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EFFECT OF SOME BIO-ORGANIC FERTILIZERS ON GROWTH, YIELD AND ROOT-ROT DISEASE SEVERITY OF EGGPLANT

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ABSTRACT

The field experiments were conducted at Kafr El-Wekala, Sherpin, Dakahlia Governorate, Egypt during 2001 and 2002 summer seasons to study the effect of different organic fertilizers, mineral fertilizers and biofertilizer (EM_1) on growth, yield and root rot disease of eggplant. The results could be summarized as follows:-
Generally, using organic fertilizers with mineral fertilizers and EM_1 biofertilizer resulted in the highest results than using it without EM_1 biofertilizer. On the other hand, using 50% mineral fertilizer with 50% chicken manure exhibited the best results on growth plant characters (stem length, No. of shoots, plant fresh and dry weights and total yield followed by 50% mineral combination with 50% of other organic fertilizer combinations (farmyard manure without litter, farmyard manure with litter and compost, respectively). In the same time, the effect of organic fertilizers with or without EM_1 biofertilizer, the highest results were by using 50% mineral fertilizer + 50 chicken manure (10%), followed by farmyard manure without litter (10-15%), then farmyard manure with litter (15-20%) and compost (20-25%). Using organic fertilizer without EM_1 biofertilizer gave little results than using it with EM_1 biofertilizer, In the same time, chicken manure gave the best results from high to low dose.Concerning the effect of organic fertilizer with or without EM_1 biofertilizer on root rot disease severity, the chicken manure gave the best effect followed by farmyard manure without litter than farmyard with litter and compost when adding EM_1 biofertilizer than without it. The total counts of soil-borne fungi in thousand colonies per one gram of dried soil, the chicken manure gave the best effect than mineral fertilizer, farmyard manure without litter, farmyard manure with litter and compost, respectively. Adding EM_1 biofertilizer to organic fertilizer gave best results than without it.

INTRODUCTION

Eggplant (*Solanum melongena* L.) is one of the most important solanaceae vegetable crops grown in summer season in Egypt. Pollution with chemical fertilizers arose as a factor of health care. Under Egyptian conditions, egg plant is infected with *Fusarium oxysporum* causing damping off and wilting of the plant that cause a great reduction in growth and yield. Up till now, synthetic fungicides are considered as the main control method for this disease and others. Such method imposes various undesirable side-effects as residual toxicity, environmental pollution and degradation development of fungicide resistance (Edwards, 1973).

Many investigators showed that eggplants can be fertilizered with biofertilizers known as EM, (Effective microorganisms) which consists of mixed cultures of beneficial and naturally-occurring microorganisms that can be applied as inoculants to increase the microbial diversity of soil and plants (Higa, 1991 and Higa & Wididana, 1991a). Another approach is to inoculate

the soil with beneficial antagonistic, antibiotic-producing microorganisms such as actinomycetes and certain fungi (Higa and Wididana, 1991a & 1991b). Beneficial microorganisms are these that can fix atmospheric nitrogen, decompose organic wastes, animal manures, detoxicty pesticides, suppress plant disease and soil-borne disease (Higa, 1991 and Parr and Hornick, 994). Magid *et al.* (1998) showed that using the chicken manure as an organic fertilizer for wheat crop increased grain yield, grain quality and straw yield, and in the same time decreased the Fusarium wilt of wheat. Also, Tratch and Bettiol (1997) found that, in general, concentration over 10% of cow manure caused inhibition of growth for the majority of fungi assayed (*Fusarium oxysporum sp. phaseoli, Pythium aphanidermatum,* and *Rhizoctonia solani*). Many investigators showed that many crops were inoculated with biofertilizer and fertilized with animals manure gave high yield and vegetative growth characteristics. Abd El-Rahman and Hosny (2001) indicated that application of chicken and cattle manures significantly increased vegetative growth characters of eggplant, i.e., plant height, number of leaves and leaf area over control. On tomato and potato plants, Awad (1998), Abdulla (1999), and El-Banna *et al.* (2001) demonstrated that vegetative growth characteristics as plant height, number of stems, number of tubers, fresh and dry weight of whole plants were increased as a result of applying chicken manure, compost and chicken manure combined with biofertilizer. On strawberry, Mohamed and Gabr (2002) found that application of chicken manure significantly increased most growth parameters including number of leaves, shoot and fresh dry weights of plant,

Application of farmyard manure with and without biofertilizers contribute to plant growth through its effect on physical, chemical and biological properties of the soil as well as through its effect as a source of essential nutrients (El-Nagar, 1996). The effect of organic fertilizer might be related to its contents materials. It may improve the physical condition of the soil, provides energy for microorganisms activity, increases nutrient supply and efficiency of macro-elements as well as its ability to meet some micro-nutrient requirements (Cooke, 1982; Sahota, 1983; Tisdale *et al.*, 1985, and Kolbe *et al.*, 1995).

MATERIALS AND METHODS

Two successive field experiments were carried out during summer seasons of 2001/2002 at Kafer El-Wekala village, Sherbeen, Dakahlia governorate, Egypt. Some physical and chemical properties of the experimental soil are recorded in Table 1.

Table 1: Some physical and chemical properties of the experimental soil.

Physical characteristics				Chemical characteristics						
Sand	Silt	Clay	Texture	pH	Available nutrients (ppm)					
					N	P	K	Zn	Mn	Fe
31.2	36.5	37.5	Clay-loam	7.8	61.5	25.0	24.5	3.00	8.50	14.80

EM_1 biofertilizer added with irrigation after planting at 1st, 2nd and 4th irrigation. On March of 2001 and 2002 (summer season), eggplant seeds were sown in 30 cm apart on one side ridge , 5 m long and 0.7 m wide (4 ridges per plot). The experiment in both seasons of study was designed as split-split plot design with three replicates. The main plots were occupied to test two levels of biofertilizer (with and without EM_1. In each plot, four organic fertilizers were randomly arranged to represent 4 sub plots. The sub-sub plot contained mineral: organic ratio treatments.

The experiments included 34 treatments, 0, 25, 50, 75 and 100% of the recommended N fertilizer (ammonium nitrate 33.5%). The mineral fertilizers were added at three equal portions. Compost prepared from city garbage, which was obtained from Mansoura Manufacture for Organic Manure. The chemical analysis of organic fertilizers are shown in Table 2.

Table 2: Chemical properties of bio and organic fertilizers.

	Macro-elements (%)			Micro-elements (ppm)				pH
	N	P	K	Fe	Mn	Zn	Cu	
Compost	1.35	0.48	1.90	151	312	64	37	7.80
Farm-1	7.2	6.5	5.5	130	320	70	40	6.00
Farm-2	7.1	6.2	5.3	142	325	78	42	5.54
Chicken manure	8.7	7.8	6.2	190	360	80	50	7.60

Compost, chicken manure and animal manure at rate of 20 m/fed. were spread and mixed with the surface soil layer (0-20 cm) before planting at 4 doses 100%, 75, 50 and 25% plus mineral fertilizer to complete the ratio.

Data recorded:

Random samples of 3 plants from each plot were chosen at 60 days from planting date, the following measurements were recorded.

-Plant height (cm): It was measured as the average length in centimeters of chosen plants from soil surface to plant stem apex.

-Number of leaves per plant of chosen plants.

-Fresh weight of plant as average weight per plant without roots in grams.

-Dry weight of plant: Fresh plants were dried out in an oven at 70°C until constant weight.

-Fruit yield: The fruits were harvested every week for six harvests up to the end of the season.

Disease assessment:

External symptoms were evaluated on a scale (0-4) according to Ciccarese *et al.* (1987) index. All plants showing symptoms of root rot and wilt category 4 in each plot were recorded (Category 4, six cm or more brown to black discoloration of lower stem and tap root region, most lateral roots decayed, most leaves yellowed, plants often stunted, wilted, moribund, or killed). Soil samples were collected from each treatment about 500 grams randomly for upper 15 cm of soil surface.

The dilution plate technique (Crossan, 1967) on Martins medium (Martin, 1959) was used in experiments of isolation of soil-borne fungi. The plates were incubated at 24-27°C for 4-5 days. The resulting colonies per Petri-dish were counted and multiplied by the dilution factor to obtain the number of colonies / g soil.

RESULTS AND DISCUSSION

Data in Table (3) showed a significant increase in stem length, number of shoots/plant, No. of leaves/ plant, plant fresh weight (g/plant), plant dry weight (%) and total yield (kg / plot) by using farmyard manure without litter and chicken manure than farmyard manure with litter and compost organic fertilizer.

On the other hand, data in the same table demonstrated that using 100% mineral fertilizer had positive effect on growth characters followed by 75% mineral + 25 organic fertilizer compared to 50% mineral + 50% organic fertilizer. Moreover, microorganisms as using as biofertilizers produce plant promoting substances, mainly AA, gibberellins and cytokinin like substance, which could stimulate plant growth, absorption of nutrient and metabolism process (Subba Rao, 1993 and El-Banna, 2001).

Data in Table (4) showed that the best results of all growth characters was obtained by using chicken manure with EM_1 followed by farmyard manure without litter.

On the other hand, the data in Table (5) showed that using 100% mineral fertilizer with EM_1 biofertilizer followed by 75% mineral + 25% organic and 50% mineral + 50% organic fertilizer significantly increased all growth characters than all treatments with or without EM_1 fertilizer.

Results on the average of growth characters of eggplant by using 4 organic fertilizers combination with one mineral fertilizer are tabulated in Table (6). The data showed that the average of growth characters were differ between treatments and the best treatment was 50% mineral + 50% chicken manure on stem length, No. of shoots, plant fresh weight, plant dry weight and total yield. On the other hand, the farmyard manure without litter gave the best average of No. of leaves / plant.

The effect of organic fertilizer might be related to its contents materials. It may improve the physical condition of the soil, provides energy for microorganisms activity, increases nutrient supply and improves the efficiency of macro elements as well as its ability to meet some micronutrient requirements (Cooke, 1982, Sahota, 1983, Tisdale *et al.*, 1985, Kolbe *et al.*, 1995 and El-Nagar, 1996).

Data in Tables (7 and 8) showed the average of growth characters as affected by using combination between ratio of mineral fertilizer (100, 75, 50, 25% and zero) + organic fertilizers (compost, farmyard manure with litter, farmyard manure without litter and chicken manure) with or without EM_1 biofertilizer. Data in Table 6 indicate that the application of 50% mineral fertilizer + 50% chicken manure with EM_1 biofertilizer significantly increased stem length and No. of shoots / plant followed by the same treatment without EM_1 fertilizer as compared with all treatments.

Table 3: Vegetative growth characters and total yield of eggplant plants as affected by biofertilizer, organic fertilizer and Min. : Org. ratio during 2001 and 2002 seasons.

Treatments	Stem length (cm)		No. of shoots / plant		No. of leaves / plant		Plant fresh weight (g)		Plant dry weight (g)		Total yield (kg/plot)	
	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
A: Biofertilizer:												
With EM_1	83.52 a	83.27 a	11.87 a	12.15 a	51.63 a	51.20 a	309.0 a	312.0 a	29.08 a	28.99 a	44.89 a	45.12 a
Without EM_2	81.77 b	81.23 b	11.23 b	11.27 b	49.48 b	49.68 a	301.0 a	300.0 b	28.56 b	28.52 a	43.44 b	43.37 b
B: Organic fert.:												
Compost	80.60 b	81.40bc	11.43ab	11.47 a	50.13ab	50.43 a	288.7 b	299.5 b	28.50 b	28.56bc	43.48 b	44.01 a
FYM without litter	81.37 b	80.47 c	10.90 b	11.77 a	48.63 b	49.57 a	280.0 b	278.7 c	28.53 b	28.42 c	43.32 b	43.97 a
FYM with litter	83.33 a	82.57 b	11.87 a	11.70 a	51.73 a	50.50 a	321.8 a	329.0 a	28.97ab	28.85ab	44.59ab	44.34 a
Chicken manure	85.27 a	84.57 a	12.00 a	11.90 a	51.73 a	50.27 a	329.7 a	324.7 a	29.29 a	29.19 a	45.21 a	44.67 a
C: Min. : Org. ratio:												
100% : 0%	86.50 a	85.71 a	12.50 a	12.50 a	53.08 a	53.17 a	339.8 a	349.0 a	29.37 a	29.42 a	47.44 a	47.37 a
0% : 100%	78.75 b	78.33 b	10.92cd	11.21 b	46.92 b	48.58 b	257.1 b	254.2 d	28.27 c	28.02 d	40.69 c	41.10 c
25% : 75%	79.75 a	78.29 a	10.79 d	11.42 b	47.42 b	46.96 b	274.0 b	274.8 c	29.39bc	28.45cd	41.84 c	40.82 c
50% : 50%	84.96 a	84.67 a	11.63bc	11.67ab	52.96 a	51.25 a	325.0 a	325.0 b	28.86ab	28.86bc	44.63 b	44.98 b
75% : 25%	85.05 a	84.25 a	11.92ab	11.75ab	52.42 a	52.25 a	329.4 a	329.4 b	29.22 a	29.03ab	46.15ab	46.96 a

Means followed by the same letter(s) within each column do not significantly differ using Duncan's Multiple Range Test.

Table 4: Vegetative growth characters and total yield of eggplant plants as affected by biofertilizer-organic fertilizer interaction during 2001 and 2002 seasons.

Bio-Fertilizer	Organic Fert.	Stem length (cm)		No. of shoots / plant		No. of leaves / plant		Plant fresh Weight (g)		Plant dry weight (g)		Total yield (kg/plot)	
		2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
With EM_1	1	81.53cd	81.73bc	11.73ab	11.87ab	51.27abc	50.67 a	288.3 b	303.0bcd	28.77 bc	28.96 ab	44.61 ab	44.12 ab
	2	82.67bcd	81.73bc	11.13bc	11.93 ab	49.27 bc	50.33 a	281.0 b	285.0 de	28.83 bc	28.63abc	43.86 ab	44.94 ab
	3	84.00abc	83.87ab	12.13ab	12.47 a	52.33 ab	52.13 a	330.0 a	332.7 a	29.21 ab	29.17 a	45.24 a	45.66 a
	4	85.87 a	85.73 a	12.47 a	12.33 a	53.47 a	51.67 a	336.7 a	327.3 a	29.53 a	29.21 a	45.87 a	45.77 a
Without EM_1	1	79.67 d	81.07bc	11.13bc	11.07 b	49.00 c	50.20 a	289.0 b	296.0 cd	28.24 c	28.16 c	42.35 b	43.90 ab
	2	80.07 d	79.20 c	10.67 c	11.60 ab	48.00 c	48.80 a	279.0 b	272.3 e	28.24 c	28.21 c	42.78 b	43.00 b
	3	82.67bcd	81.27 bc	11.60abc	10.93 b	50.93abc	48.87 a	313.7 a	313.3abc	28.73 bc	28.54 bc	43.94 ab	43.02 b
	4	84.67ab	83.40 ab	11.53abc	11.47 ab	50.00 bc	50.87 a	322.7 a	322.0 ab	29.04 ab	29.17 a	44.55 ab	43.56 ab

Means followed by the same letter(s) within each column do not significantly differ using Duncan's Multiple Range Test.
1. Compost 2. FYM without litter 3. FYM with litter 4. Chicken manure.

Table 5: Vegetative growth characters and total yield of eggplant plants as affected by biofertilizer-Min. : Org. ratio interaction during 2001 and 2002 seasons.

Bio-fertilizer	Min. : Org.	Stem length (cm)		No. of shoots / plant		No. of leaves / plant		Plant fresh weight (g)		Plant dry weight (g)		Total yield (kg/plot)	
		2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
With EM_1	100% : 0%	87.17 a	86.92 a	13.00 a	13.08 a	54.25 a	54.58 a	342.1 a	352.1 a	29.63 a	29.60 a	49.10 a	49.07 a
	0% : 100%	81.08cde	79.17 de	11.17bcd	11.75 bc	48.08 c	49.08bcde	267.1 bc	259.5 cd	28.44 bc	28.13 b	41.62 de	41.76 d
	25% : 75%	79.25 ef	80.17 cd	11.17bcd	11.83abc	48.67 bc	48.08 de	270.4 bc	277.1 c	28.60 bc	28.50 b	41.53 de	41.31 d
	50% : 50%	84.92 ab	84.83 ab	11.83 bc	12.25 ab	54.00 a	52.17 abc	331.7 a	332.5 ab	29.05 ab	29.22 a	45.49 bc	45.52 bc
	75% : 25%	85.17 ab	85.25 ab	12.17 ab	11.83abc	53.17 a	52.08 abc	333.8 a	338.8 ab	29.69 a	29.51 a	45.74 ab	47.95 ab
Without EM_1	100% : 0%	83.83abc	84.50 ab	12.00 ab	11.92abc	51.92 ab	51.75abcd	337.5 a	345.8 a	29.11 ab	29.25 a	45.79 bc	45.66 bc
	0% : 100%	76.42 f	77.50 de	10.67 cd	10.67 c	45.75 c	48.08 cde	247.1 c	248.8 d	28.09 c	27.90 b	39.76 e	40.44 d
	25% : 75%	80.25 de	76.42 e	10.42 d	11.00bc	46.17 c	45.83 e	277.5 b	272.5 cd	28.18 c	28.39 b	47.16 de	40.34 d
	50% : 50%	85.00 ab	84.50 ab	11.42bcd	11.08bc	51.92 ab	50.33 bcd	318.3 a	317.5 b	28.67 bc	28.49 b	43.77 cd	44.44 c
	75% : 25%	83.33bcd	83.25 bc	11.67 bc	11.67bc	51.67 ab	52.42 ab	325.0 a	320.0 b	28.75 bc	28.56 b	45.00 bc	45.97 bc

Means followed by the same letter(s) within each column do not significantly differ using Duncan's Multiple Range Test.
1. Compost 2. FYM without litter 3. FYM with litter 4. Chicken manure.

Table 6: Stem length and No. of shoots/plant of eggplant as affected by biofertilizer, organic fertilizer and Min.: Org. ratio interaction during 2001 and 2002 seasons.

Biofer.	Organic Fert.	Min. : Org. Ratio	Stem length (cm)		No. of shoots / plant	
			2001	2002	2001	2002
With EM_1	1	100% : 0%	88.67 abc	88.33 abc	13.00 ab	12.67 ab
		0% : 100%	80.67defghij	79.67efghijkl	11.33abcde	11.67 ab
		25% : 75%	77.67ghij	78.00hijkl	11.33abcde	12.00 ab
		50% : 50%	79.67efjhij	80.33defghijkl	11.33abcde	11.67 ab
		75% : 25%	81.00cdefghij	82.33cdefghi	11.67abcd	11.33 ab
	2	100% : 0%	87.00abcde	75.33ghijkl	13.00 ab	13.33 a
		0% : 100%	80.33defghij	78.33ghijkl	10.33 cde	11.67 ab
		25% : 75%	77.33 hij	78.33ghijkl	10.33 cde	11.00 ab
		50% : 50%	81.67cdefghij	83.00bcdefghi	10.67bcde	11.67 ab
		75% : 25%	87.00abcde	83.67bcdefghi	11.33abcde	12.00 ab
	3	100% : 0%	87.00abcde	88.00abcd	13.00 ab	13.33 a
		0% : 100%	82.00cdefghij	78.00hijkl	11.67abcd	12.00 ab
		25% : 75%	80.33defghij	79.67efghijkl	11.33abcde	12.33 ab
		50% : 50%	85.67abcdef	90.00 ab	12.00abcd	13.00 ab
		75% : 25%	85.0bcdefgh	83.67bcdefghi	12.67 abc	11.67 ab
	4	100% : 0%	86.00abcdef	86.00abcdefg	13.00 ab	13.00 ab
		0% : 100%	81.33cdefghij	80.67cdefghijk	11.33abcde	11.67 ab
		25% : 75%	81.67defghij	84.67abcdefghi	11.67abcd	12.00 ab
		50% : 50%	92.67 a	86.00abcdefg	13.33 a	12.67 ab
		75% : 25%	87.67abcd	91.00 a	13.00 ab	12.33 ab
Without EM_1	1	100% : 0%	85.3abcdefg	81.00abcdefghi	12.33 abcd	12.33 ab
		0% : 100%	74.67 j	81.33cdefghij	10.67bcde	10.33 b
		25% : 75%	76.67 ij	74.67 jkl	10.33cde	10.33 b
		50% : 50%	80.67defghij	82.33 cdefghi	11.00abcde	10.67 ab
		75% : 25%	81.00cdefghij	83.00bcdefghi	11.33abcde	11.67 ab
	2	100% : 0%	83.3 cdefghi	81.33abcdefghi	12.00abcd	12.67 ab
		0% : 100%	75.33 j	73.33 kl	10.00 de	10.67 ab
		25% : 75%	79.67efghij	77.00 ijkl	9.00 e	12.00 ab
		50% : 50%	80.67defghij	82.00cdefghij	10.67bcde	11.00 ab
		75% : 25%	81.33cdefghij	79.33fghijkl	11.67abcd	11.67 ab
	3	100% : 0%	82.33cdefghij	84.67abcdefghi	12.67 abc	11.00 ab
		0% : 100%	77.00 ij	77.00 ijkl	11.33abcde	10.67 ab
		25% : 75%	81.00cdefghij	73.00 l	11.00abcde	10.67 ab
		50% : 50%	86.33abcdef	86.33abcdef	11.33abcde	11.33 ab
		75% : 25%	86.67abcdef	85.33abcdefgh	11.67abcd	11.00 ab
	4	100% : 0%	84.33cdefghi	85.0abcdefgh	11.00abcde	11.67 ab
		0% : 100%	78.67fghij	78.33ghijkl	10.67bcde	11.00 ab
		25% : 75%	83.67cdefghi	81.00cdefghij	11.33abcde	11.00 ab
		50% : 50%	92.33 ab	87.33abcde	12.67abc	11.33 ab
		75% : 25%	84.33cdefghi	85.33abcdefgh	12.00abcd	12.33 ab

Means followed by the same letter(s) within each column do not significantly differ using Duncan's Multiple Range Test.

1. Compost 2. FYM without litter 3. FYM with litter 4. Chicken manure.

On the other hand, data in Table 7 showed that 50% mineral + 50% farmyard manure without litter with EM_1 biofertilizer was the best treatment followed by 50% mineral + 50% chicken manure on No. of leaves / plant.
In the same table, the treatment of 50% mineral + 50% chicken manure with EM_1 gave best average of plant fresh weight / plant followed by 75% mineral + 25% farmyard manure without litter.

Table 7: Stem length, No. of shoots/plant and No. of leaves / plant of eggplant as affected by organic fertilizer - Min. : Org. ratio interaction during 2001 and 2002 seasons.

Organic Fert.	Min. : Org. Ratio	Stem length (cm)		No. of shoots / plant		No. of leaves / plant	
		2001	2002	2001	2002	2001	2002
1	100% : 0%	87.00 b	86.17abc	12.67abc	12.50	51.67abcd	53.67 ab
	0% : 100%	77.67 gh	80.50defghi	11.00cefg	11.00	46.83de	50.00abcde
	25% : 75%	77.17 h	76.33 i	10.83defg	11.17	47.00cde	45.50 f
	50% : 50%	80.17efgh	81.33cdefgh	11.17bcdefg	11.17	51.33abcde	49.83abcdef
	75% : 25%	81.0cdefgh	82.67bcdef	11.50abcdef	11.50	53.83 ab	53.17 abc
2	100% : 0%	85.17bcde	84.83abcd	12.50abcd	13.00	52.33abcd	51.67abcdef
	0% : 100%	77.83 gh	75.83 i	10.17 fg	11.17	45.67 e	46.00 ef
	25% : 75%	78.50 gh	77.67fghi	9.67 g	11.50	45.83 e	50.33abcdef
	50% : 50%	81.17cdefgh	82.50bcdefg	10.67 efg	11.33	48.17 cde	48.67bcdef
	75% : 25%	84.17bcdef	81.50bcdefg	11.50abcdef	12.83	51.17abcde	54.00 ab
3	100% : 0%	84.67bcdef	86.33 abc	12.83 ab	12.17	53.83 ab	45.00 ab
	0% : 100%	79.50 fgh	77.50 ghi	11.50abcdef	11.33	47.33 cde	45.67 ef
	25% : 75%	80.67defgh	76.33 hi	11.17bcdefg	11.50	49.00bcde	46.00 def
	50% : 50%	86.00 bc	88.17 a	11.67abcdef	12.17	56.50 a	51.67 abcde
	75% : 25%	85.83 bcd	84.50abcde	12.17abcde	11.33	52.00abcd	55.17 a
4	100% : 0%	85.17bcde	85.50abcd	12.00abcde	12.33	54.50 ab	53.33 abc
	0% : 100%	80.00efgh	79.50efghi	11.00cdefg	11.33	47.33 cde	47.50 cdef
	25% : 75%	82.67bcdefg	82.83bcdef	11.50abcdef	11.50	47.83 cde	50.33abcdef
	50% : 50%	92.53 a	86.67 ab	13.00 a	12.00	55.83 a	53.17 abc
	75% : 25%	86.00 bc	83.33 a	12.50 abcd	12.33	52.67 abc	52.00 abcd

Means followed by the same letter(s) within each column do not significantly differ using Duncan's Multiple Range Test.
1. Compost 2. FYM without litter 3. FYM with litter 4. Chicken manure.

Data in Table 8 showed that the treatment 100% mineral and 75% mineral + 25% chicken manure with EM_1 biofertilizer were significantly increase on plant dry weight, in the same table total yield (Kg/plot) was increased by adding 100% mineral followed by 75% mineral + 25% farmyard without litter or 75% mineral + 25% chicken manure with EM_1 biofertilizer. These results are in line with those obtained by Awad, 1998; Magid *et al.*, 1998; Abdulla, 1999; Ouda, 2000; Abd El-Rahman and Hosney, 2001; El-Banna *et al.*, 2001 and Mohamed and Gabr, 2002.

The results of investigating the effect of organic fertilizer with or without EM_1 biofertilizer (compost, farmyard manure with litter, farmyard manure without litter and chicken manure) showed that chicken manure gave the best effect on disease severity at 50% mineral + 50% chicken manure (10%) followed by farmyard manure without litter (10-15%) then farmyard manure with litter (15-20%) and compost 20-35%) (Table, 11).

Table 8: Plant fresh weight, plant dry weight and total yield of eggplant as affected by organic fertilizer - Min. : Org. ratio interaction during 2001 and 2002 seasons.

Organic Fert.	Min. : Org. Ratio	Plant fresh weight (g)		Plant dry weight (g)		Total yield (kg/plot)	
		2001	2002	2001	2002	2001	2002
1	100% : 0%	317.5 bc	323.3bcd	29.17abc	29.42abcd	48.00 a	47.14 a
	0% : 100%	292.2 de	274.2 fg	28.32 cd	28.17 fgh	41.11efg	41.88 bcd
	25% : 75%	267.5 de	276.7 fg	28.22 cd	28.54cdefgh	40.33 fg	40.13 d
	50% : 50%	294.2 cd	316.7bcde	28.26 cd	28.30efgh	43.67bcdef	44.70 ab
	75% : 25%	295.0 cd	306.7cdef	28.55abcd	28.39defgh	44.28abcdef	46.20 a
2	100% : 0%	348.3 ab	355.0 ab	29.42abc	29.54 abc	46.72 ab	47.38 a
	0% : 100%	225.0 f	211.7 i	27.62 d	27.88 h	39.20 g	40.48 cd
	25% : 75%	245.8 ef	230.8 hi	28.33 cd	28.04 fgh	40.99 efg	39.91 d
	50% : 50%	285.8cde	294.2def	28.23 cd	28.26 fgh	44.41abcde	44.56 ab
	75% : 25%	295.0 cd	301.7cdef	29.06abc	28.42defgh	45.28abcd	47.50 a
3	100% : 0%	342.5 ab	363.3 a	29.23abc	29.10abcdef	47.19 ab	47.79 a
	0% : 100%	268.3 de	250.0 gh	28.42bcd	28.11 fgh	41.43defg	40.62 cd
	25% : 75%	281.7cde	285.0def	28.21 cd	28.71bcdefgh	42.53cdefg	41.19 bcd
	50% : 50%	351.7 ab	351.7 ab	29.29abc	29.10abcdefg	44.92abcde	44.10 abc
	75% : 25%	365.0 a	355.0 ab	29.70 a	29.34abcde	46.88 ab	47.71 a
4	100% : 0%	350.0 ab	354.2 ab	29.67 a	29.64 ab	47.88 a	47.17 a
	0% : 100%	265.8 de	280.8efg	28.70abcd	27.96 gh	41.01 ef	41.43 bcd
	25% : 75%	300.8 cd	296.7 def	28.82abcd	28.51cdefgh	43.52 bcde	41.75 bcd
	50% : 50%	368.3 a	337.5 abc	29.66 a	29.85 a	45.52 abc	46.54 a
	75% : 25%	362.5 a	354.2 ab	29.59 ab	29.99 a	48.13 a	46.44 a

Means followed by the same letter(s) within each column do not significantly differ using Duncan's Multiple Range Test.

1. Compost 2. FYM without litter 3. FYM with litter 4. Chicken manure.

Data in Tables (9 and 10) showed that the treatment 100% mineral and 25% mineral + 75% organic gave the best results (56.33 and 51.67 No. of leaves / plant; 320 and 300 g plant fresh weight; 29.35 and 28.27 g plant dry weight and 48.84 or 45.29 kg / plant of total yield. These results were followed by results of FYM without litter, FYM with litter and compost, where it gave low values compared with mineral and chicken manure with EM_1 and without EM_1 biofertilizer of all treatments. These results were in agreement with data reported by El-Banna *et al.* (2001) and Mohamed and Gabr (2002).

Table 9: No. of leaves / plant and plant fresh weight (g) of eggplant as affected by biofertilizer, organic fertilizer and Min. : Org. ratio interaction during 2001 and 2002 seasons.

Biofer.	Organic Fert.	Min. : Org. ratio	No. of leaves / plant		Plant fresh weight (g)	
			2001	2002	2001	2002
With EM_1	1	100% : 0%	53.33abcdef	56.33 ab	320.0bcdefgh	320.0abcdefghijkl
		0% : 100%	47.67cdefgh	50.67abcdefg	266.7hijjkl	278.3jklmn
		25% : 75%	48.00cdefgh	45.33 fg	261.7hijkl	276.7klmn
		50% : 50%	51.67abcdefgh	50.67abcdefg	300.0cdefghij	326.7abcdefghijk
		75% : 25%	55.67 abc	50.33abcdefg	293.3efghij	313.3cdefghijkl
	2	100% : 0%	52.33abcdefg	53.67abcdef	340.0abcdefg	355.0abcde
		0% : 100%	47.00defgh	51.67abcdef	230.0 kl	213.3 op
		25% : 75%	46.67defgh	47.00defgh	246.7 jkl	245.0mnop
		50% : 50%	49.67abcdefgh	51.33abcdef	291.7 efghij	296.7fghijklm
		75% : 25%	50.67abcdefgh	48.00bcdef	296.7defghij	315.0abcdefghijkl
	3	100% : 0%	55.33abcd	54.67abcd	350.0abcde	371.7 ab
		0% : 100%	48.67bcdefgh	46.33defg	281.7ghijk	265.0lmno
		25% : 75%	48.00cdefgh	50.00abcdef	290.0efghijk	286.7hijklmn
		50% : 50%	57.67 a	52.33abcdef	353.0abcd	366.7 abc
		75% : 25%	53.00abcdef	57.33 a	375.0 ab	373.3 a
	4	100% : 0%	56.00 abc	53.67abcdef	358.3 abc	361.7 abcd
		0% : 100%	49.00bcdefgh	47.67bcdefg	290.0efghijk	281.7 ijklmn
		25% : 75%	52.00abcdefgh	50.00abcdefg	283.3fghijk	300.0efghijklm
		50% : 50%	57.00 ab	54.33abcdef	381.7 a	340.0abcdefgh
		75% : 25%	53.33abcdef	52.67abcdef	370.0 ab	353.3 abcdef
Without EM_1	1	100% : 0%	50.00abcdefgh	51.00abcdef	315.0bcdefghi	326.7abcdefghijk
		0% : 100%	46.00fgh	49.33abcdefg	315.0bcedghi	270.0klmn
		25% : 75%	46.00fgh	45.67efg	271.7hijkl	276.7 klmn
		50% : 50%	51.00abcdefgh	49.0abcdefgh	273.3hijkl	306.7defghijkl
		75% : 25%	52.00abcdefgh	56.00 abc	288.3fghijk	300.0efghijklm
	2	100% : 0%	52.33abcdefg	49.67abcdefg	356.7abcd	355.0abcde
		0% : 100%	44.33 gh	50.67abcdefg	220.0 L	210.0 p
		25% : 75%	45.00 fgh	45.00 fg	245.0 jkl	216.7 op
		50% : 50%	46.67 fgh	49.33abcdefg	280.0ghijk	291.7 ghijklm
		75% : 25%	51.67abcdefgh	49.33abcdefg	293.3efghijk	288.3hijklmn
	3	100% : 0%	52.33abcdefg	53.33abcdef	335.0abcdefg	355.0 abcde
		0% : 100%	46.00 fgh	45.00 fg	255.0 ijkl	235.0nop
		25% : 75%	50.00abcdefgh	42.00 g	273.3hijkl	303.3efghijkl
		50% : 50%	55.33abcd	51.00abcdefg	350.0abcde	336.7abcdefghi
		75% : 25%	51.00abcdefgh	53.00abcdef	355.0abcd	336.7abcdefghi
	4	100% : 0%	53.00abcdef	53.00abcdef	343.3abcdef	346.7abcdefg
		0% : 100%	46.67fgh	47.33cdefg	241.7jkl	280.0ijklmn
		25% : 75%	43.67 h	50.67abcdefg	318.3bcdefgh	293.3ghijklm
		50% : 50%	54.67 abcde	52.00abcdef	355.0abcd	335.0abcdefghij
		75% : 25%	52.00abcdefgh	51.33abcdef	355.0abcd	355.0abcdef

Means followed by the same letter(s) within each column do not significantly differ using Duncan's Multiple Range Test.

1. Compost 2. FYM without litter 3. FYM with litter 4. Chicken manure.

Table 10: Plant dry weight (g) and total yield (kg/plot) of eggplant as affected by biofertilizer, organic fertilizer and Min. : Org. ratio interaction during 2001 and 2002 seasons.

Biofer.	Organic Fert.	Min. : Org. ratio	Plant dry weight (g)		Total yield (Kg/plot)	
			2001	2002	2001	2002
With EM_1	1	100% : 0%	29.35abcd	29.78abcd	49.84 a	46.94abcdef
		0% : 100%	28.33bcdef	28.31defghi	42.58defghij	40.63ghijk
		25% : 75%	28.33bcdef	28.30defghi	40.87fghij	40.72ghijk
		50% : 50%	28.21bcdef	28.88abcdefgh	45.28abcdefghi	45.23abcdefghi
		75% : 25%	29.64bcd	29.55abcdef	44.50abcdefghij	47.07abcde
	2	100% : 0%	29.44abcd	29.62abcde	48.36 abcd	49.25abc
		0% : 100%	28.08cdef	27.95ghi	39.62 ij	41.90defghijk
		25% : 75%	28.74abcdef	28.15efghi	40.75fghij	40.99fghijk
		50% : 50%	28.53abcdef	28.59abcdefghi	45.22abdefghi	44.99abcdefghij
		75% : 25%	29.35abcd	28.85abcdefgh	45.33abcdefgi	47.57abcd
	3	100% : 0%	29.47abcd	29.18abcdefgh	45.33abcdefghi	50.79 a
		0% : 100%	28.66abcdef	28.50abcdefghi	48.85abc	41.56efghijk
		25% : 75%	28.47bcdef	29.26abcdefgh	42.67defghij	41.49efghijk
		50% : 50%	29.58abcd	29.38abcdefg	41.89abcdefghi	44.53bcdefghijk
		75% : 25%	29.86abc	29.54abcdef	48.02abcd	49.94 ab
	4	100% : 0%	30.27 a	29.85abcd	49.37 ab	49.30abc
		0% : 100%	28.71abcdef	27.76 hi	41.61efghij	42.96defghijk
		25% : 75%	28.89abcdef	28.31cdefghi	42.60defghij	42.03defghijk
		50% : 50%	29.87abc	30.04 ab	46.67abcdef	47.32abcde
		75% : 25%	29.92ab	30.10 a	49.10abc	47.23abcde
Without EM_1	1	100% : 0%	29.00abcde	29.06abcdefgh	46.16abcdefgh	47.33abcde
		0% : 100%	28.31bcdef	28.02fghi	39.65 ij	43.12defghijk
		25% : 75%	28.12bcdef	28.77abcdefghi	39.80 hij	39.54 ijk
		50% : 50%	28.31bcdef	27.72 hi	42.06 efghij	44.17bcdefghijk
		75% : 25%	27.46 ef	27.23 i	44.07abcdefghij	45.33abcdefghi
	2	100% : 0%	29.39abcd	29.47abcdefg	45.08abcdefghi	45.48abcdefghi
		0% : 100%	27.17 f	27.71 hi	38.79 j	39.07 jk
		25% : 75%	27.92 def	27.93 ghi	41.22efghij	38.84 k
		50% : 50%	27.94 def	27.94 ghi	43.60bcdefghij	44.17bcdefghijk
		75% : 25%	28.76abcdef	27.99 fghi	45.23abcdefghi	47.43anvde
	3	100% : 0%	29.00abcde	29.01abcdefgh	45.53abcdefghi	44.80bcdefghij
		0% : 100%	28.19bcdef	27.73 hi	40.20 ghij	39.67hijk
		25% : 75%	27.95def	28.10efghi	43.18cdefghij	41.50efghijk
		50% : 50%	28.99abcde	28.64abcdefghi	45.06abcdefghi	43.67cdefghijk
		75% : 25%	29.54abcd	29.13abcdefgh	45.74abcdefgh	45.48abcdefghi
	4	100% : 0%	29.06abcde	29.43a\bcdefg	46.38abcdef	45.04abcdefghi
		0% : 100%	28.69abcdef	28.16efghi	40.40ghij	39.90ghijk
		25% : 75%	28.75abcdef	28.70abcdefghi	44.43abcdefghij	41.47efghijk
		50% : 50%	29.45abcd	29.66abcde	44.34abcdefghij	45.77abcdefg
		75% : 25%	29.26abcd	29.87abc	47.17abcde	45.65abcdefgh

Means followed by the same letter(s) within each column do not significantly differ using Duncan's Multiple Range Test.

1. Compost 2. FYM without litter 3. FYM with litter 4. Chicken manure.

On the other hand, Table (11) using organic fertilizer without EM_1 biofertilizer, the data showed that the best result of disease severity by using chicken manure (10-20%), farmyard manure without litter (20-25), farmyard manure with litter (25%) and compost (25-35%), respectively.

Adding to mention before, the using of mineral fertilizer with EM_1 biofertilizer (10%) is better than without EM_1 biofertilizer on disease severity (20%).

Table 11: Effect of EM_1 biofertilizer and organic fertilizer on root rot disease severity.

Fertilizer	Min.:Org. ratio	With EM_1 biofertilizer	Without EM_1 biofertilizer
Compost	I	35	35
	II	25	30
	III	20	25
	V!	20	25
Farmyard manure without litter	I	20	25
	II	20	25
	III	15	25
	IV	15	25
Farmyard manure with litter	I	15	25
	II	15	25
	III	10	20
	IV	10	20
Chicken Manure	I	15	25
	II	10	20
	III	10	20
	IV	10	15
LSD at 5%		2.89	3.04
1%		3.84	4.03

Where I: 0% mineral + 100% Organic fertilizer. II: 25% mineral + 75% Organic fertilizer.
III: 50% mineral + 50% Organic fertilizer. IV: 75% mineral + 25% Organic fertilizer.

The results of investigating the effect of bio and organic fertilizers on economic soil-borne fungi in eggplant under field conditions are shown in Table (11), that the effect of chicken manure from high dose to low on the total counts of soil-borne fungi in thousand colonies per one gram of dried soil had best effect than other treatments followed by mineral fertilizer and farmyard manure without litter, respectively.

On the other hand, the effect of farmyard manure with litter and compost was less effect than all treatments at four doses. In the same treatment, using biofertilizer (EM_1) added to organic fertilizer gave best results than without EM_1 biofertilizer in all treatments. The soil testing depending on identification of fungal genera only, those were *Asperiglus penicillum, Fusarium* and *Rhizoctonia* (Table 12).

These results are in accordance with those recorded by Higa (1991) and Parr and Harmic (1994), who found that such animal manures detoxify pesticides, suppress plant disease and soil-borne disease.

Table 12: Effect of EM_1 bio- and organic fertilizer on count of microorganisms of one gram dried soil.

Treatment and dose	No. of G	TC of all	*Aspergillus* TC	*Penicillium* TC	*Fusarium* TC	*Rhizopium* TC	No. Of G	TC Of all	*Aspergillus* TC	*Penicillium* TC	*Fusarium* TC	*Rhizopium* TC
	4	3.0	1.5	1.0	0.2	0.3	4	3.1	0.0	1.3	0.5	0.4
Compost	3	3.0	1.3	1.0	0.7		4	3.0	0.0	1.2	0.4	0.5
	3	2.8	1.3	1.0	0.5		4	3.0	1.0	1.0	0.5	0.5
Farmyard	3	2.9	1.5	0.9	--	0.5	4	3.0	1.1	0.9	0.4	0.6
manure	3	2.8	1.4	0.8	0.6	--	4	3.0	1.0	1.0	0.5	0.5
with litter	3	2.9	1.3	0.9	--	0.7	4	2.9	1.2	1.0	0.2	0.5
Farmyard	3	2.7	1.3	1.1	0.3	--	4	2.8	1.2	0.9	0.3	0.4
manure	3	2.7	1.4	1.0	0.3	--	4	2.7	1.2	0.8	0.4	0.3
without litter	3	2.6	1.5	1.0	--	0.1	3	2.6	1.1	0.8	--	0.7
	3	2.3	1.0	0.7	--	0.5	3	2.5	1.0	1.0	0.5	--
Chicken	2	2.1	0.9	1.2	--	--	3	2.4	1.0	0.8	--	0.6
Manure	2	2.1	0.8	1.3	--	--	3	2.3	0.9	0.9	--	0.7
Mineral	4	3.0	1.2	0.8	0.4	0.6	4	3.2	1.5	0.8	0.3	0.6

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تأثير بعض الأسمدة الحيوية والعضوية على النمو والمحصول وأعفان الجذور لمحصول الباذنجان

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تم دراسة تأثير التسميد الحيوي والعضوي على الصفات الخضرية والمحصول وكذلك أعفان الجذور لمحصول الباذنجان مختلطة بعنصر سمادى معدنى واحد وكان يمثل التسميد الحيوى السماد EM_1 وكانت الأسمدة العضوية عبارة عن سماد الكتكوت والسماد البلدى بدون إضافات والسماد البلدى به إضافة فرشه وكذلك القمامة وأظهرت النتائج بصفة عامة أن إستخدام السماد الحيوى EM_1 أعطى نتائج مع الأسمدة العضوية أفضل عن إستخدام الأسمدة العضوية بدونه فى كل الحالات سواء الصفات الخضرية من طول الساق – عدد الأفرع – الوزن الطازج والوزن الجاف وكذلك المحصول ودرجة الإصابة بأعفان الجذور وذلك فى كل المعاملات التى أجريت فى الحقل. وداخل هذه المعاملات أعطى سماد الكتكوت ٥٠% مختلطا بـ ٥٠% سماد معدنى أفضل النتائج فى كل الصفات الخضرية والمحصول. ثم تبع ذلك بالترتيب السماد البلدى بدون إضافة والسماد البلدى المضاف إليه الفرشة والقمامة فى النهاية.

على جانب آخر إتفقت النتائج المتحصل عليها من نفس المعاملات فى تأثرها على أعفان الجذور من حيث تأثيرها على الإصابة بالمرض وكذلك أعداد الوحدات الميكروبية فى واحد جرام تربة جافة تماما مما يوحى بأن التسميد الحيوى بالمادة EM_1 ذات فعالية فى تأثيرها على أعفان الجذور وعند إستخدام سماد الكتكوت مع السماد الحيوي EM_1 أعطى تأثيرا أكبر على المرض وكذلك نوع المسببات المرضية المتواجدة بالتربة وخاصة الفطريات الممرضة ، ولكن المعاملات الأخرى سواء سماد الكتكوت بدون السماد الحيوى أو الأسمدة العضوية الأخرى مثل السماد البلدى بكلا نوعيه والقمامة سواء أضيف إليها السماد الحيوى أم لم يضاف أعطت أيضا نتائج مرضية على التوالى وكان فى المؤخرة السماد العضوى (القمامة) بكلا الطريقتين سواء مضاف إليه سماد حيوى أو غير مخلوط به سماد حيوى (EM_1).