J. Plant Production, Mansoura Univ., Vol.5 (4): 555 - 572, 2014

RESPONSE OF MARJORAM PLANTS TO SOME AGRICULTURAL TREATMENTS

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ABSTRACT

A field experiment was carried out during 2010/2011 and 2011/2012 seasons at the Experimental Farm of Fac. of Agric. Minia Univ. in order to investigate the response of sweet marjoram plants to compost, bio- and/or mineral NPK fertilization treatments. The obtained data revealed that the vegetative growth traits (plant height, number of branches, herb fresh and dry weight per plant/cut and /plant/season) and essential oil parameters (oil %, oil yield/plant/cut and /plant/season), as well as, chemical constituents (total chlorophylls and N, P and K %) were significantly increased due to the application of compost at different levels over those of control treatment. The maximum values were recorded at the medium level of compost (10 ton/fed.).

Vegetative growth traits, essential oil productivity parameters and chemical determinations were significantly augmented as a result of using the six treatments of bio+ and/or mineral NPK. The most effective treatment in this concern was phosphorein-Minia Azotein + 75 % NPK followed by mineral NPK (full dose) with significant differences between them in most cases.

It could be recommended to supply marjoram plants with compost at 10 ton/fed. in combination with phosphorein + Minia Azotein + 75 % NPK to maximize herb and oil productivity and their chemical constituents.

INTRODUCTION

Sweet marjoram (*Origanum majoranum*, L.) which belonging to Family: Lamiaceae is an aromatic, perennial herb. It has been cultivated in Europe as a herb since the middle ages and is now extensively grown and widely used for culinary and perfumery purposes (Ietswaart, 1980). The predominant essential compounds are of the Thujane type dominated by sabinene, the sabinene hydrates and their acetates. Sweet marjoram was used medicinally as a carminative and stimulant due to its strong, highly aromatic spicy and pleasing odour and flavour. The dried leaves are used as condiment and the volatile oil is employed medically as stimulate and carminative (El-Sharkawy, 1976 and El-Sanafawy, 2007). Volatile oil of the herb is used as antimicrobial, antispasmodic, digestive, bitter tonic, diuretic, antidiabetic and antiparalytic drug (Yadava and Khare, 1995). In addition, marjoram is cultivated as culinary herb and as garden plants (Lagouri *et al*., 1993).

The effect of organic fertilization on increasing growth, yield and chemical composition of medicinal and aromatic plants was reported by many investigators such as El-Sayed *et al*. (2002), Edris *et al.* (2003) and Gharib *et al.* (2008) on marjoram plant and Khalil and El-Sherbeny (2003) and Abdou *et al*. (2012b) on *Mentha* spp.

The enhancement effects of bio-fertilizer treatments (N_2-fixing bacteria and/or phosphate dissolving bacteria) on vegetative growth traits,

essential oil % and yield, as well as, chemical composition of aromatic plants were obtained by Mahfouz (2003), El-Hindi and El-Boraie (2005) and Gharib *et al.* (2008) on marjoram plants, Abou El-Ela (2004) and Abdou *et al.* (2012a) on sage plants, El-Leithy (2007) on *Matricaria chamomilla* and Abdou *et al*. (2012c) on fennel plants.

The important role of mineral fertilizers in increasing the medicinal and aromatic plants production is fully recognized. Dewidar (2007), Gharib *et al.* (2008) and Hussein *et al.* (2008) on marjoram plants. Niakan *et al.* (2004) and El-Shora (2009) on *Mentha* spp. and Marzok (2011) on clove basil found that mineral NPK treatment significantly increased all vegetative growth studied parameters, oil % and yield, as well as, chemical compositions (pigments and NPK percentage).

Therefore, the percent study aimed to evaluate the response of marjoram plants to compost, bio-fertilizers and/or mineral NPK fertilization.

MATERIALS AND METHODS

The present study was conducted during two successive seasons of 2010/2011 and 2011/2012 at the Experimental Farm of Fac. of Agric. Minia Univ. to investigate the response of marjoram plants to compost in combination with bio. and/or mineral NPK. Table (a) shows the physical and chemical properties of the used soil in both seasons.

Table(a): Some physical and chemical properties of the used soil during the two seasons of 2010/ 2011 and 2011/2012

Soil Character	Value		Soil Character	Value	
	2010/2011	2011/2012		2010/2011	2011/2012
Sand %	28.20	28.98	Available P %	15.12	15.67
Silt %	30.70	29.87	Exch. K^{+} mg/100 g	2.11	2.85
Clay %	41.10	41.15	Exch. Ca^{++} mg/100 g	31.74	31.12
Soil type	Clay loam	Clay loam	Exch. Na^{+} mg/100 g	2.40	2.51
Organic matter %	1.62	1.54	DTPA Ext. ppm Fe	8.54	8.23
Ca CO_3 %	2.09	2.11	DTPA Ext. ppm Cu	2.06	2.01
pH (1 : 2.5)	7.82	7.75	DTPA Ext. ppm Zn	2.75	2.87
E. C. (m mhos / cm)	1.04	1.08	DTPA Ext. ppm Mn	8.26	8.11
Total N %	0.08	0.06			

Seeds of sweet marjoram, were obtained from the Fac. of Agric. Minia Univ. and were sown in the Nursery on November 17th of both seasons and the seedlings were transplanted on March 4th in both seasons.

The experiment was arranged in a randomized complete block design in a split-plot design with three replicates. The main plots (A) included four levels of compost [0, 7.5, 10.0 and 12.5 ton/fed.], while, the sub-plots (B) were devoted to seven treatments [control (no bio- or NPK fertilization), phosphorein (Phos.), Minia Azotein (M.A.), Phos.+ M.A., Phos.+M.A.+50 % NPK, Phos.+M.A.+75 % NPK and mineral NPK (100 %)], therefore the interaction treatments were 28 treatments. The experimental unit (plot) was 1.5×2.0 m containing 3 rows, 50 cm apart. The seedlings were cultivated in hills, 40 cm apart, each plot contained 12 plants.

Compost was added during soil preparing in the two seasons. Physical and chemical properties of the used compost are shown in Table (b).

Table (b): Physical and chemical properties of the used compost during the both seasons of 2010/ 2011 and 2011/2012

Properties	Value	Properties	Value
Dry weight of 1 m^3	450 kg	C/N ratio	18.5-14.1
Fresh weight of 1 m^3	650-700 kg	NaCl (%)	1.10-1.75
Moisture (%)	25-30	Total P (%)	0.50-0.75
pH 1:10	7.5-8	Total K (%)	0.8-1.0
E.C. (m mhose/cm)	2-4	Fe (ppm)	150-200
Total N (%)	1.1.4	Mn (ppm)	25-56
Org. matter (%)	32-34	Cu (ppm)	75-150
Org. carbon (%)	18.5-19.7	Zn (ppm)	150-225

Fresh and active two biofertilizers (phosphorein and Minia Azotein) were applied three times to the soil around each plant at 0.2 g/plant of phosphorein and 50 cm^3/plant of M.A. (1 ml=10^7 cells of bacteria) the first dose was added after two weeks from transplanting and repeated after the first and second cuts by two weeks for both seasons.

The recommended mineral NPK fertilization (100% NPK) was applied at the rate of 300 kg/fed. ammonium nitrate (33.5 % N), 150 kg/fed. calcium superphosphate (15.5 % P_2O_5) and 75 kg/fed potassium sulphate (48 % K_2O). So 75 % NPK was 225, 112.5 and 56.25 kg/fed., respectively, So 75 % NPK was 225, 112.5 and 56.25 kg/fed., respectively, while 50 % NPK was 150, 75 and 37.5 kg/fed., respectively. Chemical fertilizers were applied in three equal doses the first one was added three weeks after transplanting and repeated after the first and second cuts by three weeks in each seasons. All agricultural practices were performed as usual in the region.

The plants were harvested 3 times per season on June 22nd, August 10th and last day of October by cutting the vegetative parts at 5 cm above the soil surface, and the following data were recorded for each cut in both seasons; plant height (cm), number of branches/plant and herb fresh and dry weight/plant (g), essential oil % and yield (ml/plant/cut or ml/plant/season), total chlorophylls and N, P and K %.

Chemical analysis ; total chlorophylls (mg/g- fresh weight) were determined in the fresh leaves according to Fadl and Sari El-Deen (1978), while N, P and K % were determined according to Wilde *et al.* (1985), Chapman and Pratt (1975) and Cottenie *et al.* (1982), respectively. Essential oil % in the dry herb was determined according to British Pharmacopoeia (1963).

The obtained data were statistically analyzed according to MSTAT-C (1986). The differences between means were tested using L.S.D. at 5 % level.

RESULTS AND DISCUSSION

A-Vegetative growth traits:

Data presented in Tables (1, 2, 3, 4 and 5) disclosed that plant height, number of branches, herb fresh and dry weight/plant/cut, as well as, herb fresh and dry weight/plant/season were significantly increased due to all compost treatments over control in the three cuts in both seasons. The highest values for the six characters were obtained when compost was

applied at 10 ton/fed. similar results were found by El-Sayed *et al*. (2002), Edris *et al.* (2003) and Gharib *et al.* (2008) on marjoram plants.

Data presented in Tables (1, 2, 3, 4 and 5) showed also that all biofertilizer treatments alone or with 50 and 75 % NPK and mineral NPK (full dose) significantly increased plant height, number of branches, herb fresh and dry weight/plant/cut and per plant per season in the three cuts during both seasons in comparison with unfertilized control plants. The highest values for the aforementioned parameters were obtained due to fertilizing marjoram plants with Phos.+M.A.+75 % NPK followed by NPK (full dose) with significant differences between them. In agreement with these results were those obtained by Mahfouz (2003), El-Hindi and El-Boraie (2005) and Gharib *et al.* (2008) on marjoram plants regarding the effect of bio-fertilizers. While, Dewidar (2007) and Hussein *et al.* (2008) on marjoram plants found that mineral fertilization enhanced all vegetative growth traits.

The interaction between compost and bio. and/or mineral NPK treatments was significant for the six aforementioned characters in both seasons. The highest values were obtained due to the treatment of compost at 10 ton/fed. in combination with Phos.+M.A.+75 % NPK.

B- Essential oil production :

Data presented in Tables (6, 7 and 8) indicated that essential oil % per cut and essential oil yield/plant/cut and /plant/season were significantly increased due to all used levels of compost in comparison with control in both seasons. The highest values for the three parameters were realized when plants addressed with medium level of compost (10 ton/fed.). The stimulatory effect of compost on essential oil production may be due to that organic fertilization enhances oil biosynthesis and herb weight. These results are in agreement with those of Edris *et al.* (2003) and Gharib *et al.* (2008) on marjoram plants and Khalil and El-Sherbeny (2003) and Abdou *et al.* (2012b) on *Mentha* spp.

Essential oil productivity parameters (oil %, oil yield/plant/cut and /plant/season) was significantly increased due to all used bio- and/or mineral NPK fertilization treatments in both seasons over the control. The most effective treatment, which gave the highest essential oil % and greatest essential oil yield (per plant/cut and per plant/season) was phosphorein+Minia Azotein + 75 % mineral NPK in both seasons. The plants which received biofertilizers plus reduced dose of mineral NPK contained the highest oil % and yield. These results may be due to that mineral NPK fertilization enhances oil biosynthesis. In addition the better role of microorganisms for increasing enzymes, vitamin, proteins analysis of compounds in soil, is promoting hormone and other beneficial substances, which enhance oil biosynthesis. In agreement with these finding concerning the promoting effect of biofertilizers on essential oil % and yield were those disclosed by Mahfouz (2003), El-Hindi and El-Boraie (2005) and Gharib *et al*. (2008) on marjoram plants and Abdou *et al*. (2012c) on fennel plants. The important role of mineral fertilizers in essential oil % and yield was reported by Dewidar (2007) and Hussein *et al.* (2008) on marjoram plants and El-Shora (2009) on *Mentha piperita*.

The interaction between main and sub-plots (A×B) was significant for essential oil % and oil yield/plant per cut, as well as, per plant/season. The

highest values in this concern were obtained due to compost at 10 ton/fed. in combination with Phos.+M.A.+75 % NPK , (Tables 6, 7 and 8).

C- Chemical composition :

1- Total chlorophylls :

Concerning compost treatments , the medium level of compost (10 ton/fed.) followed by high level of compost (12.5 ton/fed.) gave significantly the highest total chlorophylls content in both seasons over either low level of compost (7.5 ton/fed.) or control treatment without significant differences between high and medium levels of compost (Table, 9). Similar results were obtained by Abdou *et al*. (2012b) on mint plants.

A significant and positive influence of the six used bio –and/or mineral NPK treatments on total chlorophylls was recorded in the present study. The treatments of Phos.+ M.A. + 75 % NPK followed by mineral NPK (full dose) were the most effect in this concern without significant differences between them (Table, 9). These results are in agreement with those obtained by El-Ghadban *et al.* (2008) on lavender plants and Mosaad (2012) on sage plants. While, Dewidar (2007) on rosemary plants, El-Shora (2009) on *Mentha piperita* and Ibrahim (2010) on geranium plants stated that mineral NPK fertilization increased photosynthetic pigments.

The interaction between main and sub-plots (A×B) was significant for total chlorophylls (Table, 9). The highest values were obtained due to fertilizing the plants with medium (10 ton/fed.) or high (12.5 ton/fed.) compost levels and treated them with Phos.+M.A.+75 % NPK or with mineral NPK (full dose).

2- NPK determination (%) :

Data in Table (10) indicated that the medium level of compost (10 ton/fed.) gave significantly the highest N, P and K % over the other two tested levels of compost or control in both seasons. The increment in N, P and K % in the dry herb by using the treatments of compost may be due to excesses of these elements in the root zone of plants as a result of analysis of organic manure which reflected on N, P and K uptake by plants. Similar results were obtained by El-Sanafawy (2007) on marjoram plants.

Regarding the effect of bio. and/or mineral NPK fertilization treatments, all six used treatments significantly increased N, P and K %, in both seasons, over that of check plants. The highest values were resulted from the treatment of Phos.+ M.A. + 75 % NPK followed by mineral NPK (full dose) without significant differences between them for all cases, except for K % in the second season, (Table 10).The stimulatory effect of bio- +NPK fertilization on N, P and K % may be due to increasing the available N, P and K elements in root zone of plants as a result of to adding NPK or treated plants with biofertilizers, which reflected on their uptake by plants. These results are in harmony with those obtained by El-Ghadban *et al.* (2008) on lavender plants and Mosaad (2012) on sage plants regarding the effect of biofertilizer. Meanwhile, Massoud (2007) on marjoram plants and Dewidar (2007) on rosemary plants found that the highest N, P and K % were obtained by supplying plants with NPK.

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The interaction between compost and bio- and/or mineral NPK fertilization treatments was significant for N, P and K % in both seasons, except for K % in the first season. The highest percentages were resulted from the treatment of 10 ton/fed. compost in combination with Phos.+ M.A. + 75 % NPK in both seasons or with mineral NPK (full dose) during the second season, (Table 10).

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استجابة نباتات البردقوش لبعض المعاملات الزراعية

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تم إجراء تجربة حقلية خلال موسمي ٢٠١٠/٢٠١١ و ٢٠١١/٢٠١٢ بمزرعة كلية الزراعة جامعة المنيا لاختبار استجابة البردقوش لمعاملات التسميد بالكمبوست علاوة على الحيوي أوالمعدني أو كلاهما معاً.

وقد أظهرت النتائج أن صفات النمو الخضري (ارتفاع النبات وعدد الفروع للنبات والوزن الطازج والجاف للعشب للنبات/الحشة وللنبات/الموسم) وتقديرات الزيت الطيار (النسبة المئوية ومحصول الزيت للنبات/الحشة ومحصول الزيت للنبات/الموسم) وكذلك المكونات الكيميائية (الكلوروفيلات الكلية والنسبة المئوية للنتروجين والفوسفور والبوتاسيوم) زادت معنوياً نتيجة استعمال مستويات الكمبوست المختلفة مقارنة بالكنترول. وكانت أعلى قيم سجلت نتيجة استعمال المستوى المتوسط من الكمبوست (١٠ طن/فدان).

وقد سجلت النتائج أعلى قيم في صفات النمو الخضري وإنتاجية الزيت والمركبات الكيماوية نتيجة للتسميد الحيوي أوالمعدني أو كلاهما معاً. وكانت أكثر المعاملات كفاءة هي الفوسفورين + المنيا أزوتين + ٧٥ % NPK تليها معاملة NPK (جرعة كاملة) مع فارق معنوي بينهما في معظم الحالات.

يمكن التوصية بإمداد نبات البردقوش بسماد الكمبوست بمعدل ١٠ طن/فدان مع الفوسفورين+ المنيا أزوتين + ٧٥ % NPK وذلك للحصول على أعلى قيم لإنتاجية العشب والزيت الطيار والصفات الكيماوية.

قام بتحكيم البحث

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Table(1):Effect of compost, bio. and/or mineral NPK fertilization treatments on plant height (cm) of *Origanum majoranum*,L., in the first, second and third cuts during the first and second seasons of 2010/2011 and 2011/2012

Bio- and / or mineral NPK fertilization treatments (B)	Compost levels (ton/feddan) (A)										
	First season (2010 / 2011)						Second season (2011 / 2012)				
	0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)		0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)
1st Cut											
Control	25.92	28.47	36.85	33.45	**31.18**		31.19	32.42	36.59	34.70	33.73
Phosphorein (Ph.)	28.26	30.20	39.16	37.42	**33.76**		33.38	35.38	39.75	37.19	36.43
Minia Azotein (M.A.)	30.37	32.14	43.48	39.68	**36.42**		36.30	38.38	43.44	40.39	39.63
Ph. + M.A.	33.04	34.40	46.60	42.65	**39.17**		39.71	41.35	48.18	44.82	43.52
(Ph. + M.A.) + 50 % NPK	34.65	36.39	48.68	44.94	**41.16**		35.64	42.37	50.71	46.47	43.80
(Ph. + M.A.) + 75 % NPK	38.81	42.01	54.77	51.93	**46.88**		42.53	47.19	58.54	56.45	51.18
100 % NPK	37.33	38.86	51.33	47.78	**43.82**		40.29	44.95	55.09	51.89	48.05
Mean (A)	**32.62**	**34.64**	**45.84**	**42.55**	**38.91**		**37.01**	**40.29**	**47.47**	**44.56**	42.33
L.S.D. at 5 %	**A :0.25**		**B :0.36**	**AB :0.71**			**A :0.31**		**B :0.43**	AB :0.85	
2nd Cut											
Control	23.62	26.61	32.48	30.09	**28.20**		27.72	29.44	34.39	32.57	31.03
Phosphorein (Ph.)	25.66	27.45	36.62	34.45	**31.04**		29.52	32.14	36.50	35.16	33.33
Minia Azotein (M.A.)	28.14	29.59	39.64	37.43	**33.70**		31.28	35.48	40.38	38.24	36.34
Ph. + M.A.	31.47	33.59	41.48	40.48	**36.76**		33.78	37.42	45.10	41.52	39.45
(Ph. + M.A.) + 50 % NPK	32.71	35.27	44.51	42.83	**38.83**		35.41	39.36	48.16	44.41	41.84
(Ph. + M.A.) + 75 % NPK	36.24	40.80	50.80	49.28	**44.28**		39.13	43.93	56.36	53.52	48.23
100 % NPK	34.29	37.96	47.64	45.66	**41.39**		36.30	42.55	51.92	48.45	44.81
Mean (A)	**30.31**	**33.04**	**41.88**	**40.03**	**36.32**		33.30	37.19	44.69	41.98	39.29
L.S.D. at 5 %	**A :0.30**		**B :0.30**	**AB :0.60**			**A :0.24**		**B :0.32**	AB :0.65	
3rd Cut											
Control	24.51	27.10	33.32	34.34	**29.82**		28.11	29.81	34.65	33.10	31.42
Phosphorein (Ph.)	26.44	27.13	37.11	35.86	**31.64**		29.83	33.10	36.95	35.55	33.86
Minia Azotein (M.A.)	28.69	29.95	40.32	38.48	**34.36**		31.88	36.11	40.88	39.11	37.00
Ph. + M.A.	31.16	33.28	42.74	40.11	**36.82**		34.15	37.55	45.91	42.16	39.94
(Ph. + M.A.) + 50 % NPK	32.91	35.82	45.06	41.72	**38.88**		35.88	39.75	48.95	44.81	42.35
(Ph. + M.A.) + 75 % NPK	36.76	41.04	51.91	50.19	**44.98**		39.55	44.41	56.63	53.89	**48.62**
100 % NPK	34.93	37.37	50.18	46.26	**42.18**		36.95	43.11	52.51	48.91	**45.37**
Mean (A)	**30.77**	**33.10**	**42.95**	**40.99**	**36.95**		**33.76**	**37.69**	**45.21**	**42.50**	**39.79**
L.S.D. at 5 %	**A :0.48**		**B :0.48**	**AB :0.97**			**A :0.51**		**B :0.55**	**AB :1.10**	

Table(2):Effect of compost, bio- and/or mineral NPK fertilization treatments on number of branches/plant of *Origanum majoranum* L., in the first, second and third cuts during the first and second seasons of 2010/2011 and 2011/2012

Bio- and / or mineral NPK fertilization treatments (B)	Compost levels (ton/feddan) (A)										
	First season (2010 / 2011)						Second season (2011 / 2012)				
	0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)		0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)
1st Cut											
Control	9.62	13.87	18.87	17.37	**14.93**		14.48	20.12	31.43	25.98	**23.00**
Phosphorein (Ph.)	12.73	19.64	26.51	23.63	**20.63**		18.03	24.27	34.51	29.33	**26.54**
Minia Azotein (M.A.)	16.47	25.37	32.96	31.27	**26.52**		22.66	31.86	43.11	36.99	**33.65**
Ph. + M.A.	21.52	32.02	40.73	37.32	**32.90**		29.15	37.77	50.76	44.23	**40.48**
(Ph. + M.A.) + 50 % NPK	25.35	34.52	44.72	40.53	**36.28**		34.11	40.29	56.76	51.69	**45.71**
(Ph. + M.A.) + 75 % NPK	31.55	40.63	58.33	53.38	**45.98**		43.31	53.21	69.82	64.83	**57.79**
100 % NPK	27.25	37.82	51.96	46.53	**40.89**		39.84	46.13	64.24	59.62	**52.46**
Mean (A)	**20.64**	**29.12**	**39.15**	**35.72**	**31.16**		**28.80**	**36.24**	**50.09**	**44.67**	**39.95**
L.S.D. at 5 %	**A :0.32**		**B :0.49**	**AB :0.98**			**A :0.35**		**B :0.53**	**AB :1.06**	
2nd Cut											
Control	15.86	20.57	23.55	22.13	**20.53**		17.47	22.89	33.06	28.53	**25.49**
Phosphorein (Ph.)	20.95	27.62	37.89	31.23	**29.42**		20.94	28.02	38.99	35.23	**30.80**
Minia Azotein (M.A.)	25.37	33.93	41.97	35.07	**34.08**		26.43	33.59	44.07	41.19	**36.32**
Ph. + M.A.	28.68	36.74	47.70	40.90	**38.51**		34.65	40.49	55.38	50.22	**45.18**
(Ph. + M.A.) + 50 % NPK	30.80	40.94	50.80	44.26	**41.70**		38.96	45.17	61.93	59.29	**51.34**
(Ph. + M.A.) + 75 % NPK	36.64	46.78	62.92	59.72	**51.52**		47.96	57.69	75.75	72.03	**63.36**
100 % NPK	33.66	42.44	57.03	55.01	**47.03**		43.45	52.18	71.70	65.99	**58.33**
Mean (A)	**27.42**	**35.57**	**45.98**	**41.19**	**37.54**		**32.84**	**40.00**	**54.41**	**50.36**	**44.40**
L.S.D. at 5 %	**A :0.49**		**B :0.44**	**AB :0.88**			**A :0.43**		**B :0.67**	**AB :1.35**	
3rd Cut											
Control	25.12	32.87	36.98	34.56	**32.38**		26.31	33.95	38.91	36.18	**33.84**
Phosphorein (Ph.)	32.49	43.21	59.08	48.74	**45.88**		33.85	44.75	61.11	50.66	**47.59**
Minia Azotein (M.A.)	39.55	52.46	65.13	54.66	**52.95**		41.33	53.67	67.41	56.55	**54.74**
Ph. + M.A.	44.74	58.03	74.49	63.79	**60.26**		46.18	60.01	76.61	65.65	**62.11**
(Ph. + M.A.) + 50 % NPK	48.71	63.70	79.18	69.03	**65.16**		49.88	65.61	81.11	70.95	**66.89**
(Ph. + M.A.) + 75 % NPK	57.23	72.91	97.08	93.10	**80.08**		59.31	74.80	99.18	94.18	**81.87**
100 % NPK	52.51	66.34	89.21	85.94	**73.50**		54.41	68.45	91.11	87.96	**75.48**
Mean (A)	**42.91**	**55.65**	**71.59**	**64.26**	**58.60**		**44.47**	**57.32**	**73.63**	**66.02**	**60.36**
L.S.D. at 5 %	**A :0.67**		**B :0.62**	**AB :1.25**			**A :0.69**		**B :0.61**	**AB :1.22**	

Table(3):Effect of compost, bio- and/or mineral NPK fertilization treatments on herb fresh weight (g/plant) of *Origanum majoranum* L., in the first, second and third cuts during the first and second seasons of 2010/2011 and 2011/2012.

Bio- and / or mineral NPK fertilization treatments (B)	Compost levels (ton/feddan) (A)										
	First season (2010 / 2011)						Second season (2011 / 2012)				
	0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)		0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)
1st Cut											
Control	24.265	31.216	42.233	38.312	34.007		36.424	46.794	57.749	52.136	48.276
Phosphorein (Ph.)	29.627	37.933	49.385	47.104	41.012		41.811	54.756	68.902	64.942	57.603
Minia Azotein (M.A.)	34.753	44.628	58.664	49.273	46.830		52.256	60.786	72.198	67.188	63.107
Ph. + M.A.	43.812	50.392	61.997	57.330	53.383		61.977	69.538	81.479	77.297	72.573
(Ph. + M.A.) + 50 % NPK	48.220	55.338	68.163	60.546	58.067		66.256	73.371	85.369	81.145	76.535
(Ph. + M.A.) + 75 % NPK	57.128	65.648	79.357	73.930	69.016		76.269	84.719	94.371	90.923	86.571
100 % NPK	52.302	60.692	70.802	64.158	61.989		70.904	79.127	88.965	86.929	81.481
Mean (A)	**41.444**	**49.407**	**61.514**	**55.808**	52.043		**57.985**	**67.013**	**78.433**	**74.366**	69.449
L.S.D. at 5 %	**A :0.683**		**B :0.952**	AB :1.904			**A :1.161**		**B :0.865**	AB :1.731	
2nd Cut											
Control	29.111	42.461	57.711	53.481	43.691		30.347	43.561	58.818	54.589	46.829
Phosphorein (Ph.)	41.711	52.151	71.000	68.000	58.216		42.833	53.050	72.005	68.207	59.024
Minia Azotein (M.A.)	50.461	65.000	80.001	74.686	67.537		51.562	66.025	81.044	76.021	68.663
Ph. + M.A.	61.111	71.666	95.823	93.111	80.428		62.534	73.659	97.724	95.507	82.356
(Ph. + M.A.) + 50 % NPK	66.777	82.467	101.111	89.811	85.042		68.676	84.566	102.325	91.741	86.827
(Ph. + M.A.) + 75 % NPK	82.611	104.757	123.691	115.000	106.515		84.508	106.647	125.580	117.165	108.475
100 % NPK	76.531	90.991	113.755	106.191	96.867		78.430	92.892	115.646	108.294	98.815
Mean (A)	**58.330**	**72.785**	**91.870**	**85.754**	77.185		**59.841**	**74.343**	**93.306**	**87.361**	78.713
L.S.D. at 5 %	**A :1.345**		**B :1.421**	AB :2.842			**A :1.433**		**B :1.560**	AB :3.119	
3rd Cut											
Control	48.588	62.911	74.156	70.629	64.071		48.921	36.684	65.787	60.331	52.931
Phosphorein (Ph.)	56.132	68.945	85.333	80.869	72.820		62.179	76.853	92.905	89.217	80.289
Minia Azotein (M.A.)	70.505	81.802	92.722	94.360	84.847		69.570	86.864	110.865	106.703	93.501
Ph. + M.A.	81.362	91.960	104.530	100.170	94.505		76.880	100.390	122.793	116.048	104.028
(Ph. + M.A.) + 50 % NPK	83.167	96.784	109.882	104.219	98.513		82.057	103.892	129.280	113.318	107.137
(Ph. + M.A.) + 75 % NPK	94.378	109.752	129.455	126.464	**115.012**		112.366	130.512	144.427	141.195	132.125
100 % NPK	90.345	103.235	121.832	116.119	**107.883**		100.811	122.118	138.585	133.919	123.858
Mean (A)	**74.925**	**87.913**	**102.558**	**98.976**	**91.093**		**78.969**	**93.902**	**114.949**	**108.676**	99.124
L.S.D. at 5 %	A :1.223		B :1.465	AB :2.929			A :1.395		B :1.896	AB :3.793	

Table(4): Effect of compost, bio- and/ or mineral NPK fertilization treatments on herb dry weight (g/plant) of *Origanum majoranum* L., in the first, second and third cuts during the first and second seasons of 2010/2011 and 2011/2012

Bio- and / or mineral NPK fertilization treatments (B)	Compost levels (ton/feddan) (A)									
	First season (2010 / 2011)					Second season (2011 / 2012)				
	0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)	0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)
1st Cut										
Control	9.835	12.537	16.961	15.386	13.680	14.628	18.793	23.193	20.938	19.388
Phosphorein (Ph.)	11.899	15.234	19.833	18.917	16.471	16.792	21.990	27.671	26.081	23.134
Minia Azotein (M.A.)	13.957	17.923	23.560	19.788	18.807	20.986	24.412	28.995	26.983	25.344
Ph. + M.A.	17.595	20.238	24.898	23.024	21.439	24.890	27.927	32.722	31.043	29.146
(Ph. + M.A.) + 50 % NPK	19.365	22.224	27.375	24.316	23.320	26.609	29.466	34.285	32.588	30.737
(Ph. + M.A.) + 75 % NPK	22.871	26.365	31.870	29.691	27.699	30.630	34.024	37.900	36.515	34.767
100 % NPK	21.005	24.375	28.434	25.767	24.895	28.476	31.778	35.729	34.911	32.723
Mean (A)	16.647	19.842	24.705	22.413	20.90	23.287	26.913	31.499	29.866	27.89
L.S.D. at 5 %	A :0.281		B :0.384	AB :0.769		A :0.374		B :0.364	AB 0.727	
2nd Cut										
Control	11.153	15.711	22.411	20.813	17.522	12.187	16.828	23.622	21.923	18.640
Phosphorein (Ph.)	16.101	20.104	27.815	26.111	22.533	17.202	21.305	28.917	27.392	23.704
Minia Azotein (M.A.)	19.611	25.411	31.135	29.121	26.320	20.708	26.516	32.548	30.531	27.576
Ph. + M.A.	23.555	28.131	38.111	35.222	31.255	25.114	29.582	39.247	36.844	32.697
(Ph. + M.A.) + 50 % NPK	26.211	32.222	40.005	37.111	33.887	27.581	33.962	41.094	38.357	35.249
(Ph. + M.A.) + 75 % NPK	32.815	41.721	49.111	45.725	42.218	33.939	42.830	50.434	47.055	43.565
100 % NPK	30.123	35.815	45.311	42.181	38.358	31.498	37.306	46.444	43.492	39.685
Mean (A)	22.796	28.445	36.271	33.683	30.31	24.033	29.761	37.472	35.085	31.59
L.S.D. at 5 %	A :0.481		B :0.621	AB :1.242		A :0.383		B :0.655	AB :1.310	
3rd Cut										
Control	19.513	25.265	29.781	28.365	25.731	19.647	14.733	26.420	24.229	21.257
Phosphorein (Ph.)	22.543	27.689	34.270	32.478	29.245	24.972	30.865	37.311	35.830	32.245
Minia Azotein (M.A.)	28.315	32.852	37.238	37.895	34.075	27.940	34.885	44.524	42.853	37.551
Ph. + M.A.	32.676	36.932	42.594	40.229	38.108	30.876	40.317	49.314	46.606	41.778
(Ph. + M.A.) + 50 % NPK	33.401	38.869	44.129	41.855	39.564	32.954	41.724	51.920	45.509	43.027
(Ph. + M.A.) + 75 % NPK	37.903	44.077	51.990	50.789	46.190	45.124	52.414	58.003	56.705	53.062
100 % NPK	36.283	41.460	48.929	46.634	43.327	40.486	49.043	55.657	53.783	49.742
Mean (A)	30.091	35.306	41.276	39.749	36.61	31.714	37.712	46.164	43.645	39.81
L.S.D. at 5 %	A :0.465		B :0.595	AB :1.191		A :0.560		B:0.762	AB :1.523	

Table(5):Effect of compost, bio- and/or mineral NPK fertilization treatments on total fresh and dry weight/plant/season (g/plant) of *Origanum majoranum* L., during the first and second seasons of2010/2011 and 2011/2012

Bio- and / or mineral NPK fertilization treatments (B)	Compost levels (ton/feddan) (A)										
	First season (2010 / 2011)						Second season (2011 / 2012)				
	0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)		0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)
Total fresh weight of herb/plant/season (g/plant)											
Control	102.0	136.6	174.1	162.4	143.8		115.7	127.0	182.4	167.1	148.0
Phosphorein (Ph.)	127.5	159.0	205.7	196.0	172.0		146.8	184.7	233.8	222.4	196.9
Minia Azotein (M.A.)	155.7	191.4	231.4	218.3	199.2		173.4	213.7	264.1	249.9	225.3
Ph. + M.A.	186.3	214.0	262.3	250.6	228.3		201.4	243.6	302.0	288.9	259.0
(Ph. + M.A.) + 50 % NPK	198.2	234.6	279.2	254.6	241.6		217.0	261.8	317.0	286.2	270.5
(Ph. + M.A.) + 75 % NPK	234.1	280.2	332.5	315.4	290.5		273.1	321.9	364.4	349.3	327.2
100 % NPK	219.2	254.9	306.4	286.5	266.7		250.1	294.1	343.2	329.1	304.2
Mean (A)	174.7	210.1	255.9	240.5			196.8	235.3	286.7	270.4	
L.S.D. at 5 %	A : 8.8		B :11.6		AB :23.2		A: 6.6		B: 8.7		AB: 17.4
Total dry weight of herb/plant/season (g/plant)											
Control	40.5	53.5	69.2	64.6	56.9		46.5	50.4	73.2	67.1	59.3
Phosphorein (Ph.)	50.5	63.0	81.9	77.5	68.2		59.0	74.2	93.9	89.3	79.1
Minia Azotein (M.A.)	61.9	76.2	91.9	86.8	79.2		69.6	85.8	106.1	100.4	90.5
Ph. + M.A.	73.8	85.3	105.6	98.5	90.8		80.9	97.8	121.3	114.5	103.6
(Ph. + M.A.) + 50 % NPK	79.0	93.3	111.5	103.3	96.8		87.1	105.2	127.3	116.5	109.0
(Ph. + M.A.) + 75 % NPK	93.6	112.2	133.0	125.7	116.1		109.7	129.3	146.3	140.3	131.4
100 % NPK	87.4	101.6	122.7	114.6	106.6		100.5	118.1	137.8	132.2	122.2
Mean (A)	69.5	83.6	102.3	95.8			79.0	94.4	115.1	108.6	
L.S.D. at 5 %	A :2.0		B :4.4		AB :8.8		A :1.5		B :3.3		AB :6.6

Table (6): Effect of compost, bio- and/or mineral NPK fertilization treatments on essential oil % of *Origanum majoranum* L., in the first, second and third cuts during the first and second seasons of 2010/2011 and 2011/2012

Bio- and / or mineral NPK fertilization treatments (B)	Compost levels (ton/feddan) (A)										
	First season (2010 / 2011)						Second season (2011 / 2012)				
	0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)		0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)
1st Cut											
Control	0.73	0.75	0.80	0.78	0.77		0.74	0.77	0.84	0.81	0.79
Phosphorein (Ph.)	0.78	0.81	0.87	0.84	0.83		0.79	0.83	0.92	0.87	0.85
Minia Azotein (M.A.)	0.81	0.83	0.89	0.85	0.85		0.83	0.86	0.93	0.89	0.88
Ph. + M.A.	0.83	0.86	0.99	0.93	0.90		0.85	0.88	1.01	0.95	0.92
(Ph. + M.A.) + 50 % NPK	0.85	0.94	1.18	1.05	1.01		0.87	0.96	1.22	1.06	1.03
(Ph. + M.A.) + 75 % NPK	0.99	1.23	1.57	1.45	1.31		1.02	1.26	1.63	1.49	1.35
100 % NPK	0.94	0.99	1.33	1.21	1.12		0.97	1.05	1.39	1.25	1.17
Mean (A)	0.85	0.92	1.09	1.02	0.97		0.87	0.95	1.13	1.05	1.00
L.S.D. at 5 %	A :0.04		B :0.05	AB 0.10			A :0.05		B :0.05	AB :0.10	
2nd Cut											
Control	0.74	0.77	0.83	0.79	0.78		0.75	0.79	0.87	0.82	0.81
Phosphorein (Ph.)	0.82	0.86	0.90	0.88	0.87		0.83	0.86	0.97	0.90	0.89
Minia Azotein (M.A.)	0.83	0.86	0.97	0.90	0.89		0.86	0.89	1.00	0.93	0.92
Ph. + M.A.	0.86	0.91	1.05	0.98	0.95		0.87	0.93	1.09	1.01	0.98
(Ph. + M.A.) + 50 % NPK	0.88	0.98	1.23	1.11	1.05		0.89	1.00	1.26	1.14	1.07
(Ph. + M.A.) + 75 % NPK	1.18	1.31	1.69	1.57	1.44		1.22	1.35	1.74	1.63	1.49
100 % NPK	0.99	1.23	1.58	1.42	1.31		1.03	1.28	1.68	1.49	1.37
Mean (A)	0.90	0.99	1.18	1.09	1.04		0.92	1.01	1.23	1.13	1.07
L.S.D. at 5 %	A :0.06		B :0.06	AB :0.11			A :0.07		B :0.05	AB :0.10	
3rd Cut											
Control	0.70	0.73	0.79	0.76	0.75		0.71	0.75	0.83	0.79	0.77
Phosphorein (Ph.)	0.78	0.80	0.88	0.84	0.83		0.79	0.82	0.92	0.87	0.85
Minia Azotein (M.A.)	0.79	0.81	0.91	0.86	0.84		0.81	0.84	0.96	0.90	0.88
Ph. + M.A.	0.80	0.83	0.95	0.89	0.87		0.82	0.86	0.99	0.93	0.90
(Ph. + M.A.) + 50 % NPK	0.82	0.90	1.13	1.01	0.97		0.84	0.91	1.16	1.03	0.99
(Ph. + M.A.) + 75 % NPK	0.97	1.19	1.51	1.33	1.25		0.99	1.22	1.57	1.36	1.29
100 % NPK	0.91	0.96	1.21	1.11	1.05		0.94	1.01	1.27	1.16	1.10
Mean (A)	0.82	0.89	1.05	0.97	0.93		0.84	0.92	1.10	1.01	0.97
L.S.D. at 5 %	A :0.04		B:0.06	AB :0.12			A :0.06		B :0.07	AB :0.14	

Table(7):Effect of compost, bio- and/or mineral NPK fertilization treatments on oil yield/plant/cut (ml) of *Origanum majoranum* L., in the first, second and third cuts during the first and second seasons of 2010/2011 and 2011/2012.

Bio- and / or mineral NPK fertilization treatments (B)	Compost levels (ton/feddan) (A)										
	First season (2010 / 2011)						Second season (2011 / 2012)				
	0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)		0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)
1st Cut											
Control	0.07	0.09	0.14	0.12	0.11		0.11	0.14	0.19	0.17	0.15
Phosphorein (Ph.)	0.09	0.12	0.17	0.16	0.14		0.13	0.18	0.25	0.23	0.20
Minia Azotein (M.A.)	0.11	0.15	0.21	0.17	0.16		0.17	0.21	0.27	0.24	0.22
Ph. + M.A.	0.15	0.17	0.25	0.21	0.19		0.21	0.25	0.33	0.29	0.27
(Ph. + M.A.) + 50 % NPK	0.16	0.21	0.32	0.26	0.24		0.23	0.28	0.42	0.35	0.32
(Ph. + M.A.) + 75 % NPK	0.23	0.32	0.50	0.43	0.36		0.31	0.43	0.62	0.54	0.47
100 % NPK	0.20	0.24	0.38	0.31	0.28		0.28	0.33	0.50	0.44	0.38
Mean (A)	0.14	0.18	0.27	0.23	0.21		0.20	0.26	0.36	0.31	0.28
L.S.D. at 5 %	A :0.02		B :0.03	AB :0.06			A :0.03		B :0.04	AB :0.80	
2nd Cut											
Control	0.08	0.12	0.19	0.16	0.14		0.09	0.13	0.21	0.18	0.15
Phosphorein (Ph.)	0.13	0.17	0.25	0.23	0.20		0.14	0.18	0.28	0.25	0.21
Minia Azotein (M.A.)	0.16	0.22	0.30	0.26	0.23		0.18	0.24	0.33	0.28	0.25
Ph. + M.A.	0.20	0.26	0.40	0.35	0.30		0.22	0.28	0.43	0.37	0.32
(Ph. + M.A.) + 50 % NPK	0.23	0.32	0.49	0.41	0.36		0.25	0.34	0.52	0.44	0.38
(Ph. + M.A.) + 75 % NPK	0.39	0.55	0.83	0.72	0.61		0.41	0.58	0.88	0.77	0.65
100 % NPK	0.30	0.44	0.72	0.60	0.50		0.32	0.48	0.78	0.65	0.54
Mean (A)	0.21	0.28	0.43	0.37	0.32		0.22	0.30	0.46	0.40	0.34
L.S.D. at 5 %	A :0.03		B :0.05	AB :0.10			A :0.04		B :0.04	AB :0.08	
3rd Cut											
Control	0.14	0.18	0.24	0.22	0.19		0.14	0.11	0.22	0.19	0.16
Phosphorein (Ph.)	0.18	0.22	0.30	0.27	0.24		0.20	0.25	0.34	0.31	0.27
Minia Azotein (M.A.)	0.22	0.27	0.34	0.33	0.29		0.23	0.29	0.43	0.39	0.33
Ph. + M.A.	0.26	0.31	0.40	0.36	0.33		0.25	0.35	0.49	0.43	0.38
(Ph. + M.A.) + 50 % NPK	0.27	0.35	0.50	0.42	0.38		0.28	0.38	0.60	0.47	0.43
(Ph. + M.A.) + 75 % NPK	0.37	0.52	0.79	0.68	0.58		0.45	0.64	0.91	0.77	0.68
100 % NPK	0.33	0.40	0.59	0.52	0.45		0.38	0.50	0.71	0.62	0.55
Mean (A)	0.25	0.31	0.43	0.39	0.34		0.27	0.35	0.51	0.44	0.39
L.S.D. at 5 %	A :0.03		B :0.05	AB :0.10			A :0.02		B :0.06	AB :0.012	

Table(8):Effect of compost, bio- and/or mineral NPK fertilization treatments on oil yield/plant/season (ml) and oil yield/feddan/season (liter) of *Origanum majoranum* L., during the first and second seasons of 2010/2011 and 2011/2012

Bio- and / or mineral NPK fertilization treatments (B)	Compost levels (ton/feddan) (A)										
	First season (2010 / 2011)						Second season (2011 / 2012)				
	0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)		0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)
Oil yield/plant/season (ml/plant)											
Control	0.29	0.40	0.56	0.50	0.44		0.34	0.39	0.62	0.54	0.47
Phosphorein (Ph.)	0.40	0.52	0.72	0.66	0.58		0.47	0.62	0.88	0.79	0.68
Minia Azotein (M.A.)	0.50	0.63	0.85	0.76	0.68		0.58	0.74	1.02	0.91	0.81
Ph. + M.A.	0.61	0.74	1.05	0.92	0.82		0.68	0.87	1.25	1.10	0.96
(Ph. + M.A.) + 50 % NPK	0.67	0.87	1.31	1.09	0.98		0.75	1.00	1.54	1.25	1.12
(Ph. + M.A.) + 75 % NPK	0.98	1.40	2.12	1.82	1.55		1.17	1.65	2.41	2.08	1.80
100 % NPK	0.83	1.08	1.69	1.43	1.24		0.98	1.31	1.98	1.71	1.47
Mean (A)	0.59	0.78	1.13	0.98			0.69	0.90	1.32	1.15	
L.S.D. at 5 %	A :0.14		B :0.14	AB :0.28			A :0.16		B :0.16	AB :0.32	
Oil yield/feddan/season (liter/feddan)											
Control	4.65	6.39	8.91	8.00	6.96		5.43	6.21	9.91	8.65	7.49
Phosphorein (Ph.)	6.41	8.28	11.59	10.58	9.21		7.56	9.90	14.05	12.56	10.91
Minia Azotein (M.A.)	7.99	10.13	13.61	12.10	10.89		9.26	11.82	16.36	14.56	12.91
Ph. + M.A.	9.76	11.79	16.82	14.68	13.14		10.93	13.88	19.94	17.61	15.43
(Ph. + M.A.) + 50 % NPK	10.71	13.99	21.02	17.44	15.60		12.06	16.03	24.61	20.02	17.92
(Ph. + M.A.) + 75 % NPK	15.70	22.33	33.85	29.18	24.77		18.77	26.34	38.50	33.32	28.85
100 % NPK	13.21	17.28	26.98	22.85	19.78		15.70	20.90	31.74	27.33	23.58
Mean (A)	9.49	12.45	18.09	15.70			11.04	14.45	21.19	18.41	
L.S.D. at 5 %	A :2.11		B :2.24	AB :4.48			A :2.18		B :2.60	AB :5.20	

Table(9):Effect of compost, bio- and/or mineral NPK fertilization treatments on total chlorophylls (mg/g- fresh weight) of *Origanum majoranum* L., during the first and second seasons of 2010/2011 and 2011/2012

Bio- and / or mineral NPK fertilization treatments (B)	Compost levels (ton/feddan) (A)										
	First season (2010 / 2011)						Second season (2011 / 2012)				
	0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)		0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)
Total chlorophylls (mg/g- fresh weight)											
Control	3.61	3.65	3.703	3.69	3.663		3.658	3.708	3.762	3.74	3.722
Phosphorein (Ph.)	3.643	3.684	3.738	3.723	3.697		3.694	3.759	3.805	3.794	3.763
Minia Azotein (M.A.)	3.678	3.719	3.773	3.756	3.732		3.711	3.776	3.857	3.83	3.794
Ph. + M.A.	3.714	3.755	3.811	3.796	3.77		3.747	3.804	3.844	3.84	3.809
(Ph. + M.A.) + 50 % NPK	3.747	3.789	3.841	3.827	3.802		3.791	3.857	3.911	3.903	3.866
(Ph. + M.A.) + 75 % NPK	3.787	3.831	3.891	3.877	3.847		3.831	3.89	3.961	3.954	3.909
100 % NPK	3.778	3.828	3.884	3.873	3.841		3.823	3.885	3.956	3.951	3.904
Mean (A)	3.708	3.751	3.806	3.792			3.751	3.811	3.871	3.862	
L.S.D. at 5 %	A:0.016		B:0.007	AB:0.014			A:0.012		B:0.004	AB:0.008	

Table(10):Effect of compost, bio- and/or mineral NPK fertilization treatments on N, P and K % of *Origanum majoranum* L., during the first and second seasons of 2010/2011 and 2011/2012

Bio- and / or mineral NPK fertilization treatments (B)	Compost levels (ton/feddan) (A)										
	First season (2010 / 2011)						Second season (2011 / 2012)				
	0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)		0 (ton/fed)	7.5 (ton/fed)	10 (ton/fed)	12.5 (ton/fed)	Mean (B)
N %											
Control	3.21	3.54	4.32	3.94	3.75		3.34	3.63	4.47	4.01	3.86
Phosphorein (Ph.)	3.25	3.55	4.42	3.97	3.80		3.38	3.72	4.53	4.12	3.94
Minia Azotein (M.A.)	3.32	3.63	4.54	4.03	3.88		3.42	3.75	4.64	4.13	3.98
Ph. + M.A.	3.37	3.72	4.67	4.16	3.98		3.46	3.84	4.74	4.23	4.07
(Ph. + M.A.) + 50 % NPK	3.39	3.75	4.74	4.22	4.02		3.51	3.88	4.81	4.29	4.12
(Ph. + M.A.) + 75 % NPK	3.43	3.86	4.82	4.32	4.11		3.57	3.99	4.93	4.41	4.22
100 % NPK	3.43	3.82	4.75	4.24	4.06		3.53	3.95	4.88	4.32	4.17
Mean (A)	3.34	3.69	4.61	4.13	3.94		3.46	3.82	4.71	4.22	4.05
L.S.D. at 5 %	A :0.02		B :0.03		AB :0.05		A :0.01		B :0.03		AB :0.06
P %											
Control	0.407	0.466	0.566	0.508	0.487		0.424	0.488	0.589	0.524	0.506
Phosphorein (Ph.)	0.416	0.473	0.572	0.518	0.495		0.435	0.496	0.596	0.534	0.516
Minia Azotein (M.A.)	0.427	0.482	0.584	0.528	0.505		0.450	0.507	0.608	0.547	0.528
Ph. + M.A.	0.439	0.485	0.586	0.539	0.512		0.462	0.512	0.615	0.558	0.537
(Ph. + M.A.) + 50 % NPK	0.446	0.494	0.594	0.552	0.521		0.464	0.514	0.622	0.563	0.541
(Ph. + M.A.) + 75 % NPK	0.462	0.503	0.610	0.558	0.533		0.479	0.524	0.632	0.575	0.553
100 % NPK	0.455	0.497	0.600	0.553	0.526		0.477	0.521	0.627	0.566	0.548
Mean (A)	0.436	0.486	0.587	0.537			0.456	0.509	0.613	0.552	
L.S.D. at 5 %	A :0.004		B :0.003		AB 0.006		A :0.004		B :0.003		AB 0.007
K %											
Control	2.19	2.68	3.39	3.09	2.84		2.29	2.83	3.59	3.22	2.98
Phosphorein (Ph.)	2.27	2.73	3.50	3.12	2.91		2.43	2.84	3.67	3.25	3.05
Minia Azotein (M.A.)	2.41	2.83	3.59	3.21	3.01		2.55	2.93	3.73	3.31	3.13
Ph. + M.A.	2.47	2.92	3.69	3.32	3.10		2.57	2.98	3.89	3.36	3.20
(Ph. + M.A.) + 50 % NPK	2.54	2.95	3.70	3.30	3.12		2.62	3.07	3.89	3.39	3.24
(Ph. + M.A.) + 75 % NPK	2.65	3.02	3.86	3.35	3.22		2.74	3.19	4.06	3.47	3.36
100 % NPK	2.57	3.00	3.83	3.34	3.19		2.71	3.10	3.96	3.50	3.32
Mean (A)	2.44	2.88	3.65	3.25			2.56	2.99	3.83	3.36	
L.S.D. at 5 %	A :0.02		B :0.04		AB :N.S.		A :0.02		B :0.03		AB :0.07