J. Plant Production, Mansoura Univ., Vol. 8 (5): 657 - 663, 2017

Effect of Bio-Fertilizers, Plants Extracts and Active Dry Yeast on Marjoram Plants.

Hekmat Y. Massoud[1]; M. N. Sharaf-Eldin[1] and A. M. Sheashaa[2]
[1] Veget and Flori. Dept., Fac. Agric., Mansoura Univ.
[2] General Admini. of Med. and Aro.Plants,Central Admini. of Horti., Ministry of Agri.,

ABSTRACT

This experiment was carried out to study the effect of bio fertilizers, active dry yeast and garlic extract on growth characteristics, essential oil determination and chemical composition of marjoram (*Majorana hortensis L.*) at private farm, Seif El Din Village, Zarqa City, Damietta Governorate, during 2012 and 2013 seasons. The experiment was set up using a split-plot design with 3 replications. The main-plot included the three biofertilizers (0.0, Biogene and Biogene plus Phosphorene), whereas, the sub-plots were devoted for active dry yeast and *Allium sativum* extract. The final statistical analysis indicated that the highest values of herb (fresh and dry), essential oil percentage and oil content / plant, as well as the chemical constituents of *Majorana hortensis* plant were produced when Biogene plus Phosphorene were combined with active dry *Allium sativum* or garlic extract treatments.

INTRODUCTION

Marjoram (*Majorana hortensis* L.), is aromatic herb plant belonging to Lamiaceae family. It has been used not only to flavour food, but also as a miraculous herb with the power to heal practically various diseases. It's essential oil has been known since antiquity to possess biological activity, notably antibacterial, antifungal and antioxidant properties as mentioned Tiziana and Dorman (1998). Active dry yeast (*Saccharomyces cerevisiae*) is considered as a type of biofertilizer which is usually added to soil or as foliar fertilizers on plants (EL-Ghamriny *et al* 1999) because of its nutrition properties as well as producing growth regulators (gibberellins or auxins) as mentioned earlier Sarhan and Sharif (1988). yeast has the ability to produce a group of plant enzymes as mentioned Dinkha and Khazrge (1990). Yeast treatment was beneficial role in improving plant growth (Omer, 2003 and Sharaf-Eldin *et al.,* 2008).

Garlic extract (*Allium sativum*) is rich in macro and micro elements, important plant hormones like Auxins, Gibberellins and Cytokinin which induce cell division and increasing cell enlargement and lead to balance of physiological and biological processes and increasing photosynthesis processes and improving growth qualities (Hanafy *et al.,* 2012, Nour Eldeen, 2014 and Ziedan and Eisa, 2016). The objective of the current study was to study the effect of some biofertilizers, active dry yeast and garlic extract as well as their combination on growth, essential oil and chemical composition of marjoram plant.

MATERIALS AND METHODS

The present work was carried out during 2012 and 2013 seasons at private farm in EL-Zarka Village, Doumyat Governorate, to study the effect of bio-fertilizers, active dry yeast, garlic extract and their interaction on vegetative growth and essential oil as well as chemical compositions of marjoram *(Majorana hortensis* L.*)* plants.

Seeds were sown in the nursery in the first day of Novembers 2011 and 2012 in the first and second season, respectively. After 90 days from sowing, when the seedling reached 10-12 cm height, they were transplanted to experimental soil. Herb harvest took place twice; the first cut when inflorescence shoots occurred (50% flowering) in May 15th and after three months the second cut harvest was done (in Augustus 15th) in both seasons..

The chemical and physical properties of experimental soil are shown in Table (A) according Page *et al.* (1982). The organic (Cattle manure) fertilizers analysis of the samples is shown in Table (B) . All treatments received organic fertilizers (Cattle manure) at rates of 15 m3 /faddan added during the preparation of the experimental soil.

The experimental design and treatments:

Split plot system in a randomized complete block design with three replicates was used. The bio-fertilizers were randomly located in the main plots, whereas, the sub-plots were active dry yeast and garlic extract. The sub-plot area was 1 x 3 m, which consisted of 5 ridges with 60 cm apart, and every ridge contained 16 seedlings at 25 cm distance.

The experiment included 9 treatments, which were the combination between three bio-fertilizers (0.0, Biogene and Biogene plus Phosphorene) and three plant extracts (0.0, active dry yeast and *Allium sativum* extract).

Table A. Some physical and chemical properties of experimental soil in two seasons of 2012 and 2013.

Available nutrients (ppm)						PH	Organic Matter%	Sand %	Silt %	Clay %	Season
Mn	Fe	Zn	K	P	N						
12.1	8.21	1.45	381	13.5	50.4	8.1	1.72	28.3	30.6	41.1	2013
12.4	7.81	1.38	394	14.1	51.2	8.0	1.54	29.0	30.7	41.3	2014

Table B. Some physical and chemical properties of different organic fertilizers used in two seasons of 2012 and 2013.

Micro-elements (ppm)				Macro-elements (%)			C:N	EC	PH	Season
Cu	Zn	Mn	Fe	K	P	N	ratio%	dS/m		
44	192	90	1865	1.18	0.59	1.88	17: 1	6.2	7.9	2013
43	176	159	2690	1.12	0.60	1.83	19:1	6.1	8.0	2014

Active dry yeast was obtained from Sugar and Integrated Industries Company (SIIC) and was applied as a foliar spray till run off point with a concentration of 8 g / liter. The *Allium sativum* extract was prepared according to (EL-Desouky *et al.* 1998). Fresh mature garlic cloves were blended in distilled water 1Kg cloves / 1 liter distilled water. Frozen and thawed two times then filtered. The filtrate was use for the preparation of different *Allium sativum* extract concentrations. The obtained extracts were used for foliar spray at 10 %. The plants received foliar sprays of active dry yeast and *Allium sativum* extract after 30 days from planting and after the first and second cuts in the both seasons. Bacteria fertilizers inoculated marjoram seedlings, before the transplanting with dissolved bacteria growth media (1kg / fad.) in 5-liter water and 100 g Arabic gum was applied, and the root of marjoram seedlings were dipped in this suspension for 10 minutes before transplanting following (El-Zeiny et al, 2001). After 30 days from transplanting and after the first and second cuts, the soil inoculation was repeated by bacteria fertilizers at 4 kg / fad, mixed with wet soft soil (1:10 ratio) into the root absorption zone of the plant then covered and irrigation in the two seasons.

Recorded data:

Growth characteristics:

The vegetative growth qualities were included: plant height (cm), number of branches and herb fresh and dry weight g /plant.

Essential oil determination:

Essential oil percentages was determined in the dry herb samples (100 g) in both seasons using hydro distillation using Clevenger apparatus according to the method described by British Pharmacopoeia (1963).

Chemical composition:

Estimation of photosynthetic pigments content: the photosynthetic pigments (chlorophylls a, b) were extracted and determined in fresh leaves of *Majorana hortensis* plants samples after three weeks of the last treatment in both seasons according to Moran (1982), using the spectrophotometer at wave length of 656 and 665 um, respectively

Carbohydrates and nutrient percentages: herb samples were air dried at 70 °C for 24 h, then ground to fine powder and was taken for determination of the following chemical analyses:

- Total carbohydrate percentages were determined as previously described by Herbert *et al.* (1971).
- The nitrogen percentage was determined according to the micro-kjeldhl method Jackson (1967).

The phosphorus percentage was determined according to the method of Murphy and Riley (1962)

The data were statistically analyzed according to Snedecor and Cochran (1980) and the averages were compared by using least significant difference (LSD) at 5%.

RESULTS AND DISCUSSION

A-Growth characters:

Plant height and number of branches per plant:

Data presented in Table 1, included plant height and number of branches per plant, in the first and second cut. Plant height and number of branches of *Majorana hortensis* were significantly affected by inoculation of biofertilizer source in the two cuts in both seasons. It is clear from the data that inoculation of *Majorana hortensis* plants with Biogene plus Phosphorene resulted in the maximum values (42.76 and 47.75 cm) for plant height and (23.86 and 25.77) for number of branches in the 1st cut in the first and second seasons respectively, also (44.15 and 45.20 cm) for plant height and (24.00 and 24.66) for number of branches in the 2nd cut in the same respective order. Inoculation of Biogene recorded 38.90 and 43.35 cm for plant height and 17.88 and 19.77 for number of branches in 1st cut, also 40.75 and 41.09 cm for plant height and 18.33 and 19.00 for number of branches in 2nd cut in the first and second seasons, respectively.

Also, there was no significant difference in plant height or number of branches per plant between the Biogene plus Phosphorene and Biogene individual, in the first and second cuts in both seasons. These results are consistent with those reported by Mahfouz (2003) on marjoram, Gharib *et al.* (2008) on marjoram, Al-Fraihat *et al.* (2011) and Yadegari *et al.* (2012) on thyme plants.

As for, the response of active dry yeast and garlic extract, data in Table 1, illustrated that plants sprayed with active dry yeast or *Allium sativum* extract gave significantly plant height and number of branches / plant compared with control, in the two cuts in the two seasons. The highest values of plant height and number of branches per plant resulted from plants sprayed with active dry yeast followed by plants sprayed with *Allium sativum* extract then the control in the first and second cut in both growing seasons under investigation. The obtained results are in agreement with Ahmed (2009) on *Melissa officinalis*, Nassar (2015) on basil, Matter and El Sayed (2015) on caraway and Taha *et al.* (2016) on *Azadirachta indica* L.The results of the interaction between biofertilizers (Biogene and Phosphorene) and active dry yeast or garlic extract are shown in Table 1. The results indicated that plant height and number of branches / plant were significantly increased by application of biofertilizers and active dry yeast or *Allium sativum* extract. Inoculation of Biogene plus Phosphorene to *Majorana hortensis* plant combined with active dry yeast recorded the height values of plant height and branches number per plant in the two cuts in the both seasons, while the few values was resulted in the control in the two cuts in the both seasons. These results are consistent with those reported by Ahmad *et al.* (2014) on basil and Nour Eldeen (2014) on sage plant

A-2- Herb fresh and dry weights:

It is clear from the data in Table 2, that biofertilizers (Biogene and Phosphorene) had a significant effect on herb fresh and dry weights / plant in both seasons. Application of bio-fertilizers as Biogene plus Phosphorene gave the highest values, in this respect, compared to the other treatments. These results agreed with those obtained by Mahfouz (2003) on marjoram, Gharib *et al.* (2008) on marjoram, Al-Fraihat *et al.* (2011) and Yadegari *et al.* (2012) on thyme plants.

Table 1. Effect of some bio fertilizers, garlic extracts and active dry yeast on plant height (cm) and number of branches / plant of *Majorana hortensis* L. during 2012 / 2013 seasons.

Plant extract / Bio fertilizer	Plant height (cm) First cut — First season 0	Y	G	Mean A	Second season 0	Y	G	Mean A
0	31.61	33.88	32.72	32.73	35.85	38.11	38.02	37.32
B	36.66	41.71	38.34	38.90	40.76	47.05	42.26	43.35
B.+Ph.	39.82	45.79	42.68	42.76	45.01	50.88	47.38	47.75
MeanB	36.03	40.46	37.91		40.54	45.34	42.55	
L.S.D 5%		A 5.64	B 3.53	A+B 7.15		A 5.13	B 4.53	A+B 9.4 1
	Second cut							
0	32.14	35.07	33.02	33.41	32.22	36.16	34.17	34.18
B	39.13	43.22	39.90	40.75	39.24	44.44	39.61	41.09
B.+Ph.	41.32	47.23	43.91	44.15	42.53	48.33	44.76	45.20
MeanB	37.53	41.84	38.94		37.99	42.97	39.51	
L.S.D 5%		A 6.24	B 4.12	A+B 8.25		A 6.35	B 4.53	A+B 9.4
	Number of branches/plant							
	First cut							
0	7.33	10.33	9.33	8.99	8.33	12.00	11.67	10.66
B	15.00	21.33	17.33	17.88	17.00	23.33	19.00	19.77
B.+Ph.	20.00	27.67	24.00	23.89	22.00	29.33	26.00	25.77
MeanB	14.11	19.77	16.88		15.77	21.55	18.89	
L.S.D 5%		A 9.02	B 5.02	A+B 10.03		A 8.73	B 4.86	A+B 9.71
	Second cut							
0	8.67	11.67	10.00	10.11	9.33	12.67	11.33	11.11
B	15.00	23.00	17.00	18.33	15.67	24.00	17.33	19.00
B.+Ph.	20.00	27.67	24.33	24.00	20.33	28.67	25.00	24.66
MeanB	14.55	20.78	17.11		15.11	21.78	17.88	
L.S.D 5%		A 8.67	B 4.47	A+B 8.93		A 8.24	B 5.35	A+B 10.69

B=Biogene Ph= Phosphorene Y= Active dry yeast, G= Garlic extract

Spraying *Majorana hortensis* plants with active dry yeast or *Allium sativum* extract had significant effect on fresh and dry weights of herb / plant compared to the control in both growing seasons, as presented in Table 3. Data cleared that, the heaviest fresh and dry weights of herb per plant resulted from spraying plants with active dry yeast followed by garlic extract, then the control in first and second cuts in both growing seasons under investigation. While there was no significant difference between spraying the plants with active dry yeast or *Allium sativum* extract in the two cuts in both seasons. This was supports the results of Ahmed (2009) on *Melissa officinalis*, Nassar (2015) on basil, Matter and El Sayed (2015) on caraway and Taha *et al.* (2016) on *Azadirachta indica* plants.

The effect of combination between biofertilizers (Biogene, Phosphorene and Biogene plus Phosphorene) and active dry yeast or *Allium sativum* extract on fresh and dry weights of herb per plant is presented in Table 2. It is clear that, the interaction between biofertilizers and active dry yeast or *Allium sativum* extract had a significant effect on fresh and dry weight of herb per plant. Biogene plus Phosphorene combined with active dry yeast gave highest fresh and dry weights of herb / plant (168.9, 185.1, 38.8 and 47.62 gm / plant, respectively) in the 1st cut in the first and second seasons, while Biogene plus Phosphorene combined with *Allium sativum* extract gave intermediate values (161.7, 180.4, 37.18 and 45.48 gm / plant) in the 1st cut in both seasons, respectively. On the other hand, the lowest values in the respect were obtained when the Biogene combined with garlic extract. The 2nd cut was a similar to 1st cut in the two seasons. Many authors proved that the biofertilizers augmented herb fresh and dry weights / plant as was mentioned by Ahmad *et al.* (2014) on basil and Nour Eldeen (2014) on sage plant

B- Essential oil percentage and oil content (ml / plant):

The presented data in Table 3, showed the effect of biofertilizers (Biogene, Phosphorene and Biogene plus Phosphorene) on essential oil percentage and oil content per plant of marjoram plant. It is clear that bio-fertilizers reflected a significant effect on essential oil percentage and oil content per plant at different cuts in each experimental season. It also showed that essential oil percentage and oil content per plant were at the uppermost values by adding Biogene plus Phosphorene as the source of biofertilizers (1.38, 137, 1.84 and 1.89 % for essential oil percentage), and (0.25, 0.31, 0.34 and 0.35 ml for essential oil content ml /plant) in the 1st and 2nd cuts in the first and second seasons, respectively. In this respect, it can be suggested that the simulative effect of the bio-fertilizers on increasing essential oil content per plant might be attributed to their enhancing effect on plant growth characteristics and plant chemical composition. In addition, this favourable effect could be related to increasing the number of glands per plant. Similar results were obtained by Mahfouz (2003), Gharib *et al.* (2008), Al-Fraihat *et al.* (2011) on marjoram and Yadegari *et al.* (2012) on thyme plants

Data presented in Table 3, show that foliar spraying of active dry yeast or *Allium sativum* extract on plants increased essential oil percentage and oil content per plant of marjoram plant compared with control in the two in both experiment seasons. The maximum mean values of most characters under study have been recorded with active dry yeast followed by *Allium sativum* extract in two cuts in both seasons was also pointed out byAhmed (2009) on Melissa officinalis,

Nassar (2015) on basil, Matter and El Sayed (2015).on Caraway plants**.**

Data in Table (3) clearly showed that the mean values of essential oil percentage and oil content / plant of marjoram were strongly affected by inoculation with biofertilizers combined with active dry yeast or *Allium sativum* extract compared with their corresponding controls, at deferent cuts in both seasons. Application of biofertilizers in combination with active dry yeast led to an increase in essential oil percentage and oil content / plant of marjoram with compared to biofertilizers in combination with *Allium sativum* extract, in the two cuts in both seasons. Similar trend of result was obtained by Ahmad *et al.* (2014) on basil and Nour Eldeen (2014) on sage plant..

Table 2. Effect of some bio fertilizers, garlic extracts and active dry yeast on herb fresh and dry weights (g / plant) of *Majorana hortensis* L. during 2012 and 2013 seasons.

Plant extract / Bio fertilizer	0	Y	G	Mean A	0	Y	G	Mean A
	Herb fresh weight g / plant First cut							
	First season				Second season			
0	102.4	119.8	110.1	110.76	114.8	130.9	123.9	123.20
B	136.6	152.9	143.0	144.16	156.8	174.3	170.9	167.33
B.+Ph.	152.1	168.9	161.7	160.90	173.9	185.1	180.4	179.80
MeanB	130.3	147.2	138.2		148.5	163.4	158.4	
L.S.D 5%		A 20.7	B 16.5	A+B 32.9		A 18.3	B 14.5	A+B 28.0
	Second cut							
0	83.2	94.9	90.0	89.36	88.82	100.4	95.5	94.90
B	121.3	146.4	139.0	135.56	123.1	153.7	146.4	141.06
B.+Ph.	148.2	170.8	159.9	159.63	151.9	172.1	161.7	161.90
MeanB	117.5	137.3	129.6		121.2	142.1	134.5	
L.S.D 5%		A 19.8	B 17.5	A+B 33.1		A 21.1	B 18.5	A+B 35.9
	Herb dry weight g / plant First cut							
0	23.54	27.54	25.32	25.46	26.4	30.10	28.48	28.32
B	31.40	35.10	32.88	33.12	36.04	40.06	39.30	38.46
B.+Ph.	34.96	38.8	37.18	36.98	42.28	47.62	45.84	45.24
MeanB	29.96	33.81	31.79		34.90	39.26	37.87	
L.S.D 5%		A 6.02	B 3.05	A+B 6.09		A 5.48	B 3.82	A+B 7.61
	Second cut							
0	19.14	21.82	20.7	20.55	20.42	23.08	21.96	21.82
B	27.88	33.66	31.96	31.16	28.3	35.34	33.66	32.43
B.+Ph.	34.08	39.28	36.76	36.70	34.92	39.56	37.18	37.22
MeanB	27.03	31.58	29.80		27.88	32.66	30.93	
L.S.D 5%		A 9.12	B 4.06	A+B 8.13		A 5.11	B 2.81	A+B 5.61

B=Biogene Ph= Phosphorene Y= Active dry yeast, G= Garlic extract

Table 3. Effect of some bio fertilizers, garlic extracts and active dry yeast on essential oil percentage and essential oil content ml / plant of *Majorana hortensis* during 2012 / 2013 seasons

Plant extract / Bio fertilizer	0	Y	G	Mean A	0	Y	G	Mean A
	Essential oil percentage First cut							
	First season				Second season			
0	1.01	1.08	1.10	1.06	0.98	1.12	1.12	1.07
B	1.21	1.42	1.33	1.32	1.22	1.39	1.32	1.31
B.+Ph.	1.31	1.44	1.39	1.38	1.32	1.42	1.39	1.37
MeanB	1.17	1.31	1.27		1.17	1.31	1.27	
L.S.D 5%		A 0.16	B 0.12	A+B 0.25		A 0.14	B 0.11	A+B 0.21
	Second cut							
0	1.56	1.74	1.64	1.64	1.56	1.73	1.63	1.64
B	1.79	1.84	1.81	1.81	1.83	1.86	1.84	1.84
B.+Ph.	1.81	1.88	1.84	1.84	1.89	1.92	1.88	1.89
MeanB	1.72	1.82	1.76		1.76	1.83	1.78	
L.S.D 5%		A 0.13	B 0.14	A+B 0.27		A 0.11	B 0.13	A+B 0.25
	Essential oil content ml / plant First cut							
0	0.12	0.15	0.14	0.13	0.13	0.17	0.16	0.15
B	0.19	0.25	0.22	0.22	0.22	0.28	0.26	0.25
B.+Ph.	0.23	0.28	0.26	0.25	0.28	0.34	0.32	0.31
MeanB	0.18	0.22	0.20		0.21	0.26	0.24	
L.S.D 5%		A 0.03	B 0.02	A+B 0.05		A 0.02	B 0.03	A+B 0.05
	Second cut							
0	0.15	0.19	0.17	0.17	0.16	0.20	0.18	0.18
B	0.25	0.31	0.29	0.28	0.26	0.33	0.31	0.30
B.+Ph.	0.31	0.37	0.34	0.34	0.33	0.38	0.35	0.35
MeanB	0.23	0.29	0.26		0.25	0.30	0.28	
L.S.D 5%		A 0.02	B 0.02	A+B 0.04		A 0.03	B 0.02	A+B 0.05

B=BiogenePh= Phosphorene Po= Potassiumag Y= Active dry yeast, G= Garlic extract

C- Chemical composition:

C-1- Total chlorophyll a + b content and total carbohydrates percentage:

Data in Table 4, elucidate that total amount of chlorophyll a+b content in fresh leaves and total carbohydrates percentage in dried herb of marjoram plants were affected by biofertilizers treatments. However, all biofertilizers led to significantly increase in total chlorophyll (a+b) content in fresh leaves and total carbohydrates percentage in dried herb of marjoram plants in the first and second cuts in both seasons under investigation. The highest total chlorophyll (a+b) content and total carbohydrates percentage of marjoram plants were obtained from plants treated by Biogene plus Phosphorene, followed by plants treated by Biogene, in the two cuts in both seasons. Similar results have been reported by Al-Fraihat *et al.* (2011) on marjoram and Yadegari *et al.* (2012) on thyme plants

Data obtained in Table 4, showed that there was significant effect of active dry yeast and *Allium sativum* extract treatments on total chlorophyll content and total carbohydrates percentage of marjoram plants compared with control, in the first and second cuts, in both seasons. Plants sprayed with active dry yeast gave the highest values total chlorophyll (a+b) content and total carbohydrates percentage followed by plant sprayed with *Allium sativum* extract, while the plant unsprayed with active dry yeast or *Allium sativum* extract gave the fewest values in the two cuts in the two seasons. The results obtained by Ahmed (2009) on *Melissa officinalis*, Nassar (2015) on basil, Matter and El Sayed (2015).on Caraway and Taha *et al.* (2016) on *Azadirachta indica* plants.

Concerning to the interaction between bio-fertilizer and active dry yeast or garlic extract on total chlorophyll (a+b) content in fresh leaves and total carbohydrates percentage in dried herb of marjoram plants, as shown in Table 4, the highest values were obtained from plants inoculated with bio-fertilizers and sprayed with active dry yeast or *Allium sativum* extract, in the two cuts in the two seasons, also the application of Biogene plus Phosphorene combined with active dry yeast was the best in this respect. Many investigators agreed that the interaction between biofertilizers and plant extract as Ahmad *et al.* (2014) on basil and Nour Eldeen (2014) on sage plant

Table 4. Effect of some bio fertilizers, garlic extracts and active dry yeast on total chlorophyll a + b content in the fresh herb and Total carbohydrates percentage in the dry herb of *Majorana hortensis* during 2012 and 2013 seasons.

Plant extract	Total chlorophyll a + b content First cut							
Bio fertilizer	First season 0	Y	G	Mean A	Second season 0	Y	G	Mean A
0	0.48	0.52	0.50	0.50	0.49	0.53	0.51	0.51
B	0.59	0.66	0.60	0.61	0.58	0.67	0.60	0.61
B.+Ph.	0.62	0.83	0.51	0.65	0.62	0.83	0.69	0.71
MeanB	0.56	0.67	0.53		0.56	0.67	0.60	
L.S.D 5%		A 0.02	B 0.04	A+B 0.07		A 0.03	B 0.04	A+B 0.08
	Second cut							
0	0.49	0.52	0.50	0.50	0.47	0.52	0.49	0.49
B	0.58	0.64	0.62	0.61	0.59	0.66	0.61	0.62
B.+Ph.	0.63	0.85	0.70	0.72	0.63	0.81	0.71	0.71
MeanB	0.56	0.67	0.60		0.56	0.66	0.60	
L.S.D 5%		A 0.03	B 0.03	A+B 0.05		A 0.02	B 0.04	A+B 0.07
	Total carbohydrates percentage First cut							
0	19.22	24.68	22.86	22.25	19.08	24.12	22.71	21.97
B	22.89	30.43	27.41	26.91	22.83	30.01	29.03	27.29
B.+Ph.	25.99	33.21	30.41	29.87	25.81	34.02	31.05	30.29
MeanB	22.7	29.44	26.89		22.57	29.38	27.60	
L.S.D 5%		A 1.17	B 1.19	A+B 2.37		A 1.12	B 1.03	A+B 2.07
	Second cut							
0	17.82	23.16	20.63	20.54	17.56	22.94	20.15	20.22
B	21.48	32.03	29.99	27.83	21.07	30.35	29.86	27.09
B.+Ph.	24.58	34.13	33.02	30.58	22.12	32.95	30.66	28.58
MeanB	21.29	29.7	27.88		20.25	28.75	26.89	
L.S.D 5%		A 1.23	B 1.20	A+B 2.41		A 1.32	B 1.14	A+B 2.27

B=BiogenePh= Phosphorene Po= Potassiumag Y= Active dry yeast, G= Garlic extract

C-2- N and P percentages in dried herb:

Data in Table 5, indicated that the different sources of biofertilizers had a significant effect on N and P percentages in the two cuts in both seasons,. It is clear that, generally, inoculation of marjoram plants with Biogene plus Phosphorene biofertilizers in the two cuts in both seasons gave the highest percentage of N and P in dried herb of marjoram plants without significant differences with Biogene biofertilizers in most cases, while the lowest value of N and P percentage was recorded in plants uninoculated with biofertilizers. The better effect of biofertilizers may be due to the effect of different strain groups and nutrients mobilizing microorganisms which help in availability of metals and their forms in the composted material and

increment levels of extracted minerals as mentioned El-Kramany *et al.* (2000).

Results Table 5 showed that N and P % in dried herb of marjoram proved a significant response with spraying active dry yeast or *Allium sativum* extract at different cut in both seasons. application of active dry yeast were the superior source, which gave the highest values of N and P percentages of marjoram plants, followed by garlic extract at different cutting stages in both seasons. Moreover, the increments in NP as a result of active dry yeast and *Allium sativum* extract application may be attributed to their favorable effect on marjoram plants growth (Tables 1 and 2) as mentioned earlier (Ahmed, 2009). Some reviewers conformed the present findings using other medicinal and aromatic plants; for instance, Nassar (2015) on basil, Matter and El Sayed (2015).on Caraway and Taha *et al.* (2016) on *Azadirachta indica* plants.

As for the mineral percentages in the dried herb of marjoram plant as affected by the interaction between biofertilizers and active dry yeast or garlic extract, data in Table 5, obviously showed that biofertilizers combined with active dry yeast or garlic extract had significant effect on N and P percentages in dried herb of marjoram plants in the two cut in both seasons, application of Biogene plus Phosphorene as an biofertilizer sources combined with active dry yeast or *Allium sativum* extract, significantly increased N and P percentage in herb and recorded the maximum values in this respect without significant differences between the two cuts in both seasons. On the other hand, the minimum values in this respect were obtained by inoculation of Biogene as the source of biofertilizers without active dry yeast or Allium sativum extract. The response of N and P percentage in herb to biofertilizers combined with *Allium sativum* extract and active dry yeast treatments was found by Ahmad *et al.* (2014) on basil and Nour Eldeen (2014) on sage plant.

Table 5. Effect of some bio fertilizers, garlic extracts and active dry yeast on nitrogen and phosphorus percentages in the dried leaves of *Majorana hortensis* during 2012 and 2013 seasons

Plant extract / Bio fertilizer	0	Y	G	Mean A	0	Y	G	Mean A
	Nitrogen percentage First cut							
	First season				Second season			
0	1.50	1.43	1.59	1.50	1.49	1.61	1.52	1.52
B	1.98	1.74	2.25	1.99	1.78	2.10	1.84	1.84
B.+Ph.	2.56	2.13	3.01	1.50	1.92	2.65	2.23	2.23
MeanB	2.01	1.76	2.28		1.73	2.12	1.86	
L.S.D 5%		A 0.01	B 0.04	A+B 0.09		A 0.02	B 0.03	A+B 0.07
	Second cut							
0	1.41	1.61	1.47	1.39	1.50	1.67	1.56	1.57
B	1.83	2.12	1.88	1.68	1.91	2.21	1.95	2.02
B.+Ph.	1.96	2.61	2.21	2.05	2.14	2.69	2.30	2.37
MeanB	1.73	2.11	1.85		1.85	2.19	1.93	
L.S.D 5%		A 0.02	B 0.04	A+B 0.08		A 0.03	B 0.04	A+B 0.07
	Phosphorus percentage							
	First cut							
0	0.15	0.19	0.17	0.17	0.15	0.19	0.17	0.17
B	0.23	0.29	0.24	0.25	0.22	0.29	0.25	0.25
B.+Ph.	0.25	0.34	0.30	0.29	0.26	0.34	0.31	0.30
MeanB	0.21	0.27	0.23		0.21	0.27	0.24	
L.S.D 5%		A 0.01	B 0.02	A+B 0.03		A 0.01	B 0.01	A+B 0.02
	Second cut							
0	0.16	0.21	0.19	0.18	0.15	0.19	0.17	0.17
B	0.24	0.28	0.25	0.25	0.22	0.29	0.25	0.25
B.+Ph.	0.27	0.35	0.31	0.31	0.26	0.34	0.31	0.30
MeanB	0.22	0.28	0.25		0.21	0.27	0.24	
L.S.D 5%		A 0.02	B 0.02	A+B 0.04		A 0.01	B 0.02	A+B 0.03

B=BiogenePh= Phosphorene Po= Potassiumag Y= Active dry yeast, G= Garlic extract

REFERENCES

Ahmed, M. M. (2009). Effect of Amino Acids and Yeast Extract on Growth and, Yield, Essential Oil Production and Chemical Constituents of Commom Balm (Melissa officinalis L.) Plant. M.Sc. Thesis, Fac. Agric., Cairo Univ., 99 pp.

Ahmad S, K., Kh. A. Hammam and A, A. Amer (2014). Effect of bio-fertilization and some plant extracts on the growth, yield and chemical constituents of basil plant. J. . Plant Production, Mansoura Univ., Vol. 5 (2):193 -210.

Al-Fraihat A.H., S.Y.A. Al-dalain, M.S. Abu-Darwish and J.A. Al-Tabbal (2011). Effect of organic and biofertilizers on growth, herb yield and volatile oil of marjoram plant grown in Ajloun region, Jordan. J. of Medicinal Plants Research 5 (13): 2822-2834.

British Pharmacopea, (1963). Determination of volatile oil in drugs.Published by Pharmaceutical Press. London. W.C.I.

Dinkha R. F., T.O. and Al Khazragji (1990). Nutrition and Fungus Function Science, University of Salahaddin, Ministry of High Education, Iraq. (In Arabic).

El- Desouky, S.A., Wans, A. L. and Z. M. Khedr. (1998). Utlization of some natural plant extracts (of garlic and yeast) as seed – soaked materials to squash (Cucurbatia pepo L). I- Effect on growth, sex expression and fruit yield and quality. J. Agric. Sci. Moshtohor, Zagazig. Univ., 35 (2): 839-854.

EL-Ghamriny E.A, H.M.H.Arisha and K.A. Nour (1999). Studies in tomato flowering, fruit set, yield and quality in summer season, I. Spraying with thiamine, ascorbic acid and yeast, Zagazig. J. Agric. Res., 26: 1345-1364.

El-Karamany, M.F.; M.K.A. Ahmed; A.A. Bahr and M.O. Kabesh (2000). Utilization of bio-fertilizers in field crop production. Egypt. J. Apple. Sci. 15(11):137.

EL-Zeiny, O.A.H.; U.A. EL-Behariy and M.H. Zaky (2001): Influence of biofertilizer on growth, yiekd and quality of tomato grown under plastic house. J. Agric. Sci. Mansoura Univ., 26 (3): 1749-1763.

Gharib F, A., L. A. Moussa and O. N. Massoud (2008). Effect of Compost and Bio-fertilizers on Growth, Yield and Essential Oil of Sweet Marjoram (Majorana hortensis) Plant. Int. J. Agri. Biol., Vol. 10, No. 4, 381–387

Hanafy, M.S., F.M. Saadawy, S.M.N. Milad and R.M. Ali (2012). Effect of Some Natural Extracts on Growth and Chemical Constituents of Scheffleraarboricola Plants. J. of Hortic. Scie. &Ornam. Plants 4 (1): 26-33.

Herbert, D., P. J. Phipps and R. E.Strange (1971). Chemical analysis of microbial cells. Methods in Microbiology 5B, 209-344.

Jackson, M.L. (1967): Soil Chemical Analysis. Printic Hall of India, New Delhi, pp. 144-197.

Mahfouz, SA (2003). Effect of biofertilization on growth and oil production of marjoram (Majorana hortensis L.). Ph. D. Thesis, Fac. Agric. Cairo Univ, Egypt .

Matter, F. M. A. and S. A. A. El Sayed (2015). Influence of Mixed NPK Fertilizers with Foliar Spray of Active Dry Yeast on Caraway under Newly Reclaimed Soil Conditions. Middle East J. Appl. Sci.., 5(2): 423-430.

Moran, R. (1982) : Formula determination of chlorophyllous pigments extracted with N – N – dimethyl – Formamide. Plant Physiol., 69: 1376 – 1381.

Murphy, J. and J.P. Riley (1962). A modified single solution method for the determination of phosphate in natural waters Anal Chim Acta 27 : 31-36.

Nassar M., M. U. El-Segai and S. N. Azoz (2015). Influence of Foliar Spray with Yeast Extract on Vegetative Growth, Yield of Fresh Herb Anatomical Structure, Composition of Volatile Oil and Seed Yield Components of Basil Plant (Ocimum basilicum L.). Intern. J. of Adva. Res. (2015), V., 3, Issue 10 , 978– 993

Nour Eldeen, E. A. (2014). Effect of bio- fertilizers and plant extracts on growth and chemical constituents under water stress conditions of sage (*Salvia officinalis* L.) plant. Ph. D. Thesis, Fac. Agric., Mansoura Univ.

Page, A.L., Miller, R.H., Keeney, D.R. (Eds). 1982. Methods of soil analysis: Part 2, chemical and microbiological properties. Agronomy series no 9, American Society of Agronomy, Madison, WI.

Omer, A. K. (2003). Effect of foliar spraying with yeast suspension on growth and yield of tomato plant C.V. Early Pearson. Iraqi of Agri. Sci. 4(3): 23-28.

Sarhan A.T., F.M. Sharif (1988). Fungus Physiology, Dar-ALkutub Publication, Mosul Univ. Iraq. (In Arabic).

Sharaf-Eldin M, Shereen E, Jose-Antonio F, Helmut J, Ronald C, Jose G, Pamela W (2008). Bacillus subtilis FZB24 Affects Flower Quantity and Quality of Saffron (Crocus sativus). Planta Med. 74:732-734.

Snedecor G.W. and W.G. Cochran. (1980). Statistical Methods 7th ed., The Iowa State Univ., Press. Ames, IA.

Taha L. S. , S. M.M. Ibrahim, N. G. Abdel Aziz (2016). Vegetative growth, chemical composition, and flavonoids content of Azadirachta indica plants as affected by application of yeast natural extract. J. of Appl. Pharm. Sci. 6 (04); 093-097.

Tiziana, B. M. and Dorman, D. H. J. (1998). Antimicrobial and antioxidant properties of some commercial oleoresin , Flavour and Fragrance J., 13: 235-44.

Ziedan, El.H. and E.A. Eisa (2016). The use of some micronutrients and plant extracts of resistance to powdery mildew and nutrition dill plants in the Gharbiyah governorate. J. Plant Prot. and Path., Mansoura Univ., Vol. 7 (9): 579 – 586.

Yadegari, M., and G.H.N. Farahani and Z. Mosadeghzad. (2012). Biofertilizers effects on quantitative and qualitative yield of Thyme (Thymus vulgaris). Afr. J. Agri. Res., 7(34): 4716-4723.

تأثير الأسمدة الحيوية و المستخلصات النباتية و الخميرة الجافة النشطة على نباتات البردقوش.

حكمت يحيى مسعود[١]، محمد نزيه شرف الدين[١] وعبدالقادر محمد شعيشع[٢]

[١] قسم الخضر و الزينة – كلية الزراعة – جامعة المنصورة

[٢] وزارة الزراعة –الإدارة المركزية للبساتين – الإدارة العامة للنباتات الطبية والعطرية - الجيزه- مصر

أجريت هذه التجربة لدراسة تأثير الأسمدة الحيوية والخميرة الجافة النشطة ومستخلص الثوم على خصائص النمو، والزيت الطيار والتركيب الكيميائي للبردقوش في مزرعة خاصة بقرية سيف الدين مركز الزرقا، محافظة دمياط. تم تنفيذ التجربة في تصميم القطاعات المنشقة لمرة واحده فى ثلاثة مكررات تم توزيع معاملات الاسمدة الحيوية عشوائيا في القطع الرئيسية والخميرة الجافة ومستخلص الثوم في القطع تحت الرئيسية فى موسمى٢٠١٢ و ٢٠١٣. وأشار التحليل الإحصائي النهائى أنه لإنتاج أعلى القيم من العشب (الاخضر والجاف)، النسبة المئوية للزيت الطيار وكذلك المكونات الكيميائية لنبات البردقوش عند معاملة النباتات بالأسمدة الحيوية جنبا إلى جنب مع الخميرة الجافة النشطة أو مستخلص الثوم.