Assiut J. of Agric. Sci., 41 (4) (91-105)

Impact of Combined Organic Manures, Chemical Fertilizer and Effective Microorganisms on Growth and Yield of Marjoram Plants under Drip and Flood Irrigation systems.

Mohamed A.Youssef[1], Galal A. Elgharably[2], Salah M.Mahmoud[2] and Sabri A.Hegab[1]

[1]Dept.Soils & water, Fac. Agric., AL-Azhar Univ., Assiut. [2]Dept.Soils and water, Fac. Agric., Assiut, Univ.

Abstract:

A field experiment was conducted at the Agricultural Experimental Farm, Faculty of Agricultural, AL-Azhar University, Assiut governorate during 2008/09 to study the effects of the application of combined organic manures (sheep and chicken), chemical fertilizer, and Effective Microorganisms (EM) as biofertilizer on the vegetative growth, yield and chemical composition of marjoram (*Majorana hortensis*, L.) plants grown under drip or flood irrigation. A randomized complete blocks design with four replications was used. Results indicated that the combination of organic manures, (EM) and nitrogen chemical fertilizer raised the growth characters in the three successive cuttings of marjoram plants, The combined application increased the dry weight of leaves (g/plant), dry leaves yield (kg/fed.), volatile oil yield (kg/fed.), nitrogen uptake (g/kg) and nitrogen use efficiency (NUE). Under flood irrigation, the T_6 (50% CM +25% SM +25% MF +EM) treatment gave the highest values with an average of 52.58 %, 52.58 %, 320.64 %, 122.82 % and 9.60 % in the three cuttings, respectively; as compared to the control.

Economic evaluation was carried out by calculating the benefit to cost ratio (B/C parameter), with the highest return 13545 L.E/fed. in T_6. The profitability get it from revenue minimum total costs and the proportion of benefits to costs estimated at 2.68, and decreased in the order $T_4 > T_7 > T_5 > T_3 > T_2 > T_1$, respectively.

Key words: Effective microorganism, marjoram, organic manures and economic evaluation.

Introduction:

The medicinal and aromatic plants have special importance all over the world for their constituents of safe and effective ingredients. The national interest in extending the area cultivated with medicinal and aromatic plants would gain a great profit from using herbs in food, pharmaceutical purposes and cosmetics (Abo elazm, 2008).

Marjoram (*Majorana hortensis*, L.), is an important aromatic and medicinal plant. It has been cultivated in the Mediterranean countries and is still widely

Received on:9/11/2010 **Accepted for publication on**: 27/12/2010
Referees: Prof.Dr.Mohamed E. Ibrahem Prof.Dr.Kamal K. Attia

cultivated today. The active principles are found chiefly in the aerial parts (*Majorana h.*)., indigenous to the Mediterranean region. The plant is cultivated in Germany, Hungary, France, Tunisia, especially in Bulgaria. In Egypt, it is considered as an important economic agricultural export crop. It grows well in Upper Egypt. Dried marjoram and the oil are used as spices in the food industry, as well as for their preservative and medicinal properties (Massoud *et al.,* 2009).

Poultry manure is an excellent organic fertilizer which contains high nitrogen, phosphorus, potassium and other essential nutrients. In contrast to mineral fertilizer, it adds organic matter to soil which improves soil structures, nutrient retention, aeration, soil moisture, holding capacity and water infiltration (Deksissa *et al.,* 2008).

Bio-fertilizers are very safe for human, animal and reduce the environmental pollution. Bio-fertilization for medicinal plants has drawn the attention of research workers. Organic manures and bio-fertilization are very important for medicinal and aromatic plants to produce a best product in both quantity and quality and safe for human, animal and environment. They have become in the last few decades a positive alternative to chemical fertilizers. Also, poultry manure significantly amended the crude oil polluted soil when compared with other manures (Cow dung, and farm yard manure) by (Madukwe *et al.,* 2008). Several investigators studied the effect of the application of organic manures (sheep and chicken) and bio-fertilizer (EM) on the growth, essential oil percentage and constituents of several medicinal and aromatic plants.

Eid and El-Ghawwas (2002) stated that plant height, number of branches/plant as well as fresh and dry weights of marjoram plants were significantly increased when plants were treated with microbein and nitrobein compared with untreated plants. Mahfouz (2003) studied the effect of bio-fertilizer on marjoram. He found the highest fresh and dry weights of the herb and yield in the bio-fertilizer plus full dose of N and P treatment.

Gawaily *et al.* (2006) studied the response of marjoram (*Majorana hortensis*, L.) plants to inoculation with tri-mixture of bio-fertilizers (*Azotobacter* + *Azospirillum* + *phosphate dissolving bacteria*) in the presence of organic manure (sheep dung manure and rice straw) and inorganic fertilizers NPK full recommendation doses, under a greenhouse pot experiment cultivation in sandy and calcareous soils. Results have shown that marjoram plants significantly responded to bio-fertilization which positively affected plants growth characters (shoots, roots fresh and dry weights) and the essential oil content; the best treatment was that including the application of (*Azotobacter* + *Azospirillum* + *phosphate dis-*

solving bacteria) in the presence of K + 0.25N + Rock phosphate + sheep manure. Abo elazm (2008) found that application of organic manure (poultry) at 10 m^3/fed. combined with phosphorein bio-fertilizer on marjoram (*Majorana hortensis*, L.) gave the tallest plants, highest number of branches/plant. The highest values of herb fresh and dry weights, concentration of chlorophyll a and b in herb tissues as well as concentration and yield of volatile oil. Mahmmoud(2009) found that application of cattle manure gave a significant increase in vegetative growth characteristics of *Nigella sativa*, L. plant (seed yield, volatile oil % and yield) compared with mineral NPK, bio-fertilizers and control. Also cattle manure gave significant increase in leaf content of chlorophyll a, b and carotenoids.

The present research was carried out to study the effect of combined of organic manures (sheep and chicken), chemical fertilizer and Effective Microorganisms (EM) on the vegetative growth, yield and chemical composition of marjoram (*Majorana hortensis*, L.)plants grown under both drip and flood irrigation systems.

Materials and Methods:

The present work was carried out at the Agricultural Experimental Farm, Faculty of Agricultural, AL-Azhar University, Assiut governorate during the season of 2008/09. Field experiment; was conducted to study the effects of combined organic manures (sheep and chicken manures), Effective Microorganisms (EM) as bio-fertilizer and nitrogen as chemical fertilizer on growth, yield and chemical composition of marjoram plants under flood and drip irrigation systems. Some physical and chemical properties of a representative soil sample (0-30 cm) used in the experimental soil were determined before preparation according to Jackson (1973) of the experiment site are presented in Table 1.

Table (1): Some physical and chemical analysis of a representative soil sample.

Physical analysis		**Chemical analysis**	
Bulk density (g/cm^3)	1.47	Total-P (%)	0.06
Particle density (g/cm^3)	2.64	Total-N (%)	0.12
Saturation %	49.50	Total-K (%)	0.08
Field Capacity %	24.25	Ava.-P (ppm)	10.50
Particle size dist.		Exch.-K (ppm)	105.21
Sand (%)	53.60	O.M (%)	1.59
Silt (%)	22.20	E.C (dSm^{-1}) (1:2.5)	0.921
Clay (%)	24.20	pH (1:2.5) Susp.	7.61
Texture grade		$CaCO_3$%	1.25
Sandy Clay Loam (S.C.L)			

Effective microorganisms (EM) is a natural combination of beneficial microbes used in agriculture, horticulture and waste management. The EM consists of mixed cultures of beneficial and natural occurring microorganisms that can be applied as inoculants to increase the microbial diversity of soils and plants. Effective microorganisms (EM) was provided from the ministry of Environment.

Sheep manure (S M): was obtained from the Animal Production Farm of AL-Azhar University, Assiut branch. Chicken manure (C M): was brought from the Poultry Production Farm of Assiut University, Assiut. The chemical analyses of organic manures are presented in Table 2.

Table (2): Chemical analysis of chicken and sheep manures.

Characteristics	Sheep manure	Chicken manure
Total-N %	2.10	3.20
Total-P %	1.31	2.81
Total-K %	3.86	3.01
Fe	4543	1433
Mn	155	191
Zn	94	198
Cu	23	25
Organic matter %	39.50	56.41
Organic-C %	22.91	32.72
pH (1:5) Susp.	8.33	7.13
E.C (dSm^{-1}) (1:5)	5.060	3.580
C/N	11:1	10:1

The experiment was conducted out in a randomized complete blocks design consisted of 7 treatments and four replicates. The soil was divided into plots of six square meters (2 x 3 m). Organic manure was added during the soil preparation before planting at the different amounts as full recommended dose (100 %) source of nitrogen and additional requirements of P and K were met through application of rock phosphate and bagasse ash, as follows in Table (3).

Table (3): Treatments of N Sources (100%) and Bio-fertilizer (EM) applied per plot.

Treatments	Sources of organic-N (100%)
T_1	Control
T_2	Control + EM
T_3	100% CM + EM
T_4	75% CM +25%SM + EM
T_5	50% CM +50% SM + EM
T_6	50% CM +25% SM +25%MF + EM
T_7	25% CM +50% SM +25%MF + EM
EM=Effective microorganisms.	**CM**=Chicken manure.
SM=Sheep manure.	**MF**=Mineral fertilizers

Seeds of marjoram plants were kindly provided from Sides Horticultural Research Station, Agric. Research Center, Beni-Suef Governorate. It was sown on the field on 25th of September 2008; two months later, marjoram seedlings (1st of December) 10-12 cm height with 8-12 leaves were transplanted to the experimental plots in four lines at 50 cm in between lines and 50 cm between seedlings. Mineral fertilizers N (50 Kg/fed.) of ammonium nitrate 33.5% N used 25% recommended dose equal (37.31 Kg/fed.) was applied at three equal doses; the first after 30 days from planting while the others used at harvesting stages for cutting late.

Plants were cut at 10 cm above soil surface in the three cuttings on 15th March, 20th May and 10th July (after 50 % of flowering), Vegetative plant samples of marjoram were randomly taken from each plot before cutting. The plant samples were freshly weighed, cleaned with distilled water, and then air dried until constant dry weight. The herbs dry weights were recorded before they were, ground and stored for chemical analysis.

- Essential oil percentage:

The estimation of volatile oil was carried out on fresh herb at cutting time. Plant samples (100 g) were extracted by hydro-distilled for 3 H using Clevenger apparatus according to Egyptian pharmacopoeia (1984). Then volatile oil percentage was calculated as ml of oil per 100 grams of fresh herb.

- Volatile oil yield (kg/fed.) = oil (%) X yield herb fresh (ton/fed.).

- Chemical composition:

- Nitrogen uptake (g/ kg) and use efficiency (NUE) were calculated according to (Anderson *et al.* 1997) =

$$\frac{[\text{Biomass yield of the treatment (kg/fed)} - \text{Biomass yield of the control (kg/fed)}]}{\text{Nitrogen applied level (kg/fed)}}$$

Data collected during this study were statistically analysis according to (Steele and Torrie, 1984).

Results and Discussion

Dry weight of leaves (g/plant):-

Data presented in Table (4) reveal that the sources of organic manures in combination with the effective microorganisms treatments had a significant effect on dry weight of marjoram leaves (g/plant) at the three cuttings during the experimental season. Data, also indicate that T_6 treatment significantly increases dry weight of leaves in all the cuttings. These increments reached 50.39, 42.62 and 65.01% over the control under flood irrigation with average means of (52.58) and 42.46, 39.93 and 69.07%, respectively, for dry weight of leaves (g/plant) under drip irrigation (50.61%) in the three cuttings, respectively; as compared to the control.

Table (4). Effect of combined organic manures and effective microorganism on dry weight of leaves (g/plant) of marjoram plants during the three cuttings under different irrigation systems*.

Treatments	1st cut		2nd cut		3rd cut		Mean of Flood Irr.	Mean of Drip Irr.
	Flood Irr.	Drip Irr.	Flood Irr.	Drip Irr.	Flood Irr.	Drip Irr.		
T_1	21.205	20.967	28.278	27.896	26.383	25.405	25.289	24.756
T_2	24.268	23.373	30.846	28.312	27.451	27.091	27.522	26.259
T_3	24.748	24.643	31.228	30.137	37.208	32.948	31.061	29.243
T_4	28.295	27.509	38.747	38.662	41.031	38.611	36.024	34.927
T_5	25.238	25.200	33.962	33.642	39.121	33.878	32.774	30.907
T_6	31.890	29.870	40.330	39.036	43.535	42.953	38.585	37.286
T_7	26.940	26.509	35.315	34.283	39.447	37.624	33.901	32.805
Means	26.083	25.439	34.101	33.138	36.311	34.073	32.165	30.883
A	0.978		0.958		0.851			
LSD 0.05 B	1.332		1.261		1.285			
AB	NS		NS		1.818			
*Each value represents the mean of 4 replications.								

The increment in dry weight of leaves may be attributed to the increase in some vegetative growth and plant fresh weight as already discussed. Organic soil amendments, such as chicken, cattle and sheep manures, provide benefits by improving soil quality as well as providing a source of some nutrients. Chick-

en manure is generally applied in large amounts due to the long period required for mineralization of nutrients into plant available forms. The obtained results are in agreement with those of Dewidar (2007) and Abo elazm (2008) on marjoram plants.

- Dry leaves yield (kg/fed.):-

It is clear from the data in Table (5) that the organic manures with effective microorganism has no significant effect on the dry leaves yield of marjoram plant in the first cut while it had in the 2nd and 3rd cuttings. Moreover, application of T_6 gave the highest values in this respect compared to the other treatments. Data also, showed that the irrigation methods significantly affected the dry leaves yield. The obtained results, indicated that T_6 recorded a significant increase as compared to the other treatments in all the three cuttings.

Table (5). Effect of combined organic manures and effective microorganism on dry leaves yield (kg/fed.) of marjoram plants during the three cuttings under different irrigation systems*.

Treatments	1st cut		2nd cut		3rd cut		Mean of Flood Irr.	Mean of Drip Irr.
	Flood Irr.	Drip Irr.	Flood Irr.	Drip Irr.	Flood Irr.	Drip Irr.		
T_1	396.11	391.66	528.22	521.10	492.84	474.56	472.39	462.44
T_2	453.32	436.60	576.20	528.86	512.78	506.06	514.10	490.51
T_3	462.30	460.34	583.33	562.95	695.05	615.46	580.23	546.25
T_4	528.55	513.87	723.79	722.20	766.46	721.25	672.93	652.44
T_5	471.45	470.74	634.40	628.43	730.78	632.85	612.21	577.34
T_6	595.71	557.97	753.36	729.19	813.23	802.37	720.77	696.51
T_7	503.24	495.19	659.68	640.40	736.86	702.82	633.26	612.80
Means	487.24	475.19	637.00	619.02	678.29	636.48	600.84	576.90
A	NS		17.904		15.905			
LSD 0.05 B	24.884		23.560		24.011			
AB	NS		NS		33.957			
*Each value represents the mean of 4 replications.								

These increments reached 50.39, 42.62 and 65.00 % for dry leaves yield under flood irrigation with an average of mean (52.58 %) and 42.46, 39.93 and 69.07 % for dry weight of leaves (g/plant) over the control with an average mean (50.61 %) in the three cut-

tings under drip irrigation, respectively; as compared to the control. The increment in dry leaves yield may be attributed to the increase in both plant height, number of branches/plant and plant fresh weight. The obtained results are in agreement with those of Eid and Ghawwas (2002) on marjoram plants.

- Volatile oil yield (kg/fed.)**:-**

Results of the effect of the organic manure combinations with effective microorganism on total oil volatile yield of marjoram plants are shown in Table (6).

Regarding to the effect of organic manure combinations with effective microorganism show significant increases volatile oil yield/fed. at different cuts during the experimental season. Moreover, the highest oil yield was obtained when plants were early harvested (1st cut) compared with the 2nd and 3rd cuts. The T_6 gave the highest values as compared with other treatments in the three cuttings. On the other hand, the lowest concentration of oil in herb tissues was obtained in the third cut. The positive effects of applied organic manure combinations with effective microorganism on growth and volatile oil content could be attributed to its positive effect on soil and plant. The obtained results are in agreement with those of Naga (2004) on *Foeniculum valgare* and *Carum carvi* plants.

Table (6). Effect of combined organic manures and effective microorganism on volatile oil yield (kg/fed.) of marjoram plants during the three cuttings under different irrigation systems*.

Treatments	1st cut		2nd cut		3rd cut		Mean of Flood Irr.	Mean of Drip Irr.
	Flood Irr.	Drip Irr.	Flood Irr.	Drip Irr.	Flood Irr.	Drip Irr.		
T_1	23.422	26.308	25.851	21.783	14.806	12.159	21.340	20.083
T_2	52.374	48.041	46.950	35.379	25.431	19.113	41.585	34.178
T_3	87.723	80.947	51.720	50.040	30.125	29.819	56.523	53.602
T_4	103.520	96.059	83.754	60.499	39.626	35.755	75.633	64.104
T_5	92.021	78.948	68.907	51.407	34.947	31.060	65.292	53.805
T_6	132.040	114.470	93.999	76.042	43.255	40.989	89.765	77.167
T_7	101.810	86.082	76.904	55.481	36.481	31.602	71.732	57.722
Means	80.959	74.004	62.059	48.670	31.391	27.846	58.136	50.173
A	6.097		12.793		2.114			
LSD	9.666		10.620		3.913			

0.05 B				
AB	NS	NS	NS	
*Each value represents the mean of 4 replications.				

In fact, volatile oil yield differed in the different treatments throughout the same cut as well as the three cuts, which might be due to the differences in dry weight/plant, owing to the different treatments. As well as the effect of the amount of organic manures on plant growth, in addition to the effect of organic manure combinations with effective microorganism a symbiotic of nitrogen and solubilizing of phosphate I on the enzymatic systems that are responsible for the biosynthesis of these compounds (Gomaa, 2002).

- **Nitrogen uptake** (g/kg)**:-**

As shown in Table (7) there were remarkable variations in the total nitrogen uptake as affected by organic manure and EM. All fertilization treatment significantly increased the nitrogen uptake by marjoram plants as compared with the control. All fertilization treatments significantly increased N-uptake in marjoram plants. The highest values were obtained by T_6 under flood irrigation. The increment percentage values were 169.35, 73.82 and 160.94 % over the control treatment for 1st cut, 2nd and 3rd cuts, respectively. The highest rate of N-uptake in the herb was obtained in the first cut.

This increase could be due to the positive effect of organic manure combinations with effective microorganism in improving soil physical and chemical properties and, consequently, increased nitrogen uptake.

Table (7). Total nitrogen uptake (g/kg) of marjoram plants during three cuttings as affected by organic manures and effective microorganism under different irrigation systems*.

Treatments	1st cut		2nd cut		3rd cut		Mean of Flood Irr.	Mean of Drip Irr.
	Flood Irr.	Drip Irr.	Flood Irr.	Drip Irr.	Flood Irr.	Drip Irr.		
T_1	1.899	1.349	3.323	3.146	1.956	1.858	2.393	2.118
T_2	2.376	2.224	3.885	3.491	2.394	2.310	2.885	2.675
T_3	3.748	2.507	4.293	3.938	3.929	3.312	3.990	3.252
T_4	4.352	2.936	5.320	5.051	4.584	3.968	4.752	3.985
T_5	3.838	2.628	4.388	4.281	4.133	3.410	4.120	3.440
T_6	5.115	3.619	5.776	5.395	5.104	4.537	5.332	4.517

T_7	4.048	2.765	4.823	4.617	4.395	3.808	4.422	3.730
Means	3.549	2.533	4.518	4.254	3.698	3.257	3.922	3.348
A	0.211		0.130		0.096			
LSD 0.05 B	0.565		0.234		0.166			
AB	NS		NS		0.235			
*Each value represents the mean of 4 replications.								

The beneficial effect of amending the aromatic plants with organic nitrogen sources either alone or combined with effective microorganism nitrogen sources on nitrogen uptake was confirmed by the results of El-Sayed *et al*. (2002), Kandeel and Abou-Taleb (2002) and Massoud, Hekmat (2009) on spearmint, marjoram and basil.

- Nitrogen Use Efficiency (NUE):

Nitrogen use efficiency (NUE) reflects the response the plants to fertilization treatments. It was calculated as kg biomass per kg of N applied.

The data in Table (8) demonstrated the effect of organic manure combinations with effective microorganism on nitrogen use efficiency in marjoram. The obtained data revealed that the maximum values of NUE were obtained by T_6 treatment for 3rd cut under flood irrigation. Meanwhile, the minimum values were obtained by T_2 treatment for 2nd cut under drip irrigation. substituting organic manure combinations with effective microorganism and mineral application increased NUE in the three cuttings compared with the control treatment.

Table (8). Nitrogen use efficiency (NUE) of marjoram plants during three cuttings as affected by organic manures and effective microorganism under different irrigation systems*.

Treatments	1st cut		2nd cut		3rd cut		Mean of Flood Irr.	Mean of Drip Irr.
	Flood Irr.	Drip Irr.	Flood Irr.	Drip Irr.	Flood Irr.	Drip Irr.		
T_1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T_2	2.76	2.44	2.16	0.97	1.95	2.24	2.29	1.88
T_3	4.45	3.93	2.75	2.16	7.73	5.34	4.98	3.81
T_4	6.11	5.47	7.51	8.09	9.95	8.72	7.86	7.43
T_5	4.67	4.09	4.03	4.21	8.86	5.83	5.85	4.71
T_6	9.23	7.44	8.37	8.50	11.21	11.35	9.60	9.10
T_7	5.47	4.71	5.87	5.82	9.08	8.07	6.81	6.20
Means	4.67	4.01	4.38	4.25	6.97	5.94	5.34	4.73
A	0.02		0.01		0.05			
LSD 0.05 B	0.03		0.02		0.07			

AB	NS	NS	NS	
*Each value represents the mean of 4 replications.				

On the other hand, the lowest NUE values (2.44, 0.97 and 2.24) were obtained when the marjoram plant was fertilized with T_2 under drip irrigation in the three different cuttings, respectively. The partial replacement of mineral-N by organic fertilizers in increasing NUE may be due to availability of nutrients under these conditions are well-documented. Similar results were mentioned by (Hassan, 2009) on cumin, coriander and caraway.

Economic Evaluation:-

Economic evaluation could be used some of the criteria that are consistent with the conditions of the field trials and the economic logic of first, the net return farm which it equal to the difference between the benefits and costs, and the project is profitable economically while the value is positive. Secondly, the rate of benefits to costs, or the so-called cost-benefit analysis and it even outside the total benefit or return on total costs, than one the project is profitable if the proportion is great, the different crops according to the follows profitability and economic trade.

The net return and benefit cost ratio (B/C) of the field experiment for leaves of Marjoram crop are shown in table 9 and figures 1 and 2. The results showed that inoculated the soil with organic combinations with EM, increased (B/C). The highest ratio was obtained under soil treated with organic combinations plus EM compared with control. Data indicated that the economic evaluation of leaves of Marjoram plant under flood irrigation system were the best treatment T_6 as a net revenue of about 13545.10 L.E./fed. the profitability get it from revenue minis total costs (comes from Adding Investment costs to operating costs), and the proportion of benefits to costs estimated at 2.68, decreased in the order $T_4 > T_7 > T_5 > T_3 > T_2 > T_1$, respectively.

Table (9)**.** Economic evaluation of field experiment (leaves of Marjoram crop) under irrigation systems (L.E./fed.).

Treat.	**Input**			**Output**			
					Economic criterion		
	Investment costs	Operating costs	Total costs cultivation	Revenue	Net Revenue (L.E./fed.)	B/C ratio*	order
Flood irrigation							
T_1	4916.68	2996.00	7912.68	14171.74	6259.06	1.79	7

T_2		3006.00	7922.68	15422.99	7500.31	1.95	6
T_3		3159.90	8076.58	17406.81	9330.23	2.15	5
T_4		3150.30	8066.98	20187.95	12120.97	2.50	2
T_5		3141.00	8057.68	18366.33	10308.65	2.28	4
T_6		3161.25	8077.93	21623.03	13545.10	2.68	1
T_7		3152.00	8068.68	18997.87	10929.19	2.35	3
Drip irrigation							
T_1	5320.01	2544.50	7864.51	13873.16	6008.65	1.76	7
T_2		2554.50	7874.51	14715.17	6840.66	1.87	6
T_3		2708.40	8028.41	16387.49	8359.08	2.04	5
T_4		2698.80	8018.81	19573.21	11554.40	2.44	2
T_5		2689.50	8009.51	17320.09	9310.58	2.16	4
T_6		2709.75	8029.76	20895.29	12865.53	2.60	1
T_7		2700.50	8020.51	18384.07	10363.56	2.29	3

* (P/C ratio) =The proportion / cost ratio

While under drip irrigation the data decreased the order $T_4 > T_7 > T_5 > T_3 > T_2 > T_1$ respectively.

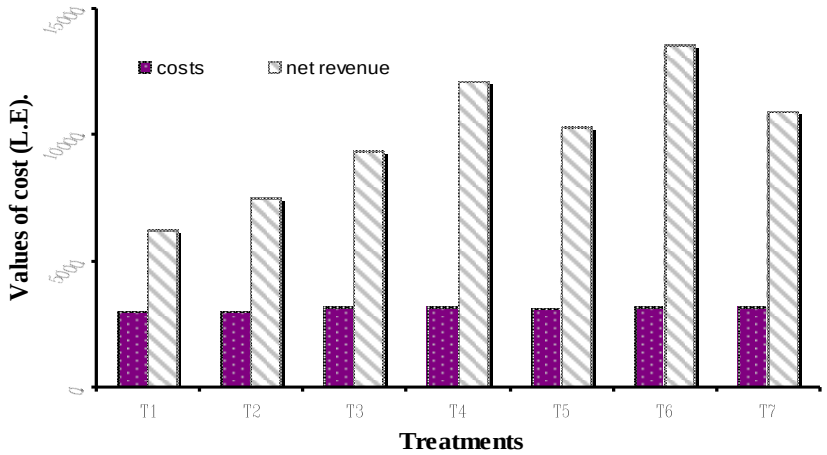

Fig.1: Relationship between operating costs and net revenue for Marjoram plants under flood irrigation.

Also, the net return was about 12865.53 E.L./fed. as shown in figure 2.

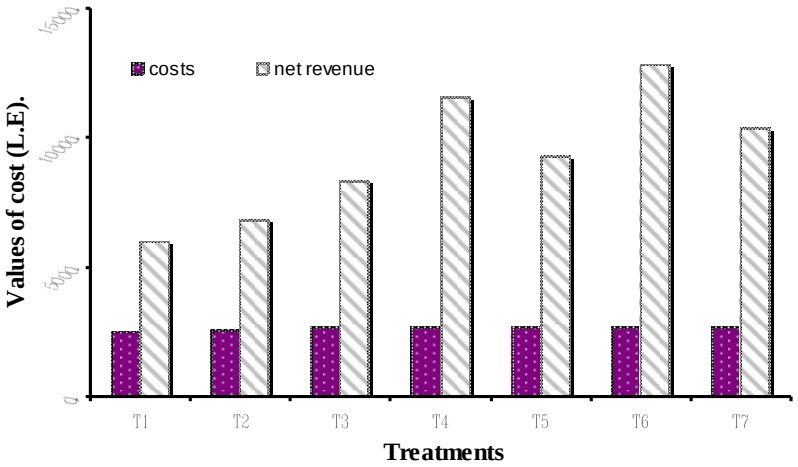

Fig.2: Relationship between operating costs and net revenue for Marjoram plants under drip irrigation.

Generally, it may be stated that it could be applying organic manure combined and bio-fertilizers has the highest valuable and net return for Marjoram plants

References

Abo elazm, M. A. I. 2008. The effect of organic and bio-fertilization sources on the growth and active constituents of *Majorana hortensis* L. Plant. M.Sc. Thesis, Fac. Agric., Al-Azhar Univ., Egypt.

Anderson, I. C., D. R. Buxton, D. L. Karlen and C. Cambardella. 1997. Cropping system effects on nitrogen removal, soil nitrogen, aggregate stability, and subsequent corn grain yield. Agronomy J., 89:881-6.

Deksissa T.; I. Short and J. Allen. 2008. Effect of soil amendment with compost on growth and water use efficiency of amaranth. In: Proceedings of the UCOWR/NIWR Annual Conference: International Water Resources: Challenges for the 21st Century and Water Resources Education, July 22–24, 2008, Durham, NC.

Dewidar, A. A. A. 2007. Post-harvest studies on some aromatic plants. Ph.D. Thesis, Fac. Agric., Kafr El-Sheikh Univ.

Egyptian pharmacopoeia. 1984. Egyptian pharmacopoeia. general organization for governmental printing office, Ministry of Health, Cairo, Egypt. pp. 31-33.

Eid, M. I. and E. O. El-Ghawwas. 2002. Study on the responsibility of marjoram plant to biofertilizer in sandy soil. Egypt . J. Appl. Sci., 17 (3):163-175.

El-Sayed, A. A.; H. A. Mansour; Effat, I. El-Maadawy; Mahassen. A. Sidky; and E. A. El-Ghadban. 2002. Effect of organic and inorganic fertilization on herb and oil productivity of speament and marjoram. Zagazig J. Agric. Res. 29 (6): 1859-1888.

Gawaily, E. M.; fatma I. El-Zamik, tomader, T. El-Hadidy, H. I. Abd El-Fattah and Sheham, H. Salem. 2006. Efficiency of bio-fertilizers, organic and inorganic amendments application on growth and essential oil of Marjoram (*Majorana hortensis* L.) plants grown in sandy and calcareous soils. Zagazig J. Agric. Res., 33(2):205-230.

Gomaa, Walaa, A. B. M. 2002. physiological studies on (C*oriandrum sativum*, L. and *Majorana hortensis*, L.). M.Sc. Thesis, Fac. Agric., Kafr El-Sheikh, Tanta Univ.

Hassan, A. M. A. 2009. Effect of irrigation and fertilization treatments on the growth and yield of some aromatic seed crops grown on soil of El-Kharga, New valley Governorate. M.Sc. Thesis, Fac. Agric., Assiut Univ., Egypt.

Jackson, M.L. 1973. Soil chemical analysis. Prentice-Hall, Inc. Englewood Cliffs, N.J. New Delhi.

Kandeel, A. M. and N. S. Abou-Taleb. 2002. Effect of some organic manures on the growth, volatile oil yield and chemical composition of *Ocimum basilicum* L. plant. Zagazig J. Agric. Res., Vol. 29 (6): 1839-1857.

Madukwe, D. K.; I. E. C. Christo and M. O. Onuh. 2008. Effect of organic manure and cowpea (*vigna unquiculata* L.) Walp varieties on the chemical properties of the soil and root nodulaiton. Sci. World J., 3(1):43-46.

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

Mahmmoud, Sabah A. E. 2009. Comparative study on black cumin (*Nigelle sativa*, L.) plants grown under different spacing and fertilization treatments. M.Sc. Thesis, Fac. Agric., Assiut Univ. Egypt.

Massoud, Hekmat Y. A.; M. N. Shalan; K. M. El-Hindi and A. E. E Dapour. 2009. Effect of salinity and some bio-compounds on growth, essential oil yield and chemical composition of Marjoram plants, J. Agric. Sci. Mansoura Univ., 34 (5): 5033-5048.

Naga, Neven M. H. 2004. Physiological studies on (*foeniculum vulgare*, Mill and *Carum carvi*, L.). M.Sc. Thesis, Fac. Agric., Tanta, Tanta Univ.

Steel, R. G. D. and J. H. Torrie, 1984. Principles and practices of statistics, 2nd Ed., pp: 107–9. McGraw Hill Co. Inc. New York.

تأثير مخاليط الأسمدة العضوية، المعدنية والحيوية على نمو ومحصول نباتات البردقوش تحت نظم الرى بالتنقيط والغمر.

محمد أحمد يوسف،[1] جلال أحمد الغرابلى،[2] صلاح محمد محمود[2]
و صبرى أمين حجاب[1]
[1] قسم الأراضى والمياه - كلية الزراعة – جامعة الأزهر– أسيوط.
[2]قسم الأراضى والمياه - كلية الزراعة – جامعة أسيوط.

تم إجراء هذه الدراسة الحقلية علي نبات البردقوش فى الموسم الزراعي 2009/2008م بمزرعة بحوث كلية الزراعة- جامعة الأزهر- بمحافظة أسيوط وذلك بهدف دراسة تأثير إضافة مجموعة مخاليط بنسب مختلفة حسب نسبة النيتروجين لهذه الأسمدة العضوية (سماد زرق الدواجن وسماد الأغنام) مع السماد الحيوي (EM) والنيتروجين الكيماوى فى صورة نترات النشادر33.5% على النمو ومحصول الأوراق الجافة والزيت الطيار لنبات البردقوش وكذلك على كفاءة استخدام الأسمدة وذلك تحت نظامى الرى بالغمر والتنقيط.

حيث تم استخدام سبعة مخاليط سمادية، T_1وهى المعاملة بدون إضافة (كنترول)، T_2 وهى المعاملة الكنترول +(EM)، T_3وهى 100% مصدر للنيتروجين من سماد زرق الدواجن+(EM)، T_4 وهى تتكون من 75% مصدر للنيتروجين من سماد زرق الدواجن +25% مصدر للنيتروجين من سماد الأغنام+(EM)، T_5وهى تتكون من 50% مصدر للنيتروجين من سماد زرق الدواجن +50% مصدر للنيتروجين من سماد الأغنام+(EM)، T_6وهى تتكون من 50% مصدر للنيتروجين من سماد زرق الدواجن +25% مصدر للنيتروجين من سماد الأغنام+25% نيتروجين كيماوى +(EM)،T_7 وهى تتكون من 25% مصدر للنيتروجين من سماد زرق الدواجن +50% مصدر للنيتروجين من سماد الأغنام+25% نيتروجين كيماوى +(EM).

أظهرت النتائج أن جميع المعاملات سجلت زيادة معنوية على النمو ومحصول الأوراق الجافة و الزيت الطيار لنبات البردقوش وعناصر النيتروجين الممتص تحت نظامى الرى بالغمر والتنقيط حيث كان تأثير نظم الرى معنوى ولكن عند دراسة التداخل بين المعاملات السمادية ونظم الرى كانت غير معنوية فى كثير من الصفات المدروسة.

وقد سجلت المعاملة T_6 زيادة معنوية فى محصول الأوراق الجافة للنبات والزيت الطيار ونسبة النيتروجين الممتص وكذلك كفاءة استخدام الأسمدة بالمقارنة بالكنترول. وتشير النتائج إلى إمكانية الاستخدام الناجح لمخاليط الأسمدة العضوية والحيوية كبديل فعال وآمن بدلا من الأسمدة الكيماوية دون أن تتأثر الصفات الكمية والنوعية للمحصول وهذا يؤدى إلى تقليل التكلفة والحد من التلوث البيئى.

وبينت الدراسة أن استخدام مخاليط الأسمدة العضوية والحيوية كان لها العائد الأقتصادى المرتفع وكان التفوق الأقتصادى للعائد من خليط المعاملة T_6 حيث سجلت أكبر عائد ربح يصل الى 13545.10جنيه مصرى تحت نظام الرى بالغمر خلال موسم زراعى واحد مقارنة بالمعاملات الأخرى، مما يوضح أهمية استخدام مخاليط الأسمدة العضوية والحيوية من أجل تحجيم استهلاك الأسمدة الكيماوية وحماية البيئة الزراعية من مخاطر التلوث وزيادة دخل وربحية المزرعة.