

EFFECT OF ORGANIC FERTILIZER AND EM1 ON GROWTH AND YIELD OF TWO LETTUCE CULTIVARS (*LACTUCA SATIVA* L.) ON GREENHOUSE CONDITIONS

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ABSTRACT

The study was conducted to observe the effects of Organic fertilizer and EM1 on growth and yield of two lettuce cultivars in the greenhouse conditions during 2011 growing season. The experiment was performed by Randomized Complete Block Design (RCBD) consisted of four levels of EM1 (0, 500, 1000, 1500) ml.l⁻¹, Organic fertilizer (without and with fertilizer) and two lettuce cultivars (Syrian and Local cv.). The results showed that cultivar Syrian significantly increased plant height (cm), leaves number plant⁻¹, and head circumference (cm) while Local cv. significantly increased stem length (cm), chlorophyll% and dry weight (g). Organic fertilizer increased head circumference (cm), head weight (kg) and total yield (t.ha⁻¹). EM1 at concentration 1500 ml.l⁻¹ significantly increased, plant height (cm), leaves number plant⁻¹, head circumference (cm), dry weight (g), head weight (kg) and total yield (t.ha⁻¹). The interactions among three factors caused positive significant differences in all vegetative and yield characteristics.

KEYWORDS: lettuce, Em1 and Organic fertilizers

INTRODUCTION

Lettuce (*Lactuca sativa* L.), is annual leafy vegetable belonging to the family compositae. It is one of the most popular salad crops which mainly grows in temperate regions and in some cases in the tropic and sub-tropic regions of the world. The best temperature for growing of lettuce is 18-25 C° and the night temperature is 10-15C° (Ryder, 1998). The nutrient value of lettuce is very high it contains calcium, phosphorus, iron, protein, carbohydrate, fat and vitamin A and C (Gopalan and Balaraman, 1966). Lettuce is also known as anodyne, diuretic, sedative and expectorant (Kallo, 1986).

Organic agriculture is one among the broad spectrum of production methods that are supportive of the environment (clean agriculture) in addition to organic fertilizer was complete fertilizer and rich in all nutrient elements required for plant, it is considered as storage of nutrient element essential element NPK and trace elements and maintain the soil humidity specially light soil that reduce from water

consumption and heating soil and improving physical soil characteristics and improving the chemical and biological characteristics of soil (Molvik 2001 and Grandy *et al.*, 2002).

Generally crop growth with microorganism application lead to gradual increasing as subsequent crops are grown (Javaid *et al.* 2000). Ahmed *et al.* (2000) resulted in significant increases in shoot height, number of leaves and fresh weight. Chantal *et al.* (2010) carried out a study to evaluate the effect of EM on leaf area and photosynthesis of cabbage vegetable comparatively to nitrogen (N) and phosphorus (P) fertilizers. They showed an increase on leaf area for EM treatment and significant differences for EM improved photosynthesis, a better photosynthetic capacity with an increased leaf area. Since a limited studies or no studies have been carried out in this regard in Iraq especially Iraqi Kurdistan, this experiment was conducted to study the effect of EM1 and organic fertilizer on growth and yield of lettuce.

MATERIAL AND METHODS

The experiment was carried out in horticulture Department (plastic house), College of Agricultural Engineering Sciences, Duhok University, during winter season of 2011 to test the effect of organic fertilizer (sheep residues) and EM1 on growth and yield of lettuce Syrian and local cultivars. The seed were sown in the nursery on 1st November and were transplanted on 1st December at distance of 20 cm on lines with 75 cm distance. Each experiment unit contains three lines, 2 m long.

The experiment include three factors, the first was two cultivars Syrian and Local cv., the second was organic fertilizer with and without organic fertilizer(0 and 25 t.ha⁻¹), the third factor was EM1 at four levels (0.0, 500, 1000 and 1500 ml.l⁻¹). The number of treatment were (2*4*2) =16 treatments. Organic fertilizer was added before planting of seedling, while EM1 was used after two weeks from seedling and the second time was after two weeks from first time. The experiment designed according F-RCBD with three replications and the data were analyzed by using SAS program (SAS, 2001) and treatments means were compared using Duncan's Multiple Range test at 0.05 level of probability.

Experiment measurements:-

Vegetative trials: five plants were chosen randomly from each experiment unit to measure: plant height (cm), Number of leaves, stem length (cm), stem circumference (cm). %chlorophyll content and TSS%

Yield trials: five heads were chosen randomly from each exp. unit to measure: dry weight (g), head circumference (cm) head weight (kg) and total yield (t.ha⁻¹).

RESULTS

Table (1) showed that Syrian cultivar had more significant difference to Local cultivar on plant height (45.46 cm), while organic fertilizer had no significant effects. The height of the plant was significantly affected by all EM1 concentrations as compared with control.

For the interactions table showed that the organic fertilizer with Syrian cv. gave the highest significant value (46.38 cm). While interaction between EM1 and cultivars showed that EM1 at 1500 ml.l⁻¹ and Syrian cultivar gave the highest value (46.25 cm). The interaction between EM and organic fertilizer had significant effect compared with control. The triple interaction among three factors, organic fertilizer with EM1 at 1000 ml.l⁻¹ and Syrian cultivar gave the highest significant value (47.17 cm).

Table(1):- Effect of Organic Fertilizer, EM1 and their interaction on plant height (cm). of two lettuce cultivars.

Cultivars	Organic Fertilizer (t.ha ⁻¹)	EM (ml.l ⁻¹)				Var. x Org.	Main effect of Var.
		0	500	1000	1500		
Syrian	0	43.00 c-e	45.33 a-c	44.17b-d	45.67ab	44.54 b	45.46 a
	25	45.17 a-c	46.33 ab	47.17 a	46.83 a		
Local	0	40.50 e	44.67 a-c	47.00 a	43.83 c-e	44.00 bc	43.48 b
	25	42.83 c-e	44.17 b-d	43.00 c-e	41.83 ed		
Var. x EM.	Syrian	44.08 ab	45.83 ab	45.67 ab	46.25 a	Main effect of Org.	
	Local	41.67 d	44.42 bc	45.00 bc	42.83 cd		
EM. x Org.	0	41.75 b	45.00 a	45.58 a	44.75 a	44.27 a	
	25	44.00 a	45.25 a	45.08 a	44.33 a		44.67 a
Main effect of EM.		42.87 b	45.13 a	45.33 a	44.54 a		

Means within a column, row and their interactions followed with the same letter are not significantly different from each other according to Duncan multiple range test at 0.05 probability level.

Data on table (2) observed that Syrian cv. significantly superior the Local cv. (33.79 plant⁻¹), there were no significant effect by organic fertilizer while using EM1 gave significant influence at all concentrations.

The high interaction difference was from the treatment of Syrian cv. without organic fertilizer gave the highest number of leaves plant⁻¹

(36.33), Syrian cv. and EM1 at 1500 ml.l⁻¹ gave the maximum leaves number plant⁻¹ (38.83), and interaction between without organic fertilizer and 1500 ml.l⁻¹ EM significantly increased leaves number plant⁻¹ (38.33). The highest leaves number was obtained from the interaction among Syrian cv. and EM1 at 1500 ml.l⁻¹ without adding organic fertilizer (39.67).

Table(2):- Effect of Organic Fertilizer, EM1 and their interaction on leaves number plant⁻¹ of two lettuce cultivars.

Cultivars	Organic Fertilizer (t.ha ⁻¹)	EM1 (ml.l ⁻¹)				Var. x Org.	Main effect of Var.
		0	500	1000	1500		
Syrian	0	29.33 d	39.33 a	37.00 a-c	39.67 a	36.33 a	36.13 a
	25	34.00 a-d	34.00 a-d	37.67 ab	38.00 ab	35.92 a	
Local	0	31.67 cd	35.00 a-d	35.33 a-c	37.00 a-c	34.75ab	33.79 b
	25	33.00 b-d	32.67 b-d	32.33 b-d	33.33 b-d	32.83 b	
Var. x EM.	Syrian	31.67 c	36.67 ab	37.33 ab	38.83 a	Main effect of Org.	
	Local	32.33 c	33.83 bc	33.83 bc	35.17 a-c		
EM. x Org.	0	30.50 c	37.17 ab	36.17 ab	38.33 a	35.54 a	
	25	33.50 bc	33.33 bc	35.00 ab	35.67 ab	34.38 a	
Main effect of EM.		32.00 b	35.25 a	35.58 a	37.00 a		

Means within a column, row and their interactions followed with the same letter are not significantly different from each other according to Duncan multiple range test at 0.05 probability level.

Table (3) showed that there were significant differences between cultivars on stem length cm, organic fertilizer and EM1 effects showed that control treatment gave the highest stem length (7.66 and 7.36 cm) respectively.

Di interaction Local cv. with no adding organic fertilizer gave the highest stem length (9.77 cm) and Local cv. with no adding EM1

gave stem length of (8.92 cm) while the treatment of no adding both organic fertilizer and EM1 gave the highest stem length (9.08 cm). Triple interaction, the superior treatment was from Local cv. and with no adding organic fertilizer and EM1 which gave the highest stem length (12.33 cm).

Table(3):- Effect of Organic Fertilizer, EM1 and their interaction on stem length (cm) of two lettuce cultivars

Cultivars	Organic fertilizer (t.ha ⁻¹)	EM1 (ml.l ⁻¹)				Var. x Org.	Main effect of Var.
		0	500	1000	1500		
Syrian	0	5.83 c-e	5.17 d-f	5.57 c-f	5.67 c-f	5.56 b	5.38 b
	25	5.77 c-f	5.27 d-f	5.20 d-f	4.57 ef	5.20 b	
Local	0	12.33 a	11.30 a	9.80 b	5.63 c-f	9.77 a	7.74 a
	25	5.50 c-f	4.40 f	6.77 c	6.17 cd	5.71 b	
Var. x EM.	Syrian	5.80 c	5.22 c	5.38 c	5.12 c	Main effect of Org.	
	Local	8.92 a	7.85 b	8.28 ab	5.90 c		

EM. x Org.	0	9.08 a	8.23 ab	7.68 b	5.65 cd	7.66 a
	25	5.63 cd	4.83 d	5.98 c	5.37 cd	5.45 b
Main effect of EM.		7.36 a	6.53 b	6.83 ab	5.51 c	

Means within a column, row and their interactions followed with the same letter are not significantly different from each other according to Duncan multiple range test at 0.05 probability level.

Table (4) showed that there were no significant differences in stem circumference between both cultivars, and organic fertilizer, while EM1 at 500 ml.l⁻¹ gave higher stem circumference (31.80 cm).

The interaction between Local cv. and without fertilizer gave the highest value (31.77 cm), also the interaction between Local cv. and

EM1 at 500 ml⁻¹ gave the highest stem circumference (34.84 cm), interaction between without fertilizer and 500 ml.l⁻¹ EM gave highest significant effect (36.76 cm). Triple interaction gave the better result since the treatment Local cv. with EM1 at concentration of 500 ml.l⁻¹ and without adding organic fertilizer gave the highest value (44.53 cm).

Table(4):- Effect of Organic Fertilizer, EM1 and their interaction on stem circumference (cm) of two lettuce cultivars.

Cultivars	Organic fertilizer (t.ha⁻¹)	EM1(ml.l⁻¹)				Var. x Org.	Main effect of Var.
		0	500	1000	1500		
Syrian	0	26.88 e-h	28.99 de	31.35 c	29.40 cd	29.15 b	29.03 a
	25	27.46 dh	28.52 d-g	26.08 g-i	33.58 b	28.91 b	
Local	0	26.40 f-h	44.53 a	27.37 d-h	28.77 d-f	31.77 a	28.52 a
	25	23.75 i	25.14 hi	26.74 e-h	25.46 hi	25.27 c	
Var. x EM.	Syrian	27.17 c	28.75 c	28.71 c	31.49 b	Main effect of Org.	
	Local	25.08 d	34.84 a	27.06 c	27.11 c		
EM. x Or.	0	26.64 c	36.76 a	29.36 b	29.09 b	30.46 a	
	25	25.60 c	26.83 c	26.41 c	29.52 b	27.09 b	
Main effect of EM.		26.12 d	31.80 a	27.89 c	29.30 a		

Means within a column, row and their interactions followed with the same letter are not significantly different from each other according to Duncan multiple range test at 0.05 probability level.

Table (5) showed that Local cv. had a superior difference compared with Syrian cv. (34.29 %). and there were no significant differences due to adding both organic fertilizer and EM1. Interaction between Local cv. and organic fertilizer significantly increased chlorophyll% (35.14), interaction between Local

Cultivar and 500 ml.l⁻¹EM1 gave the highest value (35.77%). Interaction between EM1 with organic fertilizer had no significant effects. While the triple interaction among Local cultivar, 25 t.ha⁻¹ organic fertilizer and 500 ml.l⁻¹ EM1 obtain the high chlorophyll percentage (36.27).

Table(5):- Effect of Organic Fertilizer, EM and their interaction on chlorophyll% of two lettuce cultivars.

Cultivars	Organic fertilizer (t.ha ⁻¹)	EM1(ml.l ⁻¹)				Var. x Org.	Main effect of Var.
		0	500	1000	1500		
Syrian	0	28.47 b-d	31.63 a-d	30.73 a-d	27.70 cd	29.63 b	29.51 b
	25	31.67 a-d	25.83 d	29.63 a-d	30.43 a-d	29.39 b	
Local	0	29.83 a-d	35.27 ab	35.57 a	33.10 a-c	33.44 a	34.29 a
	25	34.33 a-c	36.27 a	35.20 ab	34.77 ab	35.14 a	
Var. x EM.	Syrian	30.07 bc	28.73 c	30.18 bc	29.07 c	Main effect of Org.	
	Local	32.08 a-c	35.77 a	35.38 a	33.93 ab		
EM. x Org.	0	29.15 a	33.45 a	33.15 a	30.40 a	31.54 a	
	25	33.00 a	31.05 a	32.42 a	32.60 a	32.27 a	
Main effect of EM.		31.08 a	32.25 a	32.78 a	31.50 a		

Means within a column, row and their interactions followed with the same letter are not significantly different from each other according to Duncan multiple range test at 0.05 probability level.

Table (6) showed that there were no significant differences in TSS% due to cultivars, organic fertilizer and EM1. The interaction between Syrian cv. and organic fertilizer gave the highest significant value (2.32%). While the interaction between cultivars and organic fertilizer had no significant effect, the interaction

between organic fertilizer and EM1 at concentration of 500 ml.l⁻¹ gave the highest value (2.37%), while the triple interaction among all three factors, treatment Syrian cv. with organic fertilizer and EM1 at a concentration of 500 ml.l⁻¹ gave the highest significant value (2.57%).

Table(6):- Effect of Organic Fertilizer, EM1 and their interaction on TSS% of two lettuce cultivars

Cultivars	Organic fertilizer (t.ha ⁻¹)	EM1(ml.l ⁻¹)				Var. x Org.	Main effect of Var.
		0	500	1000	1500		
Syrian	0	2.00 ab	2.00 ab	1.97 ab	2.00 ab	1.99 ab	2.15 a
	25	2.17 ab	2.57 a	2.57 ab	1.97 ab	2.32 a	
Local	0	2.00 ab	1.50 b	1.83 ab	2.17 ab	1.88 b	1.95 a
	25	1.83 ab	2.17 ab	1.90 ab	2.17 ab	2.02 ab	
Var. x EM.	Syrian	2.08 a	2.28 a	2.27	1.98 a	Main effect of Org.	
	Local	1.92 a	1.83 a	1.87 a	2.17 a		
EM. x Org.	0	2.00 ab	1.75 b	1.90 ab	2.08 ab	1.93 a	
	25	2.00 ab	2.37 a	2.23 ab	2.07 ab	2.17 a	
Main effect of EM.		2.00 a	2.06 a	2.07 a	2.08 a		

Means within a column, row and their interactions followed with the same letter are not significantly different from each other according to Duncan multiple range test at 0.05 probability level.

Table (7) showed that local cv. significant increased dry weight (3.05 g). While organic fertilizer had no significant difference. Using

1500 ml.l⁻¹ EM1 gave the height dry weight (3.41 g),.

The interaction showed significant effect between Local cv. and organic fertilizer (3.17 g),

Local cv. and EM1 at concentration of 1500 ml⁻¹ which gave the highest value (3.82 g), without adding organic fertilizer and EM at concentration 1500 ml.l⁻¹ gave the high dry weight (3.74 g). In addition we obtained the

highest dry weight (4.63 g) from triple interaction among Local cv. with EM1 at concentration of 1500 ml⁻¹ and no adding organic fertilizer.

Table(7):- Effect of Organic Fertilizer, EM and their interaction on dry weight (g) of two lettuce cultivars.

Cultivars	Organic fertilizer (t.ha ⁻¹)	EM1(ml.l ⁻¹)				Var. x Org.	Main effect of Var.
		0	500	1000	1500		
Syrian	0	2.98 b-e	2.52 e-h	2.52 e-h	2.84 c-f	2.72 bc	2.63 b
	25	1.97 h	2.50 e-h	2.61 d-g	3.13 b-d	2.55 c	
Local	0	2.33 f-h	2.63 c-g	2.13 f-h	4.63 a	2.93 ab	3.05 a
	25	3.03 b-e	3.20 be	3.43 b	3.01 b-e	3.17 a	
Var. x EM.	Syrian	2.47 d	2.51 d	2.57 cd	2.99 b	Main effect of Org.	
	Local	2.68 b-d	2.92 bc	2.78 b-d	3.82 a		
EM. x Org.	0	2.66 c-e	2.58 de	2.33 e	3.74 a	2.82 a	
	25	2.50 de	2.85 b-d	3.02 bc	3.07 b	2.86 a	
Main effect of EM.		2.58 b	2.71 b	2.67 b	3.41 a		

Means within a column, row and their interactions followed with the same letter are not significantly different from each other according to Duncan multiple range test at 0.05 probability level.

The result on table (8) showed that the Syrian cv. significantly affected on head circumference (114.63 cm), and organic fertilizer gave significant difference (113.72 cm) compared to control, also EM (500 and 1500) ml.l⁻¹ significantly increased head circumference (113.15 and 115.25 cm) respectively .

The interactions between Syrian cv. and organic fertilizer gave the highest value (117.63

cm), the interaction between Syrian cv. and 1500 ml.l⁻¹ EM gave the highest significant effect (128.63 cm), also interaction between organic fertilizer and 1500 ml.l⁻¹ EM1 increased head circumference (123.58 cm) as compared with control.

The interaction among Syrian cv. with organic fertilizer, and EM1 1500 ml.l⁻¹ gave the highest head circumference (140.33 cm).

Table (8):- Effect of Organic Fertilizer, EM1 and their interaction on head circumference (cm) of two lettuce cultivars.

Cultivars	Organic Fertilizer (t.ha ⁻¹)	EM1 (ml.l ⁻¹)				Var. x Org.	Main effect of Var.
		0	500	1000	1500		
Syrian	0	95.53 e	139.25 a	94.82 e	116.92 b	111.63 b	114.63a
	25	102.29 b-d	113.84 bc	114.04 bc	140.33 a	117.63 a	
Local	0	94.23 e	94.24 e	99.39 de	96.93 e	96.20 c	103.01b
	25	111.73 b-d	105.29 b-e	115.44 bc	106.8b-e	109.82 b	
Var. x	Syrian	98.91 b	126.55 a	104.43 b	128.63 a	Main effect of	

EM.	Local	102.98 b	99.76 b	107.42 b	101.88 b	Org.
EM.	0	94.88 d	116.74 ab	97.11 d	106.93 c	103.91 b
x Org.	25	107.01 c	109.57 bc	114.74 bc	123.58 a	113.72 a
Main effect of EM.		100.94 b	113.15 a	105.92 b	115.25 a	

Means within a

column, row and their interactions followed with the same letter are not significantly different from each other according to Duncan multiple range test at 0.05 probability level.

Table (9) showed that there were no significant differences between both cultivars on head weight, application organic fertilizers significantly increased head weight (0.57 kg). Using 1500 ml.l⁻¹ EM1 gave the maximum head weight (0.56 kg).

The interaction between organic fertilizer with Syrian gave the highest significant value (0.57 kg), Syrian treated with EM1 at (1500

ml.l⁻¹ gave significant differences (0.59 kg). The interaction between EM and organic fertilizer significantly increased head weight compared to the control. The triple interaction among three factors also show significant difference between the treatments. The best treatment was from organic fertilizer and EM1 at 1500 ml⁻¹ and Syrian (0.66 kg).

Table(9):- Effect of Organic Fertilizer, EM1 and their interaction on head weight (kg) of two lettuce cultivar.

Cultivars	Organic Fertilizer (t.ha ⁻¹)	EM1(ml.l ⁻¹)				Var. x Org.	Main effect of Var.
		0	500	1000	1500		
Syrian	0	0.46 bc	0.52 bc	0.58 ab	0.53 a-c	0.52 ab	0.55 a
	25	0.57 ab	0.50 bc	0.55 ab	0.66 a	0.57 a	
Local	0	0.41 c	0.56 ab	0.47 bc	0.53 a-c	0.49 b	0.53 a
	25	0.57 ab	0.58 ab	0.58 ab	0.53 a-c	0.57 a	
Var. x EM.	Syrian	0.51 ab	0.51 ab	0.57 ab	0.59 a	Main effect of Org.	
	Local	0.49 b	0.57 ab	0.53 ab	0.53 ab		
EM. x Org.	0	0.43 b	0.54 a	0.52 a	0.53 a	0.51 b	
	25	0.57 a	0.54 a	0.57 a	0.60 a	0.57 a	
Main effect of EM.		0.50 b	0.54 ab	0.55 ab	0.56 a		

Means within a column, row and their interactions followed with the same letter are not significantly different from each other according to Duncan multiple range test at 0.05 probability level.

Table (10) observed that there were no significant differences between both cultivars, organic fertilizer increased total yield (33.44 t.ha⁻¹) as compared with control. EM1 at concentration 1500 ml.l⁻¹ gave the maximum total yield (32.85 t.ha⁻¹)

The interaction between Syrian and organic fertilizer gave the highest significant total yield

(33.44 t.ha⁻¹), Syrian treated with EM1 at (1500 ml.l⁻¹ gave significant differences (34.61t.ha⁻¹). While interaction between EM and organic fertilizer significantly increased total yield compared to control. The best triple treatment was from Syrian, organic fertilizer and EM1 at 1500 ml.l⁻¹ (38.72 t.ha⁻¹).

Table(10):- Effect of Organic Fertilizer, EM1 and their interaction on total yield (t.ha⁻¹) of two lettuce cultivars.

///	Organic fertilizer (t.ha ⁻¹)	EM1(ml.l ⁻¹)				Var. x Org.	Main effect of Var.
		0	500	1000	1500		
Syrian	0	26.99 bc	30.51 bc	34.03 ab	31.09 a-c	30.66 ab	32.05 a
	25	33.44 ab	29.33 bc	32.27 ab	38.72 a	33.44 a	
Local	0	24.05 c	32.85 ab	27.57 bc	31.09 a-c	28.89b	31.02 a
	25	33.44 ab	34.03 ab	34.03 ab	31.09 a-c	33.15 a	
Var. x EM.	Syrian	29.92 ab	29.92 ab	33.44 ab	34.61 a	Main effect of Org.	
	Local	28.75 b	33.44 ab	31.09 ab	31.09 ab		
EM. x Org.	0	25.23 b	31.68 a	30.51 a	31.09 a	29.92 b	
	25	33.44 a	31.68 a	33.44 a	35.20 a	33.44 a	
Main effect of EM1.		29.33 b	31.68 ab	32.27 ab	32.85 a		

Means within a column, row and their interactions followed with the same letter are not significantly different from each other according to Duncan multiple range test at 0.05 probability level.

DISCUSSIONS

The increase in vegetative growth occurred by adding FM1 and organic fertilizer may be attributed to the role of organic fertilizer on improving soil fertility and increasing the availability of nutrient elements and consequently increased plant growth and may be due to increase the nutrient elements(N,P,K and Ca), which affect plant growth.

Applying compost improved the physical conditions of soil, providing the energy necessary of micro organism's activity and increasing the availability and up take of nutrients, which was positively reflected on the vegetative growth (Bayoumi, 2005).

The EM1 leads to the activation of photosynthetic processes in plant weight (Winget and Gold, 2007). The improvement in growth characters may be due to the fact that the use of EM enhances the beneficial microbes in the environment and can improve the photosynthetic efficiency due to an increase in nutrient availability. Applying EM with organic fertilizers promotes root growth and activity, and enhance photosynthetic efficiency and capacity (Vessey, 2003). Application of organic fertilizer and EM1 enhance plant growth which take place from promoting the uptake of nutrients and consequently on total yield and its component (Zhang *et al.*, 2003).

The significant beneficial effects of EM could be due to the interactions among beneficial

organisms, the organic matter and metabolic substance included in EM or its capacity to produce these growth promoters subsequently (Yamada *et al.*, 1996). Azarmi *et al.*, (2009) state that the highest yield and improved quality characters were obtained when cucumber plant treated with organic fertilizer (sheep manure). organic fertilizer is considered the consider source of macro and micro elements that are necessary for plant growth and proved the soil with humus that enhance the physical characters of soil and their ability to absorption water and restored it, also reduce the loss of nutrient elements and increase the activity of micro organisms, and gave high yield with good qualities (Molvik, 2001 and Grandy *et al.*, 2002). El-Bassiony *et al.*, (2010) mentioned that EM improved the quality of crop production. They reported that the uses of EM enhanced the yield of bean due to greater rates of photosynthesis and dry matter accumulation. Salib and Abd-El Rasoul (2003) recorded that the high response of crop seed yield to EM application can be explained on the basis that EM increase germination, stimulants the photosynthesis process and enhance the enzymes activities.

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كارتیکرنا زبلی گیانه و هرا و EM1 ل سهر كه سكاتی و بهرهمی دوو جورین خهسی
(*Lactuca sativa* L.) لبن كاودانین خانینی پلاستیکی

پوخته

ئهف فهكولینه یا هاتیه ئه نجامدان ژبو دیاركرنا كارتیکرنا EM1 وزبلی گیانه و هرا ل سهر كه سكاتی و بهرهمی دوو جورین خهسی ل خانینی پلاستیکی ل وهرزئی گه شه كرنئی 2011 ئهف فهكولینه هاته ئه نجامدان ل دیف نه خشی (RCBD) Randomized Complete Block پیگ هاتبو ژ چار تیراتیین جودا یین EM1 (0,500,1000,1500) مل. لتر-1 وزبلی گیانه و هرا (بكارئینان و بی كارئینان) و دوو جورین خهسی (*Syrian and Local cv*). ئه نجام هاتنه دیاركرن ب سهر كه فتنا جورئ *Syrian* بشیوه گئی بهرجاف ب سالوخه تین دریژیا رووه کی (سم) و ژمارا بهلگا وفره هی یا سهر کی (سم) بهلی جورئ *Local* زیده بونا بهرجاف هه بو لسهر دریژیا قه دی (سم) ونسبا كلوروفیلی و ریژا هشكاتی (غم). زبلی گیانه و هرا كارتیکرنا هه بو ل سهر ریژا هشكاتی و كیشه یا سهر کی (كغم) و بهرهمی سهر كا (تن. هكتار-1). EM1 ب ریژا 1500 مل. لتر-1 زیده هیا پیش جاف هه بو ل سهر ژمارا بهلگا وفره هیا سهر کی (سم) ریژا هشكاتی و كیشه یا سهر کی (كغم) و بهرهمی گشتی تن. هكتار-1. لیگدان دناقههرا هه رسن فاکتورا زیده هیا ئه ریینی هه بو ل هه می سالوخه تین كه سكاتی و بهرهمی.

تائیر السماد العضوي و EM1 على نمو وحاصل صنفین من الخس (*Lactuca sativa* L.)
النامي في ظروف البيت البلاستيكي

الخلاصة

اجريت التجربة لدراسة تائیر السماد العضوي و EM1 على نمو وحاصل صنفین من الخس في ظروف البيت البلاستيكي خلال موسم النمو 2011. صممت التجربة حسب تصمم القطاعات العشوائية الكاملة (RCBD), مكونة من السماد العضوي (استخدام وبدون استخدام) واربعة تراكيز من EM1 (0.0, 500, 1000 and 1500 مل. لتر¹ و صنفین من الخس (*Syrian and Local cv*). بينت النتائج تفوق الصنف *Syrian* معنويا في صفة ارتفاع النبات (سم) وعدد الاوراق ومحيط الراس (سم), اما الصنف *Local* تفوق معنويا في صفة طول الساق (سم) ونسبة الكلوروفيل والنسبة الجافة. السماد العضوي تائیر معنويا في صفة النسبة الجافة ووزن الراس (كغم) والحاصل الكلي طن. هكتار⁻¹. EM1 بتركيز 1500 مل. لتر⁻¹ ادى الى زيادة معنوية في صفة عدد الاوراق ومحيط الراس (سم) ونسبة الجافة ووزن الراس (كغم) والحاصل الكلي طن. هكتار⁻¹. التداخل الثلاثي ادى الى زيادة معنوية في صفات النمو الخضري والحاصل.