

## **EFFECT OF CHEMICAL, ORGANIC FERTILIZERS AND ACTIVE DRY YEAST ON *SALVIA OFFICINALIS*, L. PLANTS.**

### **I. EFFECT ON GROWTH AND YIELD.**

**A. S. EL-Leithy\***; **M. M.M. Hussein \***; **E. A. E. EL-Ghadban\*\*** and **Esraa S. M. Abd EL-Latif \*\***

\*Ornamental Horticulture Department, Faculty of Agriculture, Cairo University, ,  
Cairo, Egypt.

\*\* Medicinal and Aromatic Plants Research Department, Horticulture Research  
Institute, Agricultural Research Center, Dokki , Cairo, Egypt.

### **ABSTRACT**

*The present study was conducted during the two successive seasons of 2003/2004 and 2004/2005 at the Farm of Ornamental Horticulture Department, Faculty of Agriculture, Cairo University and Medicinal and Aromatic Plants Department, Horticulture Research Institute, Agricultural Research Center, Dokki, Giza to investigate the effect of chemical fertilizers (NPK), organic manure (poultry manure) and spraying active dry yeast on sage (*Salvia officinalis*) plants .The results showed that, NPK fertilizer [300 kg ammonium sulphate (20.6 % N), 200 kg calcium superphosphate (15.5 % P<sub>2</sub>O<sub>5</sub>) and 100 kg potassium sulphate (48 % K<sub>2</sub>O)/ fad./ season ] significantly increased plant height , number of branches/ plant , leaf area , leaves, stems and herb fresh and dry weights/ plant compared to the control, in most cases.*

*In general, poultry manure (PM) fertilizer at 10 and 20 m<sup>3</sup> / fad / season significantly increased number of branches/ plant , leaf area , fresh and dry weights of leaves, stems and herb / plant compared to the control. Also, plant height was significantly increased as a result of using PM at 20 m<sup>3</sup> / fad. PM at 20 m<sup>3</sup>/ fad was more effective than 10 m<sup>3</sup> / fad / season.*

*Spraying active dry yeast alone at 5 g/ L significantly increased plant height, leaf area, fresh and dry weights of leaves and herb, and dry weight of stems in the first cut of both seasons. It also significantly increased fresh weight of stems in the first season in both cuts .*

*Generally, interaction between PM fertilizer at 10 or 20 m<sup>3</sup> / fad/ season and spraying plants with active dry yeast at 5 g / L significantly increased plant height , number of branches / plant , leaf area , leaves fresh and dry weights/ plant and herb fresh and dry weights / plant in both cuts of the two seasons, compared to the control. PM at 20 m<sup>3</sup> / fad plus active dry yeast at 5 g / L was recommended.*

**Keywords:** Chemical, organic fertilizers, active dry yeast, *salvia officinalis*, yield.

## INTRODUCTION

Common sage (*Salvia officinalis*, L.) belonging to Family *Lamiaceae*. It possess carminative, antispasmodic, antiseptic, astringent, anti-oxidant, astringent ,digestive , diuretic, laxative, stomachic and antihidrotic properties (Lawless , 1992 ) and external use for inflammations of the mouth , tongue and throat and the mucous membranes of nose (Blumenthal *et al.*, 2000 ).

Many researchers stated that chemical fertilization affected the growth and chemical constituents of different aromatic plants [Sakr (2001)on *Mentha piperita*; Mohsen (2002) on *Ocimum basilicum* and Abd El–Azim (2003) on *Salvia officinalis*].

The organic fertilizers are much more likely to increase both yield and quality, at the same time providing an alternative habitat for wildlife, and producing plants that are safe flavorsome, and chemicals free [Sakr (2001) on *Mentha piperita*; Mohsen (2002)on *Ocimum basilicum* ; Naguib (2002) on *Cymbopogon flexuosus* and El – Ghadban *et. al.*, (2003 a) on *Origanum majorana*].

Yeast (natural stimulator) is one of these substances which characterized by its richness in protein, vitamin B content, thiamin, riboflavin and pyridoxines. Also yeast are prolific producers of vitamins, amino acids, hormones and other growth regulating substances (Eid, 1977). Concerning chemical analysis of the active dry yeast, Ahmed *et al.*(1997) found that it contained 34.87 % protein, 7.55 % ash, 6.54% Glycogen, 2.9 % fats and 4.92 % cellulose. Yeast contains tryptophan which consider a precursor of IAA (Moor,1979). Yeast also contains cytokinins thus delays the aging of leaves by the way of retardation the degradation of chlorophyll and enhancing the synthesis of protein and RNA ( Natio *et al.*1981 ). In this respect, many researchers stated that active dry yeast affecting growth and chemical composition of many aromatic plants [Naguib (2002) on *Cymbopogon flexuosus* ; El-Ghadban *et. al.*, (2003 b) on *Ricinus communis* and Salman (2004) on *Ocimum basilicum*].

## MATERIALS AND METHODS

The present study was conducted during the two successive seasons of 2003/2004 and 2004/2005 at the Farm of Ornamental Horticulture Department, Faculty of Agriculture, Cairo University and Medicinal and Aromatic Plants Department, Horticulture Research Institute, Agricultural Research Center, Dokki, Giza to investigate the effect of chemical fertilizers (NPK), organic manure (poultry manure) and biofertilization (active dry yeast) on sage plants (*Salvia officinalis*, L.).

Seeds of sage (*Salvia officinalis*, L.), local variety were secured from the private farm in Sheikh Zowaid , North Sinai and sown in nursery beds with a clay soil on 10<sup>th</sup> November in the two seasons . The seedlings (10-15 cm height) were transplanted in sandy loam soil on 25<sup>th</sup> February. The physical and chemical analysis of soil (Table A) and chemical analysis of the organic fertilizers (Table B) were carried out according to the method described by Jackson, 1973.

The following fertilization treatments were used:

- Control (untreated plants).

**Table (A): Physical and chemical analysis of the soil used for growing sage (*Salvia officinalis*, L.) plants, before treatments.**

1- Physical analysis											
Clay (%)			Silt (%)			Sand (%)			Texture grade		
18.5			26.3			55.2			Sandy loam		
2- Chemical analysis											
pH	EC( dS /m )	Total nutrients content (ppm)			Soluble cations Meq /L				Soluble anions Meq /L		
		N	P	K	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>++</sup>	Mg <sup>++</sup>	HCO <sub>3</sub> <sup>-</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>-</sup>
7.5	4.45	24.30	208.00	340.70	12.70	6.76	18.76	14.40	2.00	17.14	33.48

**Table (B): The chemical analysis of the organic fertilizer applied to sage ( *Salvia officinalis*, L.) plants during 2003 / 2004 and 2004/2005 seasons.**

Organic Manure Characteristics	First season	Second season
Weight of m <sup>3</sup> (kg )	688.00	534.00
Moisture content(%)	6.90	9.56
Organic matter (%)	65.69	83.61
Organic carbon (%)	36.45	49.91
Total N (%)	2.30	3.66
C : N ratio	15.4 :1	13.2 :1
NH <sub>3</sub> -N (ppm)	3021.8	3489.90
NO <sub>3</sub> N (ppm )	174.9	224.60
Total P (%)	1.19	0.75

- Chemical fertilizer (NPK) at 300 kg ammonium sulphate (20.6 %N ), 200 kg calcium superphosphate (15.5 % P<sub>2</sub>O<sub>5</sub>), and 100 kg potassium sulphate (48 % K<sub>2</sub>O)/ fad./ season .
- Poultry manure (PM) at 10 and 20 m<sup>3</sup>/ fad / season.

- Active dry yeast at the rate of 5 g/ L.
- Poultry manure (PM) at 10 m<sup>3</sup>/fad /season + 5 g active dry yeast /L .
- Poultry manure (PM) at 20 m<sup>3</sup>/fad /season + 5 g active dry yeast / L.

The NPK mixture was divided into two equal doses as a basal dressing. The first dose was applied one month after transplanting and the second one was applied after the first cut. The organic fertilizer was applied in two doses. The first dose (2/3 of the application rate) was incorporated with the soil two weeks before transplanting, and the second one was applied as a basal dressing after the first cut.

The active dry yeast at 5g/L was sprayed four times, the first was applied after 30 days from transplanting and the second was applied after 15 days of the first one, the third spray took place one month after the first cut and the fourth was applied after one month of the third spray .The plants were harvested twice (first week of June and first week of September) by cutting the herb at 10 cm above the soil surface.

The layout of the experiment was a complete randomized blocks design included seven treatments with three replicates. The experimental area was (2 x 2 m) with three rows. Each replicate contained 18 plants. The following data were recorded in each cut: Plant height , leaf area (the fifth leaf from the shoot apex ) , number of branches , herb fresh and dry weights / plant (g).

Data recorded on vegetative growth parameters were statistically analyzed using the Least Significant Difference (L.S.D.) test at 5% level, as described by Snedecor and Cochran (1980 ).

## RESULTS AND DISCUSSION

### Plant height :

Data in Table (1) showed that, in both seasons, NPK treatment increased plant height significantly over the control. The increment in plant height might be attributed to the accumulation of nutrient materials and metabolic activity. These results agreed with the findings reported by El-Ghadban (1998) on *Mentha viridis*; and Mohsen (2002) on *Ocimum basilicum* as they all indicated that NPK fertilization increased plant height.

In the two seasons, data of both cuts reveal that two rates of organic fertilizer treatments used increased plant height compared with the control. In both seasons using the higher rate of PM (20 m<sup>3</sup>/fad ) significantly increased plant height in both cuts, compared to the control. Increasing fertilizer doses gradually increased plant height. Poultry manure at the rate of 20 m<sup>3</sup>/fad was more effective than 10 m<sup>3</sup>/fad in increasing plant height. Similar results were obtained by Jacoub (1999) on *Ocimum basilicum* and *Thymus vulgaris* and Mohsen (2002) on *Ocimum basilicum* since they all showed that organic fertilizers increased plant height.

Regarding the use of active dry yeast at 5 g/L alone in the first season there was no significant increase in the plant height compared to the control in the second cut, whereas in the first cut and in the second season in both cuts, active dry yeast significantly increased plant height. These results agreed with Hussain (2002) on

**Table (1 ): Effect of chemical , organic fertilizers (PM) and active dry yeast on plant height, number of branches and leaf area of sage( *Salvia officinalis*, L. ) plants during of 2003 / 2004 and 2004 / 2005 seasons.**

Treatments	Plant height(cm)		No.branches/plant		Leaf area (cm <sup>2</sup> )	
	1 <sup>st</sup> cut	2 <sup>nd</sup> cut	1 <sup>st</sup> cut	2 <sup>nd</sup> cut	1 <sup>st</sup> cut	2 <sup>nd</sup> cut
<b>2003 /2004</b>						
<b>Control</b>	43.92	53.67	16.11	29.22	3.66	3.27
<b>NPK*</b>	57.00	54.92	22.61	33.42	4.31	3.35
<b>PM(10m<sup>3</sup>/fad )</b>	54.91	53.44	18.98	29.42	4.81	3.43
<b>PM(20m<sup>3</sup>/fad )</b>	61.61	62.60	19.90	35.61	4.68	3.50
<b>Yeast at 5 g / L</b>	51.89	53.93	17.80	32.03	4.07	3.34
<b>PM 10m<sup>3</sup>+ yeast at 5g/L</b>	59.55	65.06	19.61	35.94	5.37	4.24
<b>PM 20m<sup>3</sup>+yeast at 5g/ L</b>	65.65	72.17	22.62	39.49	5.73	4.33
<b>LSD at 0.05</b>	2.19	1.05	2.76	1.99	0.04	0.11
<b>2004 /2005</b>						
<b>Control</b>	80.44	61.42	14.89	32.29	3.10	2.71
<b>NPK*</b>	88.11	69.58	15.67	34.67	3.82	3.10
<b>PM(10m<sup>3</sup>/fad )</b>	82.33	62.94	16.89	36.91	4.07	3.45
<b>PM(20m<sup>3</sup>/fad )</b>	86.89	71.12	15.44	39.78	3.84	3.54
<b>Yeast at 5 g / L</b>	84.34	67.92	15.33	33.99	3.64	2.92
<b>PM 10m<sup>3</sup>+ yeast at 5g/L</b>	84.56	76.58	17.45	37.70	3.57	3.47
<b>PM 20m<sup>3</sup>+ yeast at 5g/L</b>	87.11	78.22	17.67	39.90	4.23	3.22
<b>LSD at 0.05</b>	3.28	2.20	1.75	1.81	0.14	0.49

NPK\* = 300 kg ammonium sulphate (20.6 %N) + 200 kg calcium superphosphate (15.5 % P<sub>2</sub>O<sub>5</sub>) + 100 kg potassium sulphate (48 % K<sub>2</sub>O)/ fad./ season.

PM= Organic fertilizers ( Poultry manure).

*Majorana hortensis*, Naguib (2002) on *Cymbopogon flexuosus* ; Salman (2004) on *Ocimum basilicum*, they all showed that active dry yeast increased plant height.

In both seasons, data of both cuts reveal that the interaction between active dry yeast at 5g/L and organic fertilizer (PM) used significantly increased plant height compared to the control . Increasing PM dose with active dry yeast at 5 g/L gradually increased plant height. Using active dry yeast at the rate of 5g/L with PM at the rate of 20 m<sup>3</sup>/fad significantly increased plant height as compared to other treatments in both cuts.

#### **Number of branches/ plant:**

The results showed that NPK fertilization significantly increased number of branches / in both cuts of seasons compared to the control. Similar results were obtained by El-Ghadban (1998) on *Mentha viridis* and *Origanum marjorana*, who stated that NPK fertilization increased number of branches/ plant.

Regarding the effect of organic fertilizer, in the first season, data reveal that two organic fertilizer treatments used significantly increased number of branches/

plant in both two cuts compared to the control. Increasing fertilizer doses gradually increased number of branches/ plant. The best results were obtained due to PM at the rate of 20 m<sup>3</sup>/fad. In the second season, in the first cut organic fertilizer at 10 m<sup>3</sup>/fad significantly increased number of branches/plant . In the second cut, PM at the rate of 10 and 20 m<sup>3</sup>/fad significantly increased number of branches/ plant. These findings confirmed the previous works of Mohsen (2002) on *Ocimum basilicum* , who showed that organic fertilization increased the number of branches / plant .

Active dry yeast at 5 g/L alone had no significant effect on the number of branches/plant in the first cut of the first season and both cuts of the second season, whereas in the second cut of the first season active dry yeast at 5 g/L significantly increased number of branches/plant . These results agreed with the findings obtained by Salman (2004) on *Ocimum basilicum*.

In both seasons, data of both cuts reveal that the interaction between active dry yeast at 5g/L and organic fertilizer (PM) used significantly increased number of branches/ plant compared to the control . Increasing PM dose from 10 to 20 m<sup>3</sup>/fad with active dry yeast at 5 g/L increased number of branches/ plant. The best results were obtained due to active dry yeast at the rate of 5gm/L with PM at the rate of 20 m<sup>3</sup>/fad.

#### **Leaf area:**

The results showed that NPK fertilizer significantly increased leaf area compared with control in the first cut in both seasons, whereas it had no significant effect on leaf area in the second cut. These results are in agreement with those obtained by Sakr (2001) on *Mentha piperita* and Mohsen (2002) on *Ocimum basilicum*.

The results showed that two doses of PM fertilizers had a significant effect in increasing leaf area in both cuts of the two seasons compared to control. Similar results were obtained by Sakr (2001) on *Mentha piperita*.

Active dry yeast alone significantly increased the leaf area compared to the control in the first cut of both seasons, while in the second cut it had no significant effect on leaf area .These results confirmed by El-Ghadban *et. al.*, (2003 b) on *Ricinus communis* and Salman (2004) on *Ocimum basilicum*.

Interaction between active dry yeast at 5g/L with organic fertilizer (PM) at 10 or 20 m<sup>3</sup>/fad significantly increased leaf area in both seasons, in the two cuts compared to the control plants. In most cases, plants received active dry yeast at the rate of 5g/L with PM at the rate of 20 m<sup>3</sup>/fad had the widest leaf area.

#### **Leaves fresh and dry weights / plant:**

The results in Tables ( 2 and 3 ) showed that ,in the first and second cuts, NPK fertilizers significantly increased leaves fresh and dry weights /plant in both seasons compared with the control. Similar results were mentioned by Mohsen (2002) on *Ocimum basilicum* and Abd-El-Azim (2003) on *Salvia officinalis*

**Table (2) : Effect of chemical , organic fertilizers (PM) and active dry yeast on leaves, stems and herb fresh weight(g /plant) of sage( *Salvia officinalis*, L. ) plants of 2003 / 2004 and 2004 / 2005 seasons.**

Treatments	Leaves F.W.		Stems F.W.		Herb F.W.	
	1 <sup>st</sup> cut	2 <sup>nd</sup> cut	1 <sup>st</sup> cut	2 <sup>nd</sup> cut	1 <sup>st</sup> cut	2 <sup>nd</sup> cut
<b>2003 /2004</b>						
Control	117.55	165.56	58.83	84.11	176.38	249.67
NPK*	230.84	257.31	95.82	127.14	326.66	384.45
PM(10m <sup>3</sup> /fad )	169.47	181.04	74.08	123.95	243.55	304.99
PM(20m <sup>3</sup> /fad )	217.58	299.58	93.25	130.42	310.83	430.00
Yeast at 5 g / L	150.88	164.60	79.54	96.40	230.42	261.00
PM 10m <sup>3</sup> + yeast at 5g/L	197.77	329.35	93.06	136.76	290.83	466.11
PM 20m <sup>3</sup> + yeast at 5g/L	234.23	388.18	115.35	169.04	349.58	557.22
LSD at 0.05	3.69	4.04	4.32	3.50	7.30	19.17
<b>2004 /2005</b>						
Control	137.31	391.52	64.36	233.34	201.67	624.86
NPK *	206.18	515.97	80.98	252.08	287.16	768.05
PM(10m <sup>3</sup> /fad )	170.70	456.68	81.53	188.32	252.22	645.00
PM(20m <sup>3</sup> /fad )	173.78	480.39	86.22	203.50	260.00	683.89
Yeast at 5 g / L	154.15	433.70	64.74	196.69	218.89	630.39
PM 10m <sup>3</sup> + Yeast at 5g/L	187.32	470.92	79.34	201.00	266.66	671.92
PM 20m <sup>3</sup> + Yeast at 5g/L	193.76	493.40	88.79	217.10	282.55	710.50
LSD at 0.05	4.42	3.29	1.97	5.93	8.38	24.34

NPK\* = 300 kg ammonium sulphate (20.6 %N) + 200 kg calcium superphosphate (15.5 %P<sub>2</sub>O<sub>5</sub>) + 100 kg potassium sulphate (48 % K<sub>2</sub>O)/ fed./ season .

PM= Organic fertilizers ( Poultry manure).

In both seasons, the data revealed that poultry manure at 10 and 20 m<sup>3</sup>/fad/season significantly increased leaves fresh and dry weights / plant compared with the control, but lower than the NPK treatment, in most cases. In both seasons, increasing PM dosage from 10 to 20 m<sup>3</sup> / fad / season gradually increased both fresh and dry weights of leaves in most cases. PM at 20 m<sup>3</sup>/fad./season treatment was more effective than 10 m<sup>3</sup> / fad / season in the two cuts in both seasons. These results confirmed by Mohsen (2002) on *Ocimum basilicum* who found that organic fertilization increased leaves fresh and dry weights.

Data revealed that active dry yeast alone at 5g/L significantly increased fresh and dry weights of leaves in the first cut of the first season, whereas it had no significant effect on both leaves fresh and dry weights in the second cut. In the second season, active dry yeast at 5 g/ L significantly increased fresh and dry weights of leaves in the two cuts compared with control. These results agreed with those obtained by Hussain (2002) on *Majorana hortensis* and Salman (2004) on *Ocimum basilicum*.

The interaction between active dry yeast and different rates of PM (10 and 20 m<sup>3</sup>/fad/season) significantly increased the leaves fresh and dry weights /plant

**Table (3) : Effect of chemical , organic fertilizers and active dry yeast on leaves, stems and herb dry weight(gm /plant) of sage( *Salvia officinalis*, L. ) plants during of 2003 / 2004 and 2004 / 2005 seasons.**

Treatments	Leaves D.W.		Stems D.W.		Herb D.W.	
	1 <sup>st</sup> cut	2 <sup>nd</sup> cut	1 <sup>st</sup> cut	2 <sup>nd</sup> cut	1 <sup>st</sup> cut	2 <sup>nd</sup> cut
<b>2003 /2004</b>						
<b>Control</b>	28.98	36.97	14.51	18.81	43.49	55.78
<b>NPK *</b>	57.33	63.92	23.78	31.49	81.11	95.41
<b>PM(10m<sup>3</sup>/fad )</b>	39.65	47.41	17.42	32.39	57.07	79.80
<b>PM(20m<sup>3</sup>/fad )</b>	48.23	73.30	20.66	32.49	68.89	105.79
<b>Yeast at 5 g/ L</b>	35.92	40.94	18.96	23.66	54.88	64.60
<b>PM 10m<sup>3</sup> + yeast at 5g/L</b>	49.08	77.30	23.14	32.16	72.22	109.46
<b>PM 20m<sup>3</sup> + yeast at 5g/L</b>	61.26	100.92	30.21	43.95	91.47	144.87
<b>LSD at 0.05</b>	4.05	7.53	3.08	7.46	3.69	10.25
<b>2004 /2005</b>						
<b>Control</b>	37.08	134.47	17.38	80.09	54.46	214.56
<b>NPK *</b>	57.05	165.11	22.89	80.64	79.94	245.75
<b>PM(10m<sup>3</sup>/fad )</b>	48.64	139.54	23.26	57.84	71.90	197.38
<b>PM(20m<sup>3</sup>/fad )</b>	48.36	163.36	24.01	69.19	72.37	232.55
<b>Yeast at 5 g/ L</b>	46.97	143.56	19.82	65.27	66.79	208.83
<b>PM 10m<sup>3</sup> + yeast at 5g/L</b>	51.47	137.32	21.82	58.60	73.29	195.92
<b>PM 20m<sup>3</sup> + yeast at 5g/L</b>	51.69	161.83	21.69	74.65	73.38	236.48
<b>LSD at 0.05</b>	3.79	4.53	1.96	5.07	4.12	7.99

NPK\* = 300 kg ammonium sulphate (20.6 %N) + 200 kg calcium superphosphate (15.5 %P<sub>2</sub>O<sub>5</sub>) + 100 kg potassium sulphate (48 % K<sub>2</sub>O)/ fed./ season .

PM= Organic fertilizers ( Poultry manure).

compared with the control in the first and second cuts of both seasons, except PM at 10 m<sup>3</sup> /fad /season combined with active dry yeast at 5 g/L in the second cut of the second season which insignificantly increased leaves dry weight /plant.

#### **Stems fresh and dry weights/ plant:**

Data in Tables (2 and 3) showed that NPK fertilizers significantly increased stems fresh and dry weights /plant in the first and second seasons compared to the control plants in both cuts, except in the second cut of the second season which gave insignificantly heavier dry weight of stems compared with the untreated plants. Similar results were mentioned by Mohsen (2002) on *Ocimum basilicum* and Abd El-Azim (2003) on *Salvia officinalis*.

Organic manure (PM) at 10 and 20 m<sup>3</sup>/fad/season significantly increased stems fresh and dry weights /plant compared to of the control plants in the first season in both cuts (except with plants received 10 m<sup>3</sup>/fad/season, giving insignificantly heavier dry weight of stems in the first cut ) and in the first cut of the second season



only. Poultry manure at 10 and 20 m<sup>3</sup>/fad/season significantly decreased fresh and dry weights of stems /plant in second cut of the second season compared with the control. Similar increase in stems fresh and dry weights as a result of organic fertilization was reported by El- Gendy *et. al.* (2001) on *Ocimum basilicum*.

Data revealed that active dry yeast alone at 5g/L significantly increased stems fresh weight /plant in the first season only. In the second season, active dry yeast at 5gm/L had no effect on stem fresh weight in the first cut, while it significantly reduced the stems fresh weight compared with the control in the second cut. Also it can be noticed that, active dry yeast at 5 g / L significantly increased stems dry weight in the first cut of both seasons . On contrast , spraying yeast at 5 g /L insignificantly increased dry weight of stems in the second cut of the first season, whereas it decreased stems dry weight significantly in the second cut of the second season. The increase in both fresh and dry weights of stems as a result of spraying yeast is in agreement with the findings obtained by Naguib (2002) on *Cymbopogon flexuosus* and Salman (2004) on *Ocimum basilicum*.

The interaction between active dry yeast and different rates of PM (10 and 20 m<sup>3</sup>/fad) significantly increased the stems fresh and dry weights /plant in the first season ( in both two cuts)and in the first cut of the second season, compared to the control. Increasing PM rate from 10 m<sup>3</sup> / fad to 20 m<sup>3</sup> / fed/ season alone or combined with active dry yeast at 5 g/ L gradually increased fresh and dry weights of stems/ plant. On the contrary, PM fertilizer at 10 and 20 m<sup>3</sup>/fed combined with active dry yeast at 5gm/L significantly decreased stem fresh and dry weights in the second cut of the second season compared with the control. In most cases, PM rate from at 20 m<sup>3</sup> / fed/ season combined with active dry yeast at 5 gm / L significantly increased stem fresh and dry weights, compared to other treatments.

#### **Herb fresh and dry weights / plant:**

Data in Tables ( 2 and 3) showed that NPK dose significantly increased herb fresh and dry weights compared with the control plants in both cuts and second seasons. This effect confirmed the role of the nutrition in increasing the growth of plants such as fresh and dry matter. The favourable effect of NPK fertilization treatments on the vegetative growth characteristics (compared to the control) can be attributed to the important role played by N, P and K in the physiological processes within the plant, which in turn affect the growth of the vegetative and root systems. Also, nitrogen is present in the structure of protein molecules, while phosphorus is an essential constituent of nucleic acids and phospholipids, and potassium is essential as an activator for enzymes involved in the synthesis of certain peptide bonds (Devlin, 1975). Similar results were mentioned by Sakr (2001) on *Mentha piperita*, and Mohsen (2002) on *Ocimum basilicum* ,they indicated that NPK fertilization increased herbage fresh and dry weights per plant.

The data indicated that PM doses (10 and 20 m<sup>3</sup>/fad/season) significantly increased herb fresh and dry weights over the control plants (except PM fertilizer at 10 m<sup>3</sup> / fad / season in the second cut of the second season). Poultry manure at 20 m<sup>3</sup>/fad/ season was more effective than 10 m<sup>3</sup>/fad/ season because of giving the higher

values in both cuts in the first and second seasons. The favorable influence of organic manures (including poultry manure) on vegetative growth may be attributed to their effects on the soil, such as improving some of its chemical and physiochemical properties, improving water use efficiency (Wallace, 1994 a), preventing salt injury to plants that sometimes results from concentration of chemical fertilizers through the buffering properties of organic matter (Wallace, 1994 b), and providing the soil with essential macro and micronutrients (Awad *et al.*, 1993). Also, the addition of manures to the soil increases its cation exchange capacity (CEC) due to the ability of the negatively charged organic matter particles to attract and hold the positively charged cation in the soil, and to provide the plant roots with these cation. Moreover, the addition of manures to the sandy soil increases the soil's water-holding capacity which, in turn, allows higher absorption of water and nutrients from the soil, and enables photosynthesis to occur efficiently within the plant leaves (Hartmann *et al.*, 1981). These results agreed with those obtained by El-Gendy *et al.*, (2001) on *Ocimum basilicum*; Sakr (2001) on *Mentha piperita* and Mohsen (2002) on *Ocimum basilicum*.

The data revealed that active dry yeast alone at 5 g/ L had a significant effect on increasing herb fresh and dry weights / plant in the first cut of both seasons. On the other hand, in the second cut of both seasons active dry yeast had no significant effect on herbage fresh and dry weights compared to the control. These results agreed with the findings obtained by Hussain (2002) on *Majorana hortensis* and Salman (2004) on *Ocimum basilicum*.

The interaction between active dry yeast at 5 g/ L and PM fertilizer at 10 and 20 m<sup>3</sup>/fad/season significantly increased the herb fresh and dry weights over the control in both cuts of the two seasons, except PM at 10m<sup>3</sup> / fad combined with yeast at 5 g/ L which significantly decreased herb dry weight in the second cut of the second season. Poultry manure at 20 m<sup>3</sup>/fad combined with yeast at 5 g/L significantly increased herb fresh and dry weights as compared to other treatments in both cuts, in the first season.

### **Recommendation:**

From the above mentioned results, it can be recommended that, sage (*Salvia officinalis*, L.) plants should be fertilized with poultry manure at 20 m<sup>3</sup>/fad / season combined with active dry yeast at 5 g/L for high vegetative growth and yield.

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## تأثير التسميد الكيماوي والعضوي والرش بالخميرة علي نباتات المريمية أ- التأثير علي النمو والمحصول.

أحمد سلامه الليثي\* - محمد موسى محمد حسين\* - الموافي عبده الموافي الغضبان\*\* - إسراء سالم محمد عبد اللطيف\*\*

\* - قسم بساتين الزينة- كلية الزراعة - جامعة القاهرة.

\*\* - قسم النباتات الطبية والعطرية- معهد بحوث البساتين- مركز البحوث الزراعية - الدقي.

أجريت هذه الدراسة خلال موسمين متتاليين ٢٠٠٣/٢٠٠٤ و ٢٠٠٤/٢٠٠٥ بمزرعة قسم بساتين الزينة - كلية الزراعة جامعة القاهرة ، وقسم النباتات الطبية والعطرية ، معهد بحوث البساتين ، مركز البحوث الزراعية- الدقي - الجيزة ، بهدف دراسة تأثير التسميد الكيماوي والعضوي (سماد الدواجن) والرش بالخميرة علي نباتات المريمية. وأوضحت النتائج مايلي:

أدي التسميد الكيماوي بالنتروجين والفسفور والبوتاسيوم بمعدل [٣٠٠ كجم سلفات الأمونيوم (٢٠.٦ % ن) + ٢٠٠ كجم سوبر فوسفات الكالسيوم الأحادي (١٥.٥ % فوسفات) + ١٠٠ كجم سلفات البوتاسيم (٤٨ % بوز) / فدان/ موسم ] إلي زيادة معنوية في ارتفاع النبات ، عدد الأفرع / نبات، مساحة الورقة ، الوزن الطازج والجاف للأوراق والسيقان والعشب مقارنة بالكنترول في معظم الأحيان.

بصفة عامة أدي التسميد العضوي بسماد الدواجن بمعدل ١٠ ، ٢٠ م<sup>٣</sup> / فدان / موسم إلي زيادة معنوية في عدد الأفرع / نبات، مساحة الورقة ، الوزن الطازج والجاف للأوراق والسيقان والعشب مقارنة بالكنترول. أيضا حدثت زيادة معنوية في ارتفاع النبات نتيجة لاستخدام سماد الدواجن بمعدل ٢٠ م<sup>٣</sup> / فدان. وكانت المعاملة بالمعدل الأعلى (٢٠ م<sup>٣</sup> / للفدان / موسم) أكثر تأثيرا من المعدل الأقل (١٠ م<sup>٣</sup> / للفدان / موسم).

أدي الرش بالخميرة بتركيز ٥ جرام/ لتر إلي زيادة معنوية في طول النبات، مساحة الورقة والوزن الطازج والجاف للأوراق والعشب والوزن الجاف للسيقان في الحشة الأولى في كلا الموسمين ، الوزن الطازج للسيقان في الموسم الأول في كلا الحشتين .

بصفة عامه أدي التداخل بين التسميد العضوي بسماد الدواجن بمعدل ١٠ أو ٢٠ م<sup>٣</sup> / فدان/ موسم مع رش النباتات بالخميرة بمعدل ٥ جرام/ لتر إلي زيادة معنوية في ارتفاع النبات ، عدد الأفرع / نبات، مساحة الورقة ، الوزن الطازج والجاف للأوراق والعشب في كلا الحشتين في الموسمين مقارنة بالكنترول. ويمكن التوصية بتسميد نبات المريمية بسماد الدواجن بمعدل ٢٠ م<sup>٣</sup> / فدان/ موسم مع الرش بالخميرة بمعدل ٥ جرام / لتر.