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RESPONSE OF MARJORAM PLANT (*MAJORANA HORTENSIS, L.*) GROWTH, OIL CONTENT AND OIL COMPOSITION TO ORGANIC FERTILIZATION TREATMENTS.

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ABSTRACT: This study was carried out during the two successive seasons of 2002/2003 and 2003/2004 to study the effect of organic manure sources,and rates on the growth, herb yield and active composition of marjoram (*Majorana hortensis*, L.) plants.

Organic manure was added through the soil preparation before planting at the different rates (10, 15 and 20 m^3/fed. cattle manure , 8,12 and 16 m^3/fed. for sheep manure and 5, 7.5 and 10 m^3/fed. for poultry manure. Plants in the two seasons were harvested at three cutting times.

The application of poultry manure at 10 m^3 */fed* proved to be the superior treatments, which reflected in the greatest influence upon all the studied characters, i.e., fresh and dry herb yields, highest volatile oil percentage and oil yield/ plant of marjoram plant, followed by sheep manure at 16 m^3/fed.

Organic fertilization altered the oil compositions strictly due to the level of applications; however, the highest dose of fertilization resulted in rising the major contents of the oil components.

INTRODUCTION

Marjoram (*Majorana hortensis, L.*), is one of the most commercially perennial herbaceous medicinal plants belongs to family (Lamiaceae). Its popular flavoring was used to flavor meat dishes and in making salamis and other sorts of sausages. The active principles in the drug oil help digestion, relieves flatulence, act as an intestinal antispasmodic and stimulate the secretion of bile. The plant contains up to 2 percent of essential oil. (Frantisek and Voclav, 1975)

The major components of Marjoram oil is α Pinene, β- Pinene, Limonene, 1.8 cineole, Linalool, Terpinene-4-ol, α Terpinene, Linalyl/acitate and Eugenol as main components (Refaat,1988).

Organic manure is a mixture of organic matter composed mainly of plant remains mixed with animal excretes as farmyard manure (FYM) or

animal excrete alone as poultry manure (PM), cattle manure (CM) and sheep manure (SM). Organic manures added to the soil to improve its physical and chemical properties, and its fertility.

It is also a good source of useful organic materials and nutrient elements especially nitrogen (Abou El-Fadl *et al.*, 1990). In addition, organic fertilization is very important method to provide the plants with their nutritional requirements without having an undesirable impact on the environment. (El-Sayed *et al.*, 2002).

El-Ghadban (1998) found that poultry manure (PM) at 30 m^3/fed. or cattle manure (CM) at 60 m^3/fed., significantly increased plant height and leaf area/plant on marjoram L., Moreover, he also showed that (PM) at 20 m^3/fed. and (CM) at 40 m^3/fed. were the best treatment to give higher ratio of leaves fresh weight and stem fresh weight than the control. He also showed that poultry manure (PM) at 30 m^3/fed. significantly increased the herb fresh and dry yield, followed by cattle manure (CM) at 60 m^3/fed.

This promoter effect of organic fertilization in inducing the growth rate was also determined by Eid and El-Ghawwas (2002) on marjoram plants as well as Kandeel and Abou-Taleb (2002) on sweet basil plant

Aflatuni, *et al.*, (1993) showed that *Marjoram, Caraway* and *Basil* plants that transplanted to soil which had been treated with organic fertilization or composted manure had the highest percentage of the essential oil among all the other treatments.

Similar findings were also reported by (Scheffer *et al.*, 1993) on *Achilla millefolium* plants, Ram and Kumar (1997), on *Mentha arvensis*, Hammam (1996) on anise (*Pimpinella anisum L.*), .(El-Ghadban *et. al.*, 2002) in marjoram, Aly (2003) on fennel and (Naga, 2004) on *Foeniculum vulgare* and *Carum carvi* L plant s, whereas the essential oil % , oil yield/ plant and essential oil components were greatly improved with organic manures fertilization.

Accordingly, this investigation was performed to study the effects of the application of organic manures (cattle, sheep or poultry) on the vegetative growth, essential oil yield and chemical composition of marjoram (*Majorana hortensis,* L.) plant.

MATERIALS AND METHODS

This study was carried out at the Experimental Farm of Department

of Medicinal and Aromatic Plants, Gemmeiza Agricultural Research Station, Gharbieah, Governorate during the two successive seasons of 2002/2003 and 2003/2004. This experiment was conducted to study the effect of organic manure sources, and rates on the growth, herb yield and active constituents of marjoram (*Majorana hortensis*, L.) plants.

Two months marjoram seedlings (10 – 12 cm height with 8-10 leaves taken from the experimental station of the Horticulture Research Institute, Knater El Khairia Farm) were transplanted on first of December in the two seasons.

The experimental field was carefully prepared and divided into plots of nine square meters (3 x 3 m) with five rows for each 60 cm in between. Seedlings were planted at planting distance of 25 cm. The chemical and physical analyses for the soil were performed according to Jackson (1970) before treatments and tabulated in Table (1).

Table (1): Mechanical and chemical analysis of the experimental soil during the two seasons of 2002 / 2003 and 2003/2004

Physical properties	2002/2003	2003/2004
Clay %	50.60	50.13
Silt %	24. 73	24.88
Sand %	23.50	23.10
Texture class	Clay	Clay
Chemical properties		
PH (1 : 2.5 suspension)	7.8	7.9
Electric conductivity (M. Mohs/cm)	1.2	1.3
Organic matter %	1.7	1.6
Available nitrogen (ppm)	8.9	9.4
Available P_2O_5%	0.031	0.027
Available K_2O %	0.51	0.53

Organic manure was added during the soil preparation before planting and their mechanical and chemical analysis are shown in Table (2).The application of organic matters were added as follows:

1-Cattle manure at the rate of 10, 15 and 20 m^3/fed
2-Sheep manure at the rate of 8, 12, 16 m^3/fed.
3-Poultry manure at the rate of 5, 7.5 and 10m^3/fed

Plants were cut at 10 cm above soil surface at three harvesting dates on 20 April, 5 Aug. and 10 Nov. for the first season and at 10 May , 20 Aug. and 20 Oct. for the second season (after 75 % of flowering). The following data were recorded:

Table (2): Chemical analysis of cattle manure, sheep manure and poultry manure during 2002/2003 and 2003/2004 seasons.

Elements ppm	Cattle manure		Sheep manure		*Poultry manure*	
	2002/2003	2003/2004	2002/2003	2003/2004	2002/2003	2003/2004
Macro elements (%)						
N %	0.46	0.65	0.50	0.95	2.87	3.60
P %	0.30	0.18	0.17	0.25	0.96	1.62
K %	1.10	0.95	1.12	3.66	1.28	1.17
Micro elements (ppm)						
Fe	5940	5340	2830	2410	1104	1266
Mn	464	395	404	330	210	266
Zn	38	48	50	85	209	221
Cu	48	52	46	49	41	43
Organic matter	22.16	28.46	19.04	31.85	71.81	85.14
Organic carbon	21.90	16.55	11.07	18.52	41.75	49.50

1- Vegetative growth included: Plant height (cm)- Number of branches / plant - Herb fresh and dry weight / plant (gm) .

2- Oil percentage: The volatile oil from air-dried herb of marjoram plant was extracted by water distillation, using 25g dried herb according to Balbaa *et al.* (1981).

3- Oil composition :The volatile oil obtained from the dry herb was analyzed using DsChrom 6200 Gas Chromatograph equipped with a flame ionization detector for separation of volatile oil constituents.

4-Oil yield per plant (ml) according to Mahfouz (2003).

The experiment was carried out using the completely randomized block design with three replicates the results were evaluated using the analysis of variance and the means were compared to the significant differences (L.S.D.) test at 5 % level of significance according to Snedecor and Cochran (1980)

RESULTS AND DISCUSSION

1-Effect of organic fertilizers on the growth of marjoram (*Majorana hortensis*, L.) plants:

Plant height of marjoram was significantly affected by the addition of organic fertilizer source and rates in the three cuts in both seasons .

It is clear from the data in Table (3) that fertilization of marjoram plants with poultry manure at (10 m^3 /fed.) resulted in the tallest plant height in the three cuts, followed by Sheep manure at 16 m^3/fed values in

both seasons.

Moreover, the shortest plants were obtained with cattle manure at $8m^3$/fed. in both seasons in the three cuts.

The increase in marjoram plant height due to application of poultry manure might be attributed to the effect of organic fertilizer which improves physical, chemical and biological properties of soil; that caused increasing soil organic matter, cation exchange capacity, water holding capacity and availability of mineral nutrients and this in turn increase plant height.

These treatments significantly stimulated the progress of branching formation (Table 4) showing the most effective treatments with $10m^3$/fed. poultry manure), while, the minimum values were obtained with cattle manure at $10m^3$/fed. in both seasons at all cutting stages.

On the other hand, It is of great interest to note that the effect of organic manure on fresh weights(Table5)show similar trends to those observed with its effect on plant morphological characters and can be explained according to the effect of organic fertilizer that previously mentioned.

Poultry manure at 10 m^3*/fed* gave the highest values of the fresh and dry weight of leaves (Table 6) of marjoram plants, while, sheep manure at the highest rate gave intermediate values in both seasons. On the other hand, the highest values were recorded with cattle manure at $10m^3$/fed both seasons at the different cuts.

It could be concluded that the increment in plant fresh and dry weight may be attributed to the increase in both plant height and number of branches/plant as already discussed.

Moreover, the increase in fresh weight could be explained by increasing metabolic activities of the plant under the effect of the organic fertilizers giving a significant values for fresh weight in the two seasons. The optimum stimulation effect which recorded for poultry litter may be due to its high content of essential macro-elements (NPK) comparing with the cattle, and sheep litter as shown in (Table 2).

The obtained results are in agreement with those of Eid and Ghawwas (2002) and El-Sayed *et al.*, (2002)on marjoram, Khandkar and Nigma, (1996) on *Zingiber officinalis* L., Yadav and Singh (1997) on

Table (3): Effect of some organic fertilizers on plant height (cm) of marjoram (*Majorana hortensis, L.*) plants during 2002/2003 and 2003/2004 seasons.

Organic sources	Fert. rates	2002/2003 season				2003/2004 season			
		First cut	Second cut.	third cut	Mean	First cut	Second cut.	third cut	Mean
Cattle manure	10 m^3 /Fed.	35.88	37.33	27.89	33.70	38.44	33.77	29.00	33.74
	15 m^3 /Fed.	39.77	40.11	30.66	36.85	41.44	36.11	30.66	36.07
	20 m^3 /Fed.	42.33	37.77	30.11	36.74	42.88	42.00	33.89	39.59
	Mean	39.33	38.40	29.55	35.76	40.92	37.29	31.18	36.46
Sheep manure	8 m^3 / Fed.	34.22	38.22	27.66	33.37	33.33	33.66	32.66	33.22
	12 m^3 /Fed.	37.11	41.77	36.55	38.48	36.77	35.88	31.77	34.81
	16 m^3 /Fed.	42.22	46.44	38.66	42.44	40.44	37.22	35.33	37.66
	Mean	37.85	42.14	34.29	38.09	36.85	35.59	33.25	35.23
Poultry manure	5 m^3 / Fed.	40.77	40.89	35.44	39.03	38.00	38.66	37.89	38.18
	7.5 m^3 / Fed.	43.33	42.67	37.11	41.04	49.88	36.22	39.44	41.85
	10 m^3 /Fed.	46.55	44.78	39.44	43.59	47.77	38.55	42.67	42.10
	Mean	43.55	42.78	37.33	41.22	45.22	37.81	40.00	41.01
L.S.D. (5%)		0.941	0.79	0.63	0.79	0.913	0.75	0.87	0.84

Table (4): Effect of some organic fertilizers on number of branches (*Majorana hortensis, L.*) plants during 2002/2003 and 2003/2004 seasons.

Organic sources	Fert. rates	2002/2003 season				2003/2004 season			
		First cut	Second cut.	third cut	Mean	First cut	Second cut.	third cut	Mean
Cattle manure	10 m^3 /Fed.	16.67	39.89	43.22	33.26	17.33	35.00	38.22	30.18
	15 m^3 /Fed.	23.55	46.22	49.55	33.77	22.11	42.44	46.55	37.03
	20 m^3 /Fed.	35.55	50.78	44.55	43.63	36.44	43.66	43.11	41.07
	Mean	25.27	45.63	45.77	38.89	25.29	40.37	42.63	36.10
Sheep manure	8 m^3 / Fed.	18.77	46.78	44.00	36.52	22.10	40.22	47.22	36.51
	12 m^3 /Fed.	25.78	48.44	46.33	40.18	29.00	48.11	42.89	40.00
	16 m^3 /Fed.	36.11	57.33	45.55	46.33	35.66	50.33	47.11	44.37
	Mean	26.89	50.85	45.29	41.01	28.92	46.22	45.74	40.29
Poultry manure	5 m^3 / Fed.	21.11	56.66	45.00	40.92	31.88	41.44	45.77	39.70
	7.5 m^3 / Fed.	30.11	50.11	52.33	44.18	36.78	48.44	48.89	44.70
	10 m^3 /Fed.	38.66	50.78	55.89	48.44	40.78	46.44	48.22	45.70
	Mean	29.96	52.52	51.07	45.52	36.48	45.44	47.63	43.18
L.S.D. (5%)		0.676	0.76	1.10	0.85	0.818	1.05	1.20	1.02

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Table (5): Effect of some organic fertilizers on the herb fresh weight/plant (gm) (*Majorana hortensis*, L.) plants during 2002/2003 and 2003/2004 seasons.

Organic sources	Fert. rates	2002/2003 season				2003/2004 season			
		First cut	Second cut.	third cut	Mean	First cut	Second cut.	third cut	Mean
Cattle manure	10 m^3 /Fed.	60.22	39.00	33.66	44.29	57.44	40.66	37.66	45.25
	15 m^3 /Fed.	72.88	45.22	39.55	52.55	75.88	42.55	41.55	53.33
	20 m^3 /Fed.	84.44	49.44	55.11	63.00	82.00	51.11	45.55	59.55
	Mean	72.51	44.55	42.77	53.28	71.77	44.77	41.59	52.71
Sheep manure	8 m^3 / Fed.	69.66	51.66	50.55	57.29	75.22	56.00	49.00	60.07
	12 m^3 /Fed.	72.88	51.22	53.11	59.07	77.88	59.00	47.22	61.37
	16 m^3 /Fed.	87.00	56.55	64.77	69.44	48.33	67.00	63.89	59.74
	Mean	76.51	53.14	56.14	61.93	79.14	60.67	53.37	64.39
Poultry manure	5 m^3 / Fed.	65.44	48.88	49.66	54.66	99.66	60.11	47.44	69.07
	7.5 m^3 / Fed.	98.88	50.00	52.00	66.96	97.00	67.22	59.00	74.41
	10 m^3 /Fed.	110.44	46.33	60.11	72.29	103.55	76.11	61.33	80.33
	Mean	91.59	48.40	53.92	64.64	100.07	67.81	55.92	74.60
L.S.D. (5%)		1.15	1.06	0.98	1.06	1.16	0.89	0.89	0.98

Table (6): Effect of some organic fertilizers on the herb dry weight/plant (gm)(*Majorana hortensis*. L.) plants during 2002/2003 and 2003/2004 seasons.

Organic sources	Fert. rates	2002/2003 season				2003/2004 season			
		Cutting time				Cutting time			
		First cut	Second cut.	third cut	Mean	First cut	Second cut.	third cut	Mean
Cattle manure	10 m^3 /Fed.	19.73	14.74	12.14	15.54	19.33	13.81	13.14	15.43
	15 m^3 /Fed.	24.29	17.81	12.96	18.35	25.26	15.63	17.96	19.62
	20 m^3 /Fed.	28.48	20.81	32.81	27.37	26.48	21.26	21.96	23.35
	Mean	24.18	17.79	19.30	20.42	23.69	16.90	17.69	19.43
Sheep manure	8 m^3 / Fed.	22.89	19.55	19.88	20.77	24.40	18.88	24.18	22.49
	12 m^3 /Fed.	28.96	21.92	23.74	24.87	31.04	20.59	21.85	24.49
	16 m^3 /Fed.	30.22	28.18	21.92	26.77	36.63	24.07	26.59	29.10
	Mean	27.36	23.22	21.85	24.14	30.69	21.18	24.21	25.36
Poultry manure	5 m^3 / Fed.	21.33	26.70	23.88	23.94	33.41	19.92	27.59	26.97
	7.5 m^3 / Fed.	28.70	25.74	26.89	27.11	38.18	25.70	27.96	30.61
	10 m^3 /Fed.	35.18	35.78	30.55	33.84	39.07	32.37	36.03	35.82
	Mean	28.40	29.41	27.11	28.31	36.88	26.00	30.53	31.14
L.S.D. (5%)		0.83	1.04	0.92	0.93	0.91	1.01	0.88	0.93

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African marigold , El-Ghadban (1998) on marjoram, Sakr (2001) on *Mentha piperita* L., Kandeel and Abou-Taleb (2002) on sweet basil and Naga (2004) on *Foeniculum vulgare* and *Carum carvi* ,L.

2- Effect of organic fertilizers on Essential oil percentage and composition:

The different sources of organic manure fertilizers and their rates significantly increased volatile oil percentage (Table7) at the three cuts in both seasons. The maximum values were obtained by the poultry manure at the rate of $10m^3$ /fed in both seasons. While, the lowest values of volatile oil percentage (1.073) was recorded for cattle manure at 10 m^3/fed. in first seasons. Moreover, the highest concentration of volatile oil was obtained when plants were harvested at early date (the first cut) in both seasons. On the other hand the lowest concentration of oil in herb tissues were obtained in the second cut in both seasons.

The volatile oil yield/plant data (Table 8) showed similar trend to those of the oil percentage. Moreover -in almost cases- the highest yield of oil/ plant was obtained when plants were early harvested (1st cut) compared with the 2nd and 3rd cuts in both seasons. While, sheep manure gave intermediate values in the three cuts in both seasons. On the other hand the lowest concentration of oil in herb tissues were obtained in the second cut in both seasons.

Using poultry manure led to an increase in organic matter, availability of nutrients nitrogen fixation, rizosphere microorganisms that release nutrient substances, which resulted in an increase in growth, and dry matter accumulation and this in turn increase concentration of oil.

Results of Maheshwari *et al.*, (1998) on palmarosa, Gad (2001) on fennel and anise plants, Eid and El-Ghawwas (2002) on marjoram plants, Mahfouz (2003) on marjoram and Hammed (2004) on *Salvia officinalis* were in confirmation with these findings.

Analysis of essential oil samples taken from the first cut in the first season were subjected to GC analysis. The percentage of the main components were calculated and presented in Table (9) and Figs. (1). Data indicated that α-pinene, β- pinene, Limonene, 1,8 cineole, Linalool, Terpinene-4-ol, α-terpineol, Linalyl acetate and Eugenol were the main components in the marjoram oil.

Table (7): Effect of some organic fertilizers on volatile oil percentage (*Majorana hortensis*. L.) plants during 2002/2003 and 2003/2004 seasons.

Organic sources	Fert. rates	2002/2003 season				2003/2004 season			
		Cutting time				Cutting time			
		First cut	Second cut.	third cut	Mean	First cut	Second cut.	third cut	Mean
Cattle manure	10 m^3 /Fed.	1.050	1.130	1.040	1.073	1.620	1.210	1.600	1.477
	15 m^3 /Fed.	1.300	1.100	1.570	1.323	1.610	1.500	1.570	1.560
	20 m^3 /Fed.	1.570	1.630	1.650	1.616	1.560	1.560	1.300	1.473
	Mean	1.306	1.286	1.420	1.337	1.596	1.423	1.490	1.503
Sheep manure	8 m^3 / Fed.	1.900	1.160	0.953	1.338	1.600	1.110	0.880	1.197
	12 m^3 /Fed.	1.800	1.320	0.980	1.367	1.700	1.500	1.040	1.413
	16 m^3 /Fed.	1.800	1.170	1.480	1.483	1.650	1.630	1.480	1.587
	Mean	1.833	1.216	1.137	1.395	1.650	1.413	1.133	1.399
Poultry manure	5 m^3 / Fed.	1.700	1.630	1.450	1.593	1.610	1.640	1.450	1.567
	7.5 m^3 / Fed.	1.560	1.220	1.600	1.460	1.820	1.400	1.560	1.593
	10 m^3 /Fed.	2.000	1.400	1.780	1.727	1.860	1.850	1.380	1.697
	Mean	1.753	1.416	1.610	1.593	1.763	1.630	1.463	1.619
L.S.D. (5%)		0.10	0.062	0.073	0.078	0.122	0.079	0.057	0.089

Table (8): Effect of some organic fertilizers on volatile oil yield/plant (ml) (*Majorana hortensis*, L.) plants during 2002/2003 and 2003/2004 seasons.

Organic sources	Fert. rates	2002/2003 season				2003/2004 season			
		Cutting time				Cutting time			
		First cut	Second cut.	third cut	Mean	First cut	Second cut.	third cut	Mean
Cattle manure	10 m^3 /Fed.	0.20	0.16	0.16	0.17	0.31	0.16	0.19	0.22
	15 m^3 /Fed.	0.31	0.19	0.19	0.23	0.40	0.23	0.29	0.31
	20 m^3 /Fed.	0.44	0.39	0.33	0.39	0.41	0.31	0.31	034
	Mean	0.32	0.24	0.22	0.26	0.37	0.23	0.26	0.29
Sheep manure	8 m^3 / Fed.	0.45	0.20	0.20	0.28	0.43	0.20	0.20	0.28
	12 m^3 /Fed.	0.52	0.28	0.28	0.36	0.43	0.30	0.39	0.37
	16 m^3 /Fed.	0.54	0.41	0.32	0.42	0.53	0.40	0.40	0.44
	Mean	0.50	0.29	0.26	0.35	0.47	0.3	0.33	0.37
Poultry manure	5 m^3 / Fed.	0.33	0.45	0.45	0.41	0.36	0.32	0.32	0.33
	7.5 m^3 / Fed.	0.48	0.52	0.31	0.44	0.44	0.35	0.45	0.41
	10 m^3 /Fed.	0.70	0.62	0.50	0.61	0.70	0.59	0.47	0.59
	Mean	0.50	0.53	0.42	0.48	0.50	0.42	0.41	0.44
L.S.D. (5%)		0.10	0.062	0.073	0.08	0.12	0.079	0.057	0.085

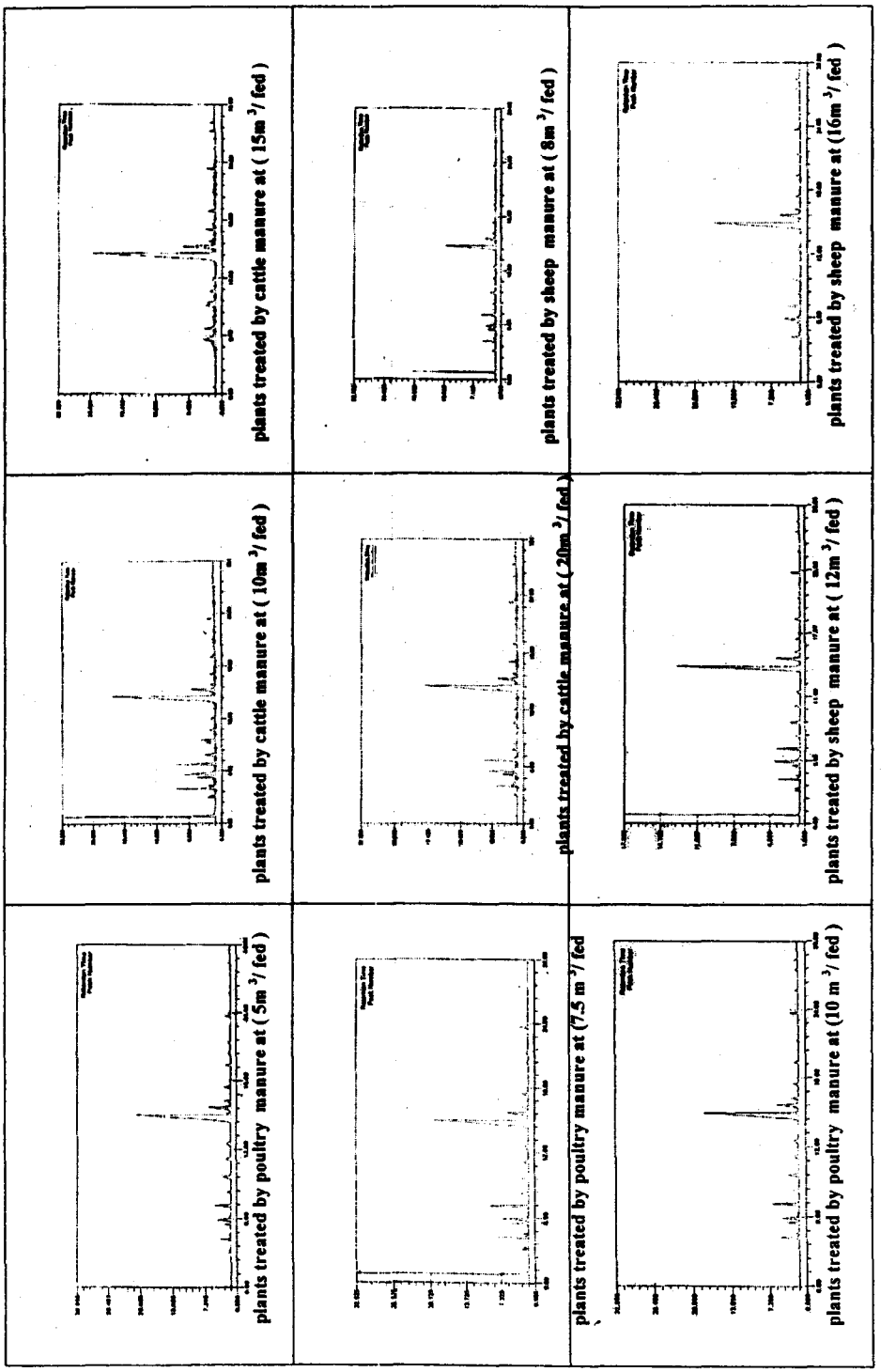
The data in Table (9) and Figs (1) showed that the highest percentage of Terpinene-4.ol (56.33%) was obtained from the application of poultry manure at the rate of 5m^3/fed., followed by cattle manure at the rate of 15m^3/ fed. (55.13%), While the lowest percentage of Terpinene-4-ol (20.82 %) was obtained from the application of poultry manure at the rate of 7.5m^3/ feddan.

Table (9): Effect of some organic fertilizers on the percentage of essential oil compound in marjoram (*Majorana hortensis,L.*) plants of the first cut during 2002/2003 and 2003/2004 seasons

Organic fertilizers	Rates m3/fadden	Oil composition percentages								
		α -pinene	β -pinene	1.8 cineole	Linalool	Terpinene-4-01	α- terpineol	Linalyl acetate	Eugenol	Limonene
Cattle manure	10	1.59	6.35	6.37	1.65	42.99	7.77	1.19	1.63	7.37
	15	-	0.90	5.43	1.85	55.13	8.37	1.99	1.55	3.22
	20	1.27	12.81	2.82	1.68	47.46	6.25	2.15	1.75	9.05
Sheep manure	5	-	5.96	3.52	0.02	45.10	7.55	2.69	1.26	9.83
	12	1.57	5.29	3.92	2.07	48.25	7.64	1.09	2.74	5.61
	16	0.66	3.11	4.35	2.20	52.77	7.79	1.92	2.51	3.79
Poutlry manure	5	0.51	1.96	3.57	2.18	56.53	8.20	3.00	1.41	4.45
	7.5	2.68	9.61	10.79	0.91	20.82	3.29	1.90	1.88	16.65
	10	0.95	4.34	4.08	2.25	51.18	7.84	1.52	.58	0.16

Limonene percentage in the marjoram oil was, in most cases increased by different treatments. The maximum percentage was obtained by the addition of poultry manure at the rate of 7.5m^3/fed., followed by sheep manure at the rate of 5m^3/ fed. and cattle manure at the rate of 20m3/fed.(16.65, 9.83 and 9.05%, respectively), while the minimum percentage of Limonene (0.16 %) was obtained from the application of poultry manure at the rate of 10m^3/ feddan.

Organic manure applications improved the β- Pinene content - in most cases – reaching the maximum with cattle manure at the rate of 20m^3/fed., followed by poultry manure at the rate of 7.5m^3/ fed., and cattle manure at the rate of 10m^3/ fed. This gave 12.81, 9.61 and 6.35%, respectively. On the other hand, the minimum percentage (0.90%) was obtained by fertilization of marjoram plants with cattle manure at the rate of 15m^3/fed.



Fig(1) Effect of organic fertilization on the Essential oil composition of *Majoranna hortensis* L.

The highest percentage of 1.8 Cineole (10.79, 6.37 and 5.43) were observed by the application of poultry manure at the rate of 7.5m^3/fed., followed by cattle manure at the rate of 10m^3/fed, then come the cuttle manure treatments at the rate of 15m^3/ fed., On the other side the minimum percentage(2.82%) was obtained by adding cattle manure at the rate of (20m^3/fed)

α - Pinene was ranged from 0.051 to 2.68 %. according to fertilization application Table (9). The highest percentage of α Pinene (2.68 %) was obtained by the addition of poultry manure at the rate of 7.5m^3/ fed., followed by cattle manure at the rate of 10m^3/fed. (1.59%), while the lowest percentage (0.51%) was obtained by application of poultry manure at the rate of 5m^3/fed.

These results were in accordance with that of El-Ghadban *et. al.*, 2002 on marjoram plants.

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استجابة النمو ومحتوى الزيت ومكوناته فى نبات البردقوش لمعاملات التسميد العضوى

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الملخص العربى

أجريت هذه الدراسة خلال الموسمين ٢٠٠٢/٢٠٠٣ ، ٢٠٠٣/٢٠٠٤ لدراسة تأثير مصادر ومعدلات السماد العضوى على النمو ومحصول العشب ، والمكونات الكيماوية الفعالة لنباتات البردقوش .

وقد أضيف السماد العضوى بالمعدلات التالية (١٠، ١٥ ، ٢٠ م٣/ فدان سماد الماشية) ، (٨ ،١٢ ، ١٦ م٣/ فدان سماد الغنم) ، (5 ،7.5 ، 10 م٣/ فدان سماد الدواجن) أثناء الأعداد والتجهيز للتربة قبل الزراعة وقد تم أخذ ثلاث حشات من النباتات أثناء موسمى النمو.

تسميد نباتات البردقوش بالسماد العضوى فى صوره سماد دواجن بمعدل ١٠ م٣/ فدان كانت أفضل المعاملات لزيادة الصفات المدروسة متمثلا فى محصول العشب الطازج والجاف مع أعلى القيم لمحتوى النبات من الزيت ، يليها تسميد نباتات البردقوش بمعدل ١٦ م٣/ فدان من سماد الغنم؛ كما حسنت المعاملات بالتسميد العضوى النسبه من مكونات الزيت حيث ارتفعت نسب المكونات الرئيسيه فى الزيت كلما ارتفعت جرعه السماد العضوى