EFFECT OF ORGANIC AND BIOFERTILIZERS ON GROWTH, YIELD AND FRUIT QUALITY OF CUCUMBER (*Cucumis sativus*, L.) GROWN UNDER CLEAR POLYETHYLENE LOW TUNNELS

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ABSTRACT

This study was conducted in two winter seasons of 2002-2003 and 2003-2004 on cucumber hybrid "PRINCE" at EL-Borolos area under clear polyethylene low tunnel conditions to evaluate the effect of some organic manures (Chicken manure and compost) and biofertilizers (dual inoculation of *Azotobacter* and *Azospirillum*) compared with chemical fertilizers on growth, early and total yield, fruit characteristic and chemical composition (NPK), cholorophyll and the rhizospheric microbial symptoms. (Nitrogenase activity, count of associative diazotrophs, *Azotobacter* spp and *Azospirillum* spp, CO_2 evaluation, soil dehydrogenase activity and Bacterial population. Results indicated that application of chicken manure with biofertilizer at the rates of 10 m^3 and 20 m^3/ feddan significantly increased vegetative growth (plant height, number of branches, number of leaves and leaf area), early and total yield and fruit quality. Furthermore, rhizosphere microbial symptoms (nitrogenase activity, number of associative diazotrophs, *Azotobacter, Azospirillum* spp., CO_2 evolution, dehydrogenase activity and bacterial population) were also increased compared with those resulted in chemical fertilizer application.

As for the chemical contents of cucumber leaves and fruits (N, P and K and total chlorophyll), results showed that N, P and K were similar in all treatments. Chlorophyll content did not differ significantly from control.

INTRODUCTION

Cucumber (*Cucumis sativus*, L.) is one of the important cucurbiteous crops grown in Egypt. The cultivated open field area reached 58249 feddan with average yield of 7.44 ton/fed, while plastic house area grown with this crop reached 2083 feddan with an average yield of 16.0 ton/fed (Anon, 2000)

A great attention has been focused on the use of bioagriculture in cucumber production by using organic fertilizers and biofertilizers in order to reduce plant and soil pollutions with different elements and also to reduce the use of mineral fertilizers. The addition of organic matter improved the physical, chemical and biological properties of soils and in turn improved the ability of the plant to absorb nutrients (Sterrett, *et al.* 1982 and Harrison & Staub, 1986). Maynard, (1991) pointed that, poultry manure at 50 tons / acre gave equal yield or more than that of inorganic one. He also added that application of organic fertilizer at 5800 lb /acre gave the highest yields for all spring and summer crops at all tested sites.

The application of biofertilizers is economically important to reduce the cost of fertilizers and ecologically to avoid environmental pollution. Many diazotrophic bacteria produce and also secrete phytohormones like auxin, cytokinins and gibberellins and thereby enhance growth of roots and shoots (Jagnow *et al.,* 1991).

Azotobacter is also known to produce an ether soluble fungistatic substance which inhibits the growth of fungi like *Alternaria, Fusarium* and *Rhizoctonia solani* (Gupta *et al.*, 1995). Single inoculation of cucumber and tomato plants with *Azotobacter* caused an increase in nitrogen content by 44.3 and 50% in cucumber and tomato plants compared with uninoculated plants, respectively (Gomaa, 1995). Wang (1998) studied the effects of different fertilizer rates (solid biofertilizer + Foliar applied fertilizer) on the growth and yield of cucumber. He found that fruit quality was improved and yield was increased after application of fertilizer. Gharib (2001) found that inoculated cucumber plants with *Azotobacter* + Phosphate dissolving bacteria (PDB) led to significant increases in early and total yield at the half dose of the normal mineral nitrogen. This study also indicated that the mixture of *Azespirillum* and PDB was more effective on cucumber yield than that contained *Azotobacter* + PDB.

EL-Hadad *et al.* (1993) declared that biofertilizer application is considered a promising alternative for chemical fertilizers under local conditions. Mansour (2002) showed that substituting inorganic nitrogen fertilizer with the biofertilizer Nitrobein (mixture of *Azotobacter* and *Azospirillum*) till 50% was quite enough to produce high marketable yield of sweet potato. Hsieh and Hsu (1994) mentioned that plant height as well as fruit size and fruit number of pepper were significantly higher by application of organic manure than those with chemical fertilizer. Warman (1990) mentioned that chicken manure increased total yield and improved the quality of tomato fruits. EL-Sheikh and Salama (1997) showed that application of chicken manure at 30 and 45 kg/540m^2 enhanced the growth of tomato plant (Plant height and leaf number), fruit number and increased early and total yield, fruit components and their properties.

Organic manure was found to play an important role in increasing growth, yield and its components of many Crops. Ryan *et al.* (1985) found that organic manure gave positive and significant increments for tomato plant height, leaf area and number of fruit per plant. Abd EL-Rahman and Hosny (2001) stated that using organic manure improved eggplant growth, fruit yield and their components. These improvements were much pronounced by application of chicken manure. The same improving effect was found by Montagu & Goh (1990) Giardini *et al.* (1992) on tomato and Hanna & EL-Gizy, (1999) on phosolia.

The objective of the present work was to study the effect of organic manure (Obour compost and Chicken manure) and biofertilizer (*Azotobacter* + *Azospirillum*) on plant growth, yield and its components as well as fruit quality of cucumber and some microbiological activities under low tunnel conditions.

MATERIALS AND METHODS

This experiment was carried out under clear polyethylene low tunnels conditons during the winter seasons of 2002-2003 and 2003/2004 at Brolos area, Kafr EL-Sheikh governorate, to study the effect of organic and biofertilizers on plant growth, yield and its components as well as cucumber fruit quality. The cucumber hybrid used was "PRINCE". Date of sowing was December 13th 2002 and 2003. The experiment included 11 treatments as follows:

1- 10 m^3 of compost without biofertilizer.

2- 10 m^3 of compost with biofertilizer.

3- 20 m^3 of compost with biofertilizer.

4- 30 m^3 of compost with biofertilizer

5- 40 m^3 of compost with biofertilizer.

6- 10 m^3 of chicken manure without biofertilizer.

7- 10 m^3 of chicken manure with biofertilizer.

8- 20 m^3 of chicken manure with biofertilizer.

9- 30 m^3 of chicken manure with biofertilizer.

10- 40 m^3 of chicken manure with biofertilizer.

11- The control (Chemical fertilization).

The compost and chicken manure were added during soil preparation. The biofertilizer was added at three split doses. The first dose was applied by inoculating the seeds before sowing, the second was after twenty days from sowing and the third was added 40 days after sowing. The seeds were sown on rows with width of 1.5m and distance between plants was 30cm. uniform cultivation practices were followed according the recommendation of Ministry of agricultural.

The previous treatments were arranged in three replicates using complete randomized block design. Physical and chemical properties of the experimental soil are presented in Table (1). The analyses of the used chicken manure and compost are shown in Table (2). The biological properties of the soil, chicken manure and compost are shown in Table (3).

Table (1): The chemical and physical analysis of the soil at prolos.

pH	Ec DS/m	$CaCO_3$ %	Cations meq/l					Anions meq/l			Mechanical Analysis			
			N %	P %	K %	Ca	Mg	HCO_3	Cl	SO_4	Sand %	Silt %	Clay	Texture
8.20	1.5	4.50	Traces	0.46	0.52	2.55	1.30	3.87	43	55.56	88	5	7	Sand

Table (2): Some chemical characteristics of the organic sources (compost and chicken manure).

Organic source	Macro nutrients mg/100g			Micro nutriants mg/100g				pH	C / N ratio	C organic
	N	P	K	Fe	Za	Mn	Cu			
Chicken manure	3.21	0.73	1.15	5873	67.3	128	25	7.5	19.81	63.6
Compost	2.04	0.94	0.80	2020	350	170	110	8.08	1.25	1.2

Table (3): Biological properties of the soil, chicken manure and compost.

	CO_2 evolution mg CO_2/100g soil	**Nitrogense activity moloC$_2$ H$_4$ g^{-1} h^{-1}**	**Dehydrogenose activity M1 H100g^{-1} $soil^{-1}$**	**Colony forming unit X 10^5**
Sand soil	247	102.4	17.72	6.7
Compost	317	143.8	29.54	158
Chicken manure	334	219.4	37.91	199

Inoculum preparation:

Azotobacter chroococcum and *Azospirillum lipoferum* was initially isolated from the soil rhizosphere of maize in the Agric.Res.Center (ARC), Giza. The most efficient strain was screened and used as an inoculant for field trials. The mother culture of *Azotobacter* strain was grown on modified Ashby's medium of Abd- EL-Malek and Ishac (1968) while the mother culture of *Azospirilum* strain was grown on N-deficient lactare medium of Döbereiner *et al.* (1976). Inoculum was prepared by subculturing the *Azotobacter* and *Azospirillum* mother culture on nutrient agar in Kolle flasks for 72 hrs, after which the heavy growth was then scratched and transferred to sterile tap water and thoroughly mixed. The prepared inoculum was then used to inoculate seeds.

Seed Inocultation:

Before sowing, seeds were soaked in culture suspension for 30 minutes using 16% Arabic gum solution as sticking agent, then air dried and then sowed. While, for the uninoculated plots (Control), the seeds were similarly treated with the medium without *Azotobacter* or *Azospirillum*.

Data recorded was as follows:

1- Vegetative growth.

Random samples of ten plants from each treatment were chosen at the flowering stage and following data was recorded.

a- Plant height (in cm).

b- Leaf number / plant

C-Leaf area (in cm^2) of the sixth leaf from the meristemic top of the main stem.

Ten plants of each treatment and the area was determined by using L1 – 3000- Portable Area Meter (PAM).

d- Number of branches / plant.

2- Yield and its components.

a- Early yield (ton/feddan): Fruits of first eight harvests from each treatment were weighed to calculate the early yield per feddan.

b- Total yield (ton/feddan): All fruits harvested from each treatment along the harvesting period were weighted to calculate the total yield per feddan.

c- Fruit characteristics: Ten fruits from each treatment were taken randomly for determining average fruit characters as follows.

1- Fruit length (cm).
2- Fruit diameter (cm).
3- Fruit weight (gm).
4- Total soluble solids (TSS) %.
5- Fruit dry weight%.

3- Chemical constituents:

a- Total nitrogen, phosphorus and potassium were determined in the dry matter of leaves and fruits according to the methods described by Pregl (1945), Trough and Mager (1939) and Browns and Lilliland (1946) respectively.

b- Chlorophyll content: leaf content of chlorophyll (mg 100g fresh weight) was determined according to the method of Brougham (1960).

All obtained data were statistically analyzed for variance and the mean values were compared at 5% levels of LSD according to (Snedecor and Cochran, 1972).

4- Microbiological determination:

At harvest, the remained soil was exposed to determine total number of nitrogen fixing bacteria (*Azotobacter* and *Azospirillum*) (Cochran 1950), CO_2 evolution (Pramer and Shmidt 1964) and delydrogenase activity (Casida *et al*. (1964) while nitrogenase activity (N-ase) was estimated in cucumber root rhizosphere area as noted by Leth bridge *et al*. (1982) and total bacteria by decimal serial dilutions (Allen, 1959).

RESULTS AND DISCUSSION

1- Vegetative growth:

Data presented in Table (4) showed that in the first season plant vegetative growth, *i.e.,* plant height (cm), number of leaves, leaf area (cm^2), number of branches and number of leaves showed different responses towards the use of organic and biofertilizer compared with (control) chemical fertilizers. Chicken manure with biofertilizer increased the values of vegetative growth parameters than Obour compost. Application of chicken manure with biofertilizer at the rate of 10 m^3, 20 m^3 and 30 m^3 gave the highest values in the most vegetative growth parameters *i.e*. no of branches and leaf area compared with the chemical fertilization. The lowest values for plant height, number of leaves, number of branches and leaf area were observed with application of the compost. The results showed the same trend during the second season. These results are in agreement with those of Maynard (1991) who stated that adding chicken manure at a rate of 5800 lb /acre gave higher vegetative growth compared with the chemical fertilizer. Hsieh and Hsu (1994) on pepper, EL-Shiekh and Salama (1997) on tomato and Abd EL-Rahman and Hosny (2001) mentioned that adding chicken manure enhanced the plant growth. Gharib (2001) on cucumber mentioned that using biofertilizer led to a remarkable promotion effect on the plant growth, i.e. stem length number of branches, number of leaves and leaf area.

Table (4) Effect of organic and biological fertilization on vegetative growth of cucumber

Treatments	First season				Second season			
	Plant Height (cm)	No of branches	Leaf area cm^2	Leaf Number	Plant height (cm)	No of branches	Leaf area Cm^2	Leaf number
1- $10m^3$ compost without bio	98.3	2.6	87.25	55.6	93.0	2.6	85.8	52.3
2- $10m^3$ compost and bio	75.0	3.0	124.3	77.0	103.0	3.0	113.3	71.6
3- $20m^3$ compost and bio	99.6	3.3	137.2	86.3	93.0	3.3	137.5	75.3
4- $30m^3$ compost and bio	104.3	3.6	141.9	89.3	95.0	4.0	143.2	83.3
5- $40m^3$ compost and bio	106.6	4.0	159.7	93.0	104.6	5.0	147.6	91.0
6- $10m^3$ chicken manure without bio	170.0	6.0	139.2	155.0	152.6	4.6	168.5	106.0
7- $10m^3$ chicken manure and bio	180.0	7.0	193.7	129.0	175.0	6.6	197.3	119.6
8- $20m^3$ chicken manure and bio	205.0	7.0	197.2	112.0	193.3	6.0	177.0	104.3
9- $30m^3$ chicken manure and bio	169.6	6.6	192.3	119.0	140.3	6.0	1162.0	107.0
10- $40m^3$ chicken manure and bio	145.0	5.0	149.7	91.0	136.3	5.0	143.3	133.3
11- Control (mineraL Fert.)	170.0	5.3	180.5	134.0	155.0	6.0	189.0	156.0
L.S.D. at 5%	**17.317**	**0.639**	**21.62**	**16.32**	**7.219**	**0.726**	**19.43**	**18.67**

2-Yield and its components:

a- Early and total yield:

Data in Table (5) show the different studied yield parameters, average fruit weight, early and total yield were significantly responded in positive trend to chicken manure and biofertilizer. Data indicated that the highest fruit weight was obtained at the rates of 10 m^3 chicken manure and biofertilizer. The lowest value was obtained with compost. Data also showed that application of chicken manure at the rate of 10 m^3 without biofertilizer, 10 m^3 with biofertilizer and 20m^3 with biofertilizer gave the highest early yield compared with chemical fertilizer and compost, with a positive significant effect in both seasons. Concerning, total yield chicken manure at the rate of 10 m^3 with biofertilizer, 10m^3 without biofertilizer and 20m^3 with biofertilizer gave the highest production (17.3, 16.7 and 15.5 tons /feddan) respectively, with significant difference between these treatments and compost and chemical fertilization. The lowest total yield was observed with application of compost with and without biofertilizer (4.1 –7.1 ton /feddan). The chemical fertilization gave 12.756 ton /feddan, similar results were observed during the two studied seasons. These results are in agreement with that of Maynard (1990) on nine vegetable crops, Worman (1990), EL-Shiekh and Salama (1997) on tomato, Abd EL-Rahman and Hosny (2000) on eggplant and Monsour (2002) on sweet potato, they stated that using organic manure gave significant increments of early and total yield.

b- Fruit characteristics:

Concerning fruit characters, Table (5) indicated that no significant difference in T.S.S. % was noticed between treatments. The T.S.S. % ranged from 4.2 –4.7%. The fruit length and diameter were not affected by treatments and no significant differences were noticed among the different treatments. The dry matter in cucumber fruits was significantly increased by using chicken manure and compost biofertilizer compared with chemical fertilization during both seasons of the study. Table (5) also revealed the fruit characteristics were improved by adding chicken manure and biofertilizer. These results are similar to those of Warman (1990), EL-Shickh and Salama (1997) on tomato and Abd EL-Rahman and Hosny (2001) in eggplant

3- Chemical constituents:

a- Total nitrogen phosphorus and potassium:

Results in Table (6) indicated that no significant differences were noticed between the manure with biofertilizer and the chemical fertilization in both seasons. These results were detected in both cucumber leaves and fruits.

b-Chlorophyll content:

Chicken manure with biofertilizer application significantly increased total chlorophyll content. The highest values were obtained at the rate of 10 m3, 20 m3 chicken manure with biofertilizer. Chicken manure and chemical fertilization showed no significant difference. The same trend of results was obtained in the second season. The lowest chlorophyll content was obtained by compost fertilizer.

Table (5): Effect of organic and biological fertilization on yield and its components of cucumber

Treatments	First season							Second season						
	T.S.S %	D.W. %	Fruit Length (cm)	Fruit Diam (cm)	Fruit weight g.	Early Yield T/Fed.	Total Yield T/Fed	T.S.S. %	D.W. %	Fruit Length (cm)	Fruit Diam (cm).	Fruit weight g.	Early Yield T/Fed.	Total Yield T/Fed.
1- 10m^3 compost without bio	4.2	11.4	11.7	3.0	95.7	1.035	4.174	5.3	11.2	12.0	3.0	85.0	0.973	4.247
2- 10m^3 compost and bio	4.7	16.2	11.7	3.1	97.1	1.004	4.536	5.5	11.6	12.4	3.1	88.0	1.000	6.558
3- 20m^3 compost and bio	4.6	12.9	12.7	3.1	101.6	1.022	5.159	5.8	11.3	12.7	3.2	94.0	1.095	5.728
4- 30m^3 compost and bio	4.2	13.2	13.0	3.2	11.4	1.248	5.436	5.5	10.5	13.4	3.3	95.0	1.135	5.859
5- 40m^3 compost and bio	4.2	13.5	13.3	3.2	112.5	1.015	7.111	5.6	9.8	13.5	3.3	100.0	1.299	6.095
6-10m^3 chicken manure without bio	4.3	11.1	14.3	3.3	129.2	2.678	16.666	5.7	11.1	14.2	3.4	153.3	2.366	13.034
7- 10m^3 chicken manure and bio	4.3	10.1	15.0	3.5	159.9	2.397	17.317	4.3	10.5	15.4	3.5	155.0	3.077	15.940
8- 20m^3 chicken manure and bio	4.7	10.3	13.6	3.2	119.3	2.181	15.500	4.1	10.2	14.1	3.4	142.0	2.314	14.567
9- 30m^3 chicken manure and bio	4.6	14.8	13.7	3.2	11.1	2.571	13.166	4.1	11.0	16.6	3.2	130.0	1.880	13.412
10-40m^3 chicken manure and bio	4.5	12.4	13.3	3.1	108.5	1.521	12.493	4.0	10.2	13.4	3.2	100.0	1.918	12.640
11-Control (mineraL Fert.)	4.60	11.0	13.6	3.3	150.4	1.610	12.756	4.1	10.5	14.1	3.4	150.0	1.840	12.520
L.S.D. at 5%	**0.142**	**0.53**	**N.S**	**0.05**	**15.382**	**0.726**	**1.021**	**0.12**	**0.41**	**N.S**	**0.109**	**7.316**	**0.267**	**1.083**

Table (6) Effect of organic and biological fertilization on chemical content for fruit and levels of cucumber

Treatments	First season							Second season						
	Fruits mg/100g D.W			Leaves mg/100g D.W			Total Chlor Mg/100g	Fruits mg/100g D.W			Leaves mg/100g D.W			Total Chl Mg/100g
	N.	P.	K.	N.	P.	K.		N.	P.	K.	N.	P.	K.	
1- 10m^3 compost without bio	1.4	0.1	1.9	2.3	0.1	1.6	125.2	1.5	0.1	1.8	2.3	0.1	1.5	121.9
2- 10m^3 compost and bio	1.6	0.1	1.9	2.4	0.1	1.6	125.3	1.8	0.1	2.0	2.4	0.1	16	123.1
3- 20m^3 compost and bio	1.7	0.1	2.2	2.4	0.1	1.7	125.5	1.8	0.2	2.1	2.4	0.1	1.7	124.7
4- 30m^3 compost and bio	1.8	0.2	2.2	2.4	0.1	1.7	128.7	1.9	0.2	2.2	2.5	0.1	1.8	132.9
5- 40m^3 compost and bio	1.9	0.2	2.3	2.5	0.2	1.8	134.7	2.0	0.2	2.2	2.6	0.2	1.8	133.4
6-10m^3 chicken manure without bio	2.2	0.3	2.5	3.1	0.3	2.1	247.9	2.3	0.3	2.4	3.0	0.2	2.1	247.8
7- 10m^3 chicken manure and bio	2.2	0.3	2.5	3.2	0.4	2.1	252.9	2.4	0.3	2.5	3.1	0.2	2.1	254.9
8- 20m^3 chicken manure and bio	2.0	0.2	2.2	2.9	0.3	2.0	245.2	2.0	0.2	2.3	2.8	0.1	2.0	247.7
9- 30m^3 chicken manure and bio	1.9	0.2	2.2	2.5	0.2	2.0	243.6	1.9	0.2	2.3	2.8	0.1	2.0	242.5
10- 40m^3 chicken manure and bio	1.8	0.2	2.2	2.5	0.2	1.8	238.6	2.1	0.2	2.3	2.6	0.1	1.7	242.4

11- Control (mineraL Fert.)	2.1	0.3	2.9	2.9	0.3	2.0	250.9	2.2	0.3	2.5	3.0	0.2	2.1	253.9
L.S.D. at 5%	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**6.318**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**7.28**

4-Rhizosphere microbial symptoms:

Data presented in Table (7) indicated the rhizosphere microbial symptoms as follows:

a-Nitrogenase activity:

As to be expected, nitrogenase activity was successfully promoted throughout the experimentation. The full dose of nitrogen reduced this activity (79.6 and 86.0 nmole C2H4 g-1h-1) at the first and second seasons respectively. Organic manure had tremendously positive effect on this activity. Nitrogenase activity varied according to the different supplements. Table (7) indicated that dual inoculation of *Azotobacter* and *Azospirillum* scored the highest significant amount of N-ase activity with chicken manure at the rate of 10 m3 with biofertilizer (273.2 and 332.8 nmole C2H4 g-1h-1) for the first and second seasons, respectively, and slightly decreased with increasing the rate of organic fertilizers. This observation is coincided with that proposed by Gomaa (1995) who reported that inoculation of cucumber and tomato plants with *Azotobacter* caused an increase in nitrogen content as composed with uninoculated plants.

b-The associative diazotrophs:

The effect of dual inoculation of *Azotobacter* and *Azospirillum* on the total count of bacteria, *Azospirillum* spp. and *Azotobacter* spp, population in rhizosphese and root surface are presented in Table (7). The highest most probable number of *Azotobacter* spp and *Azospirillum* spp. was recorded for the treatment received inoculation at the rate of 10m3 chicken manure for the former (6.8 x 104) and the latter bacteria (7.0 x 104). Also, there were significant differences between both organic manure (compost and chicken manures) in the population of N2 fixing bacteria. On the contrary, there was no significant effect of inoculation at different rates of manures (Table 7). The above results have suggested that the adverse effect occurred for the counts of N-Fixers may attributed to the nitrogen abundance irrespective of the nitrogenous source, where the observation proved that the more the available accumulated nitrogen produced, the less count of N- Fixers. These effects have been in agreement with Ghani – Nagroho and Kuwatsuka (1992).

C- Evolution of soil CO_2:

As potential of the soil to produce CO_2 is shown in Table (7). Concerning the types and rate of organic fertilization and/or biofertilizer, a promotion of microbial activity was observed. It seems that there is stimulating effect of chicken manure (449 and 567mg no moles CO2100g soil-1 for the first and second seasons respectively) than the other manure (226 and 368 mg CO2100g soil-1) with the rate of 10m3 g organic manure.

Therefore, it can be suggested that increasing of microbial population density and hence, production of CO_2, may be attributed to N-ase activity for nitrogen fixing microorganisms in particular. This finding was agreed with data of Baldam *et al.* (1986) and Martin *et al*. (1989).

Table (7) Effect of organic and biological fertilization on microbial activity of cucumber.

Treatments	First season						Second season					
	Dehydr-ognease activity ىIHI100g soil^{-1}	Co^2 evalution Mg CO^2. 100g soil^{-1}	Total plate count X 10^6	Nitrogenas activity nmoles C2H4 g $^{-1}$.h $^{-1}$	Nirogen fixers X 10^5		Dehydr-ognease activity ىIHI100g soil^{-1}	Co^2 evalution Mg CO^2. 100g soil^{-1}	Total plate count X 10^6	Nitrogenas activity nmoles C2H4 g $^{-1}$.h $^{-1}$	Nirogen fixers X 10^5	
					Azoto.	Azosp.					Azoto.	Azosp.
1- 10m^3 compost without bio	14.2	175	16.5	108.4	0.8	0.7	19.9	235	21.4	141.5	1.2	1.1
2- 10m^3 compost and bio	24.9	226	29.1	131.0	1.6	1.2	29.3	36.3	34.7	143.8	2.6	1.8
3- 20m^3 compost and bio	28.5	243	34.5	142.7	1.9	1.7	34.0	390	36.7	179.2	3.3	2.4
4- 30m^3 compost and bio	28.7	272	35.9	156.2	2.3	2.4	38.2	402	41.0	183.6	3.9	3.1
5- 40m^3 compost and bio	31.5	280	40.2	144.5	2.8	2.9	36.3	449	47.8	156.2	4.1	3.2
6- 10m^3 chicken manure without bio	33.2	416	52.6	257.0	3.3	4.5	46.5	485	54.1	259.6	5.4	4.8
7- 10m^3 chicken manure and bio	53.7	449	79.5	273.2	7.0	5.8	57.3	567	87.7	332.8	9.2	8.6
8- 20m^3 chicken manure and bio	41.6	426	62.3	215.8	5.2	3.5	50.2	553	69.8	226.7	9.1	6.3
9- 30m^3 chicken manure and bio	38.9	388	50.2	197.5	5.6	2.6	45.1	537	65.9	198.9	7.4	7.1
10- 40m^3 chicken manure and bio	32.6	347	48.5	161.6	3.9	3.3	42.0	461	55.8	197.5	5.2	3.3
11- Control (mineraL Fert.)	31.8	326	47.7	79.6	3.7	2.8	43.5	473	51.5	86.0	4.9	3.7
L.S.D. at 5%	**11.619**	**95.00**	**7.809**	**25.235**	**0.249**	**0.380**	**12.894**	**106.32**	**13.668**	**8.924**	**0.839**	**1.645**

D- Soil Dehydrogenase activity and Bacterial population:

The active of soil dehydrogenase as affected by organic fertilization and /or biofertilization and the colony forming units (cfu) are presented in Table (7). The soil dehydrogenase was positively responded to the application of organic manure. Chicken manure was better to furnish conditions most suitable for soil microflora to produce more and active dehydrogenase (53.7 and 57.3 μLH_2 100g soil^{-1}) whereas compost was less in the two seasons (24.9and 29.30 μLH_2 100g soil^{-1}respectively.

Since dehydrogenase activity is as measure of microbial activity in soil, hence, in soil receiving inorganic fertilizers (NPK), the activities were low (only 31.8 µLH2 100g soil-1) due to the presence of nitrate which served as an alternative electron acceptor. Therefore, dehydrogenase activities were not a reliable index of microbial activity in soil treated with N-fertilizer (Goyal *el al.* 1992).

The bacterial densities increased with the addition of different manures with biofertilizer. The bacterial population was in the range of 16.5 x 106 to 87.7 cfu. g soil-1, in both seasons depending on the supplements. It was observed that at the end of the experiment, the soil treated with chicken manure harbored higher microbial densities than Obour compost.

CONCLUSION

It has been well documented in the literature that crop yield of cucumber can be improved by the inoculation with the associative N_2- fixers (Gomaa, 1995; Wang *et al*., 1998 and Gharib, 2001). The increase in vegetative growth, yield and its component, fruit characteristics and rhizosphere microbial activities might be explained on the basis of either the hormonal effect or N- fixing activity of diazotrophic bacteria and there activities were enhanced due to the increase of diazotrophic population densities in soil received inoculation with chicken manure. At the same time, as Gupta *et al.* (1995) mentioned that *Azotobacter* produce fungistatic substance which inhibits the growth of pathogenic fungi such as *Alternaria, fusarium* and *Rhizoctonia solani*.

Therefore, the obtained data in the present study strongly confirmed and suggested that biofertilizer inoculation can be successfully applied in order to reduce half of the consumed chemical fertilizers. Taking into consideration the economic point of view, such inoculation treatments could be applied to reduce the consumption of chemical fertilizer (by 50%) which in turn would reduce the agricultural costs as well as pollution of the Egyptian agriculture environment.

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تأثير السماد العضوي والحيوي على نمو ومحصول وجودة ثمار الخيار تحت الأنفاق البولي إيثيلين الشفاف

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أجريت هذه الدراسة فى منطقة البرلس بمحافظة كفر الشيخ خلال المواسم الشتوية ٢٠٠٢/٢٠٠٣، ٢٠٠٣/٢٠٠٤ تحت ظروف التغطية بالأقبية البلاستيكية على الخيار هجين "برنس" لدراسة تأثير التسميد العضوى والحيوى (دواجن + أزوتوباكتر + أزوسبيريلم) و(الكومبوست + أزوتوباكتر + أزوسبيريلم) على صفات النمو والمحصول المبكر والكلى وصفات الجودة فى الثمار مقارنة بالتسميد الكيماوى. كما تم دراسة محتوى الثمار من NPK والكلوروفيل وكذلك النشاط الميكروبى (نشاط انزيم النيتروجينيز، أزوتوباكتر، أزوسبيريلم، ثانى أكسيد الكربون والنشاط البكترى) فى منطقة الريزوسفير وأوضحت النتائج أن :-

-إضافة ١٠م٣ أو ٢٠م٣ من سماد الدواجن للفدان بالإضافة إلى التسميد الحيوى أدى إلى زيادة النمو الخضرى (طول النبات، عدد الأفرع، عدد الأوراق ومساحة سطح الورقة) وكذلك زيادة المحصول المبكر والكلى وتحسين صفات الجودة لثمار الخيار، وكذلك زيادة النشاط الميكروبى فى منطقة الريزوسفير مقارنة بالسماد الكيماوى وبفروق معنوية واضحة عن بقية المعاملات.

-أظهر التحليل الكيماوى للاوراق وثمار الخيار زيادة فى محتوى الكلوروفيل للمعاملات الموصى بها عن بقيه المعاملات وكان المحتوى من النيتروجين والفوسفور والبوتاسيوم متماثلاً في كل المعاملات تحت الدراسة بدون فروق معنوية.

وتوصى الدراسة بإضافة ١٠م٣ سماد دواجن للفدان بالإضافة إلى التسميد الحيوي وعدم المغالاة في إضافة الأسمدة العضوية