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on ***Origanum majorana*** L., **Somida (2002)** on ***Tagetes minuta*** L., **El-Yazal, *et al.* (2005)** on *Ocimum basilicum* L and **Mohamed (2006)** on roselle plants and **El–Yazal Sawasan** and **Somida (2007)** on *Nigella sativa* plant.

Leaf content of mineral N, P and K significantly increased by treating *Origanum majorana* L., plants with organic manures as compared to the control pants. Poultry manure gave the highest result of leaf content of N, P and K than the farmyard and sheep manures in the three cuts during both studied seasons. In the meantime both poultry manure and mineral "NPK were statistically equal in producing significant leaf mineral content of N, P and K in the three cuts. So, from the healthy and economical sides the highest mineral contents of N, P and K were obtained when ***Origanum majorana*** L. plants treated with poultry manure at rate of 20 m^3/fed. The results are in agreement with those obtained by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on ***Origanum majorana*** L., **Somida (2002)** on ***Tagetes minuta*** L., **El-Yazal, *et al.* (2005)** on *Ocimum basilicum* L and **Mohamed (2006)** on roselle plants. Table (6) show that the active dry yeast spray combination with mineral NPK or poultry manure gave the best mineral contents of N, P and K than other combined ones in the three cuts. The most effective treatments that gave the best leaf mineral content of N, P and K were active dry yeast spraying combination with the poultry manure, which surpassed the other combined ones in the three cuts).This results are in agreement with **Somida *et al* (2005)** on roselle plants.

B- Iron and zinc contents (mg/g.) of dry matter:

The data in Table (7) indicate that active dry yeast fertilization treatments at all application rates significantly increased the iron and zinc contents of leaves as compared to the untreated plants in the three cuts of the two seasons. In the meantime, high rate 3.g /L of active dry yeast gave the best result thane the other treatments in the three cuts of the two experimental seasons. These results are in agreement with **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on *Origanum majorana* L., and **Mohamed (2005)** on Phaseolus *vulgaris* L., plants.

The mineral NPK fertilization significantly increased the iron and zinc contents as compared to the untreated plants. No significant difference between mineral NPK, farmyard and sheep manures for producing iron and zinc contents as compared to the control plants in the three cuts as indicate by the data in Table (7). These results are in agreement with **those** obtained by **Mohamed (2005)** on *Phaseolus vulgaris* L., plants.

All organic manure used in this study significantly increased the iron and zinc contents as compared to the control plants in the three cuts. Application of organic manure such as poultry manure significantly increased iron and zinc contents than the other treatments in the three cuts of both

seasons. So, the highest values were obtained when *Origanum majorana* L., plants received poultry manure at rate of 25 m3/fed .These results are in agreement with the findings reported by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on ***Origanum majorana*,**

Concerning the interaction between active dry yeast spray application and mineral NPK or organic fertilization, it was significantly increased as compared to the control plants in the three cuts of both seasons. The most effective treatment that gave the highest value of iron and zinc contents in plants due to the use of active dry yeast at 3.g/L., in combination with poultry manure in the three cuts of both seasons. Similar results were obtained by **Mohamed (2005)** on *Phaseolus vulgaris* L., plants.

6 – Total carbohydrates content (mg/g D.W.):

Data in Table (7) clearly showed that total carbohydrates content gradually increased as a result of applied active dry yeast spray. The maximum increases in total carbohydrates were obtained by active dry yeast spray at rates of 2 and 3 g/L.,. No significant effects between the applied rates of 2 and 3 g/L of active dry yeast spray in rising total carbohydrates content as compared to the other treatments. These results are in agreement with those obtained by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on ***Origanum majorana*, Somida *et al.* (2005)** on roselle plants and **Mohamed (2005)** on Phaseolus *vulgaris* L., plants.

Data in Table (7) show that total carbohydrates content significant increased due to applied mineral NPK fertilizer as compared to the control, farmyard and sheep manures. These results are in agreement with **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on ***Origanum majorana* L., *and* Mohamed (2005)** on Phaseolus *vulgaris* L., plants.

Organic fertilization caused a significant increase in total carbohydrates content as compared to the control as shown in Table (7). The increase in such constituent was gradual and parallel to the fertilization by poultry manure than farmyard and sheep manures. These results are in agreement with those obtained by **El-Ghadban (1998)** and **Mansour *et al.* (1999)** on ***Origanum majorana* L., Mohamed and Matter (2001)** on ***Tagetes minuta* L., Matter and Mohamed (2001)** *Calendula officinalis* L., **El-Yazal, *et al.* (2005)** on *Ocimum basilicum* L , **Mohamed (2006)** on roselle plants and **El –Yazal Sawasan** and **Somida (2007)** on *Nigella sativa* plant.

Table (7) reveals that the active dry yeast spray application combined with mineral NPK or organic manure gave the best total carbohydrates content than the control ones in the three cuts of both seasons. The most effective treatment that gave the highest total carbohydrates content was active dry yeast spray application combined with poultry manure, which surpassed the other combined ones in both cuts. These results are in agreement with those obtained by **Somida *et al* (2005)** on roselle plants and **Mohamed (2005)** on Phaseolus *vulgaris* L., plants.

In conclusion, it could be recommended that usage of active dry yeast spray application combined with poultry manure at rate of 25 m^3/fed to produce ***Origanum majorana*** L., plants that having the good growth rates and high volatile oil content, in the mean time to alleviate the hazard effect of soil pollution resulting from using chemical fertilizers in agricultural production.

Table (5): Effect of biofertilizers (active dray yeast spray) ,chemical NPK and organic manures on chlorophyll a, b and caroteniods of *Majorana marjoram* L. plant.

Treatments	Chl a (mg /100g leaves)					Chl b (mg/100g leaves)					Caroteniods (mg/100g leaves)				
	First cut														
	Biofertilizer														
	Y 0	Y 1	Y 2	Y 3	Mean	Y 0	Y 1	Y 2	Y 3	Mean	Y 0	Y 1	Y 2	Y 3	Mean
Control	0.588	0.609	0.628	0.631	0.614	0.418	0.432	0.452	0.454	0.439	0.321	0.335	0.351	0.354	0.340
NPK	0.619	0.642	0.665	0.668	0.648	0.446	0.471	0.482	0.486	0.471	0.359	0.383	0.391	0.397	0.382
FYM	0.605	0.629	0.643	0.656	0.633	0.428	0.453	0.467	0.474	0.455	0.347	0.371	0.382	0.389	0.372
PM	0.621	0.645	0.663	0.672	0.650	0.445	0.469	0.483	0.493	0.472	0.363	0.384	0.391	0.399	0.384
SM	0.594	0.618	0.629	0.633	0.618	0.412	0.437	0.453	0.457	0.439	0.334	0.359	0.371	0.375	0.359
Mean	0.605	0.629	0.646	0.652		0.429	0.452	0.467	0.473		0.345	0.366	0.377	0.383	
LSD	A:0.019	B:0.010	AB:0.020			A:0.014	B:0.007	AB:0.014			A:0.012	B:0.006	AB:0.012		
Second cut															
Control	0.531	0.555	0.576	0.579	0.560	0.402	0.420	0.435	0.438	0.423	0.315	0.332	0.342	0.345	0.333
NPK	0.599	0.627	0.636	0.648	0.626	0.420	0.448	0.459	0.463	0.447	0.336	0.361	0.363	0.367	0.357
FYM	0.578	0.604	0.623	0.632	0.609	0.415	0.439	0.444	0.452	0.437	0.323	0.348	0.368	0.375	0.353
PM	0.602	0.628	0.638	0.646	0.628	0.419	0.449	0.459	0.467	0.448	0.337	0.362	0.367	0.378	0.361
SM	0.569	0.593	0.604	0.608	0.593	0.388	0.414	0.436	0.44	0.419	0.314	0.339	0.345	0.349	0.337
Mean	0.576	0.601	0.615	0.623		0.409	0.434	0.446	0.452		0.325	0.348	0.357	0.363	
LSD	A:0.011	B:0.006	AB:0.012			A:0.010	B:0.005	AB:0.011			A:0.009	B:0.005	AB:0.010		
Third cut															
Control	0.512	0.530	0.545	0.548	0.534	0.335	0.358	0.372	0.375	0.360	0.262	0.275	0.288	0.292	0.279
NPK	0.551	0.577	0.588	0.593	0.577	0.375	0.399	0.414	0.418	0.401	0.285	0.309	0.325	0.329	0.312
FYM	0.524	0.551	0.573	0.580	0.557	0.365	0.388	0.393	0.401	0.387	0.278	0.302	0.320	0.329	0.307
PM	0.553	0.579	0.589	0.598	0.579	0.374	0.399	0.415	0.423	0.403	0.294	0.318	0.328	0.336	0.319
SM	0.512	0.541	0.552	0.556	0.540	0.339	0.363	0.388	0.393	0.371	0.271	0.288	0.298	0.302	0.289
Mean	0.530	0.556	0.569	0.575		0.357	0.381	0.396	0.402		0.278	0.298	0.312	0.317	
LSD	A:0.010	B:0.005	AB:0.011			A:0.009	B:0.005	AB:0.010			A:0.008	B:0.004	AB:0.009		

A: Active dry yeast (Y), B: Fertilizer sources, AB: Active dry yeast (Y) x Fertilizer sources,

Data of this table represents the mean of the two growing seasons.

Table (6): Effect of biofertilizers (active dray yeast spray) ,chemical NPK and organic manures on nitrogen, phosphorous and potassium % of *Majorana marjoram* L., plant.

Treatments	Nitrogen %					Phosphorus %					Potassium %				
	First cut														
	Biofertilizer														
	Y 0	Y 1	Y 2	Y 3	Mean	Y 0	Y 1	Y 2	Y 3	Mean	Y 0	Y 1	Y 2	Y 3	Mean
Control	1.855	1.845	1.875	1.887	1.865	0.113	0.128	0.147	0.160	0.137	2.203	2.252	2.321	2.333	2.277
NPK	2.329	2.353	2.424	2.437	2.385	0.184	0.209	0.227	0.242	0.215	2.62	2.645	2.838	2.851	2.738
FYM	2.177	2.195	2.294	2.308	2.243	0.151	0.176	0.197	0.213	0.184	2.456	2.481	2.555	2.569	2.515
PM	2.335	2.364	2.436	2.541	2.419	0.185	0.210	0.229	0.335	0.239	2.637	2.662	2.841	2.945	2.771
SM	1.899	1.922	2.191	2.203	2.053	0.133	0.158	0.177	0.187	0.163	2.293	2.330	2.397	2.409	2.357
Mean	2.119	2.135	2.244	2.275		0.153	0.176	0.195	0.227		2.442	2.474	2.590	2.621	
LSD	A:0.041		B:0.022		AB:0.044	A:0.035		B:0.018		AB:0.036	A:0.034		B:0.018		AB:0.036
Second cut															
Control	1.799	1.815	1.823	1.835	1.818	0.103	0.114	0.123	0.135	0.118	2.185	2.242	2.281	2.293	2.250
NPK	2.302	2.327	2.387	2.402	2.354	0.164	0.189	0.201	0.214	0.192	2.592	2.617	2.807	2.821	2.709
FYM	2.142	2.167	2.267	2.281	2.214	0.128	0.153	0.174	0.188	0.160	2.432	2.457	2.527	2.541	2.489
PM	2.308	2.333	2.399	2.504	2.386	0.166	0.191	0.208	0.313	0.219	2.598	2.623	2.817	2.922	2.740
SM	1.872	1.897	2.068	2.08	1.979	0.11	0.135	0.154	0.166	0.141	2.202	2.287	2.347	2.359	2.298
Mean	2.086	2.108	2.189	2.220		0.134	0.156	0.172	0.203		2.402	2.445	2.556	2.587	
LSD	A:0.033		B:0.018		AB:0.036	A:0.032		B:0.017		AB:0.034	A:0.033		B:0.017		AB:0.034
Third cut															
Control	1.754	1.785	1.801	1.812	1.788	0.099	0.105	0.113	0.125	0.110	2.142	2.165	2.179	2.194	2.170
NPK	2.213	2.238	2.308	2.320	2.269	0.122	0.147	0.154	0.167	0.147	2.532	2.557	2.759	2.773	2.655
FYM	2.054	2.079	2.179	2.192	2.126	0.086	0.111	0.132	0.146	0.118	2.394	2.419	2.495	2.508	2.454
PM	2.216	2.241	2.312	2.416	2.296	0.129	0.154	0.156	0.261	0.175	2.538	2.563	2.762	2.865	2.682
SM	1.788	1.813	1.984	1.995	1.895	0.068	0.093	0.112	0.124	0.099	2.162	2.187	2.315	2.327	2.247
Mean	2.005	2.031	2.118	2.147		0.101	0.122	0.133	0.166		2.353	2.378	2.502	2.533	
LSD	A:0.030		B:0.016		AB:0.032	A:0.035		B:0.018		AB:0.036	A:0.032		B:0.016		AB:0.032

A: Active dry yeast (Y), B: Fertilizer sources, AB: Active dry yeast (Y) x Fertilizer sources,

Data of this table represents the mean of the two growing seasons.

Table (7): Effect of biofertilizers (active dray yeast spray) , chemical NPK and organic manures on Fe, Zn, and total carbohydrates content %, of *Majorana marjoram* L., plant.

Treatments	Fe content mg/g. of dry matter					Zn content mg/g. of dry matter					Total carbohydrates content % of dry matter				
	First cut														
	Biofertilizer														
	Y 0	Y 1	Y 2	Y 3	Mean	Y 0	Y 1	Y 2	Y 3	Mean	Y 0	Y 1	Y 2	Y 3	Mean
Control	0.321	0.346	0.366	0.379	0.353	0.189	0.196	0.206	0.217	0.202	7.552	7.625	7.685	7.697	7.639
NPK	0.440	0.485	0.520	0.553	0.499	0.216	0.220	0.224	0.237	0.224	8.293	8.309	8.316	8.329	8.311
FYM	0.378	0.423	0.458	0.492	0.437	0.206	0.210	0.214	0.228	0.214	8.120	8.150	8.181	8.195	8.161
PM	0.444	0.489	0.534	0.599	0.526	0.218	0.222	0.226	0.331	0.249	8.288	8.301	8.315	8.425	8.332
SM	0.398	0.443	0.478	0.516	0.458	0.209	0.213	0.217	0.229	0.217	7.979	8.045	8.111	8.123	8.064
Mean	0.396	0.437	0.471	0.508		0.207	0.212	0.217	0.248		8.046	8.086	8.122	8.154	
LSD	A:0.030		B:0.016		AB:0.032	A:0.022		B:0.012		AB:0.024	A:0.039		B:0.020		AB:0.041
	Second cut														
Control	0.270	0.302	0.319	0.331	0.305	0.175	0.185	0.200	0.212	0.193	7.451	7.532	7.612	7.624	7.555
NPK	0.356	0.401	0.446	0.459	0.415	0.208	0.212	0.216	0.229	0.216	8.261	8.271	8.288	8.301	8.280
FYM	0.294	0.339	0.384	0.399	0.354	0.198	0.202	0.206	0.224	0.207	8.092	8.122	8.153	8.167	8.133
PM	0.360	0.405	0.450	0.554	0.442	0.210	0.214	0.218	0.324	0.241	8.265	8.284	8.297	8.402	8.312
SM	0.314	0.359	0.404	0.416	0.373	0.201	0.205	0.209	0.221	0.209	7.951	8.017	8.083	8.095	8.036
Mean	0.319	0.361	0.401	0.432		0.198	0.203	0.209	0.242		8.004	8.045	8.087	8.118	
LSD	A:0.029		B:0.016		AB:0.031	A:0.020		B:0.011		AB:0.022	A:0.037		B:0.019		AB:0.039
	Third cut														
Control	0.212	0.257	0.302	0.314	0.271	0.170	0.178	0.188	0.202	0.184	6.745	6.825	6.885	6.897	6.838
NPK	0.274	0.319	0.364	0.377	0.333	0.200	0.208	0.212	0.225	0.211	7.248	7.322	7.429	7.440	7.359
FYM	0.232	0.277	0.322	0.336	0.292	0.191	0.195	0.201	0.215	0.200	7.157	7.300	7.342	7.412	7.303
PM	0.278	0.323	0.368	0.474	0.361	0.201	0.209	0.213	0.319	0.235	7.296	7.319	7.468	7.487	7.392
SM	0.270	0.302	0.319	0.331	0.305	0.192	0.199	0.204	0.216	0.202	7.015	7.193	7.254	7.295	7.189
Mean	0.253	0.296	0.335	0.366		0.190	0.198	0.203	0.235		7.092	7.192	7.276	7.306	
LSD	A:0.027		B:0.014		AB:0.029	A:0.018		B:0.010		AB:0.020	A:0.036		B:0.019		AB:0.038

A: Active dry yeast (Y), B: Fertilizer sources, AB: Active dry yeast (Y) x Fertilizer sources,

Data of this table represents the mean of the two growing seasons.

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تأثيراضافة السماد الحيوي بالاشتراك مع بعض الاسمدة العضوية و المعدنية على النمو والمكونات الكيميائية لنباتات البردقوش

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أجريت تجربة حقلية خلال موسمين متتابعين هما ٢٠٠٥/ ٢٠٠٦و٢٠٠٦/٢٠٠٧م لدراسة تأثير الرش بسماد حيوي مثل الخميره النشطة الجافة بمعدلات صفر، ١، ٢، ٣ جرام / لتر بمفردها أو متحدة بالأسمدة المعدنية بمعدل (٤٠٠كجم من سلفات الأمونيا + ٢٠٠كجم سوبر فوسفات الكالسيوم الأحادي +١٠٠ كجم سلفات البوتاسيوم) أو مع أنواع مختلفة من الأسمدة العضوية (سماد بلدي، زرق الطيور، مخلفات الأغنام) بمعدل ٢٥ م^{٣} / ف لدراسة تأثير هذة المعاملات على النمو والمكونات الكيميائية لنبات البردقوش المنزرع بالعقلة الطرفية من الناحية الصحية والاقتصادية.

وتشير النتائج إلى:

* تحسن معنوى فى صفات النمو (طول النبات، عدد االفروع للنبات، الوزن الطازج والجاف للعشب/ نبات، محصول الأوراق الجافة هوائيا/ فدان، عدد الجذور/ نبات)، المكونات الكيميائية (نسبة الزيت، محصول الزيت للنبات والفدان، محتوى النبات من النتروجين والفسفور والبوتاسيوم والحديد والزنك والمحتوى الكلى من الكربوهيدرات) كنتيجة لاستخدام الرش بالخميره النشطة والتسميد المعدني والعضوي بمفردهم أو باتحاد الخميره النشطة مع المعدني أو العضوي.
* أعطى التسميد بزرق الطيور والسماد المعدني أعلى القيم فى طول النبات، عدد االفروع للنبات، الوزن الطازج والجاف للعشب/ نبات، محصول الأوراق الجافة هوائيا/ فدان، عدد الجذور/ نبات، نسبة الزيت، محصول الزيت للنبات والفدان، ولم يكن بينهما فرق معنوي.
* أعلى نتيجة من محتوى النبات من النتروجين والفسفور والبوتاسيوم والحديد والزنك والمحتوى الكلى من الكربوهيدرات تم الحصول عليها باستخدام التسميد بزرق الطيور، وفى هذا المجال أعطى الرش بالخميره النشطة مع التسميد المعدني أو مع التسميد بزرق الطيور أفضل نتيجة من التفاعلات الأخرى.
* من الناحية الصحية والاقتصادية اعطت معاملة الرش بالخميره النشطة مع التسميد بزرق الطيور بمعدل ٢٥ م^{٣}/ف افضل النتائج بالنسبة لصفات النمو التي تم دراستها وأيضا المحصول ومكوناته.
* ومما سبق يوصى باستخدام الرش بالخميره الجافة النشطة مع الإضافة الأرضية بالتسميد العضوي بصورتيه المستخدمة فى الدراسة من اجل زيادة النمو الخضري وزيادة محصول الزيت الطيار وأيضا الحد من تلوث التربة والبيئات الذي يحدث نتيجة استخدام التسميد المعدني والمبيدات التي تستخدم فى الزراعة.