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EFFECT OF ORGANIC AND BIOFERTILIZERS ON GROWTH AND YIELD OF SNAP BEAN grown UNDER TRANSPARENT POLYETHYLENE LOW TUNNELS IN NEWLY RECLAIMED LAND

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ABSTRACT

A trials was carried out at Borollous site, Kafr EL-Sheikh Governorate, North Nile Delta region during the winter seasons of 2003 and 2004, to study the effect of organic and biofertilizers on snap bean plant growth, yield and its components as well as pod quality, under clear polyethylene low tunnels and using fertigation through drip irrigation system.

The results can be summarized as follows:

- Vegetative growth i.e., plant height, number of leaves, stem diameter, plant dry weight percentage, number of branches per plant and plant leaf area showed increasing the values towards the use of chicken manure with biofertilizer compared with chemical and compost fertilizers.
- Application of chicken manure at the rate of 30 m^3/fed. with biofertilizer gave the highest early and total yield of pods than other treatments.
- Chicken manure treatment plus biofertilizer improved pod content of N.P. K. and total sugars.

The addition of biofertilizer to the organic manure (compost or chicken manure) enhanced the biological activity of total microbial count i.e., count of nitrogen fixing bacteria, both dehydrogenase and nitrogenase activities and CO_2 evolution. These results were in comparison with the treatments received organic manure only at the rate of 10 m^3 fed^{-1}. Results also revealed that the highest soil biological activity was due to the application of 40 m^3 chicken manure plus biofertilizer in both tested seasons. Accordingly, this study ensured that the use of organic fertilizers accompanied with biofertilizers was more beneficial than the use of organic fertilizers alone in bopth tested seasons.

INTRODUCTION

Organic agriculture started in Egypt in 1978. This sort of Production was mainly for medicinal herbs for both local and export market. The total acreage of organic agriculture in Egypt reached about 15000 feddan in 2003, with a full range of products including medicinal herbs, fresh vegetables, fruits, field crops and cotton EL-Araby, 2003).

Snap bean is one of the important vegetable crops in Egypt, which has a great weight for both local consumption and export. Egyptian Ministry of Agriculture aimed to extend the cultivation area of snap bean especially in newly reclaimed land because of its economical value. Snap bean is the second exportable vegetable crop in Egypt.

A great attention has been focused on the bio agriculture production by using organic fertilizers and biofertilizers in European countries in order to avoid plant and environmental pollution with different elements and also to reduce the use of mineral fertilizers.

Snap bean needs little quantity of fertilizers (40 kg N + 48 kg p_2o_5 + 48kg k_2o/fed) than any vegetable crop for producing a good yield.

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.*, 1988 and Harrison & Staub, 1986).

The application of biofertilizers is economically important to reduce the use of mineral fertilizers and ecologically to avoid environmental pollution. Many auotrophic bacteria produce and also endogenous phytohormones like auxin, cytokynins and gibberellins and therby enhance growth of roots and shoots (Jagnow *et al.*, 1991). *Azotobacter* is also known to produce an ether soluble fungistatic substances which, inhibit the growth of fungi like *Alternaria, Fusarium* and *Rhizoctonia solani* (Gupta *et al.*, 1995). It was concluded that inoculation with N_2-fixers can save half of the normal field rate of inorganic nitrogen fertilizer (Subba Rao 1979, Badawy *et al.*, 1997). It was demonstrated that *Azospirillum* inoculation to cereal crops can save about 20 unit of nitrogen (Omar and Hassan 1993). The beneficial effect of N_2–fixing bacteria inoculation has been proved by many scientists at different parts of the world on plant growth, dry weight, total nitrogen content and yield of various crops (Nayak *et al.*, 1986). There are specific bacteria responsible for fixing nitrogen by symbiosis with legumes such as snap bean, but occasional inoculation failures may be resulted from microbiological competition, density of protozoalysis with bacteriophages and susceptibility to toxins produced by other groups of organisms, which, suppress the desired microsymbiont and prevent infection initiation (Subba Rao, 1979). For these reasons, the investigators had recommended that inoculation with associative N_2–fixers such as *Azospirillum* as an alternative mean to enhance plant growth in the absence or presence of *Rhizobia*. This biotechnology might save up to 50% of the cost of nitrogen fertilizers and also gave a healthy product (Subba Rao, 1979, Badawy *et al.*, 1997) or increased crop productivity (Bashan *et al.*, 1989).

Safaa Mansour (2002) showed that substituting inorganic nitrogen fertilizers with the biofertilizer Nitrobein (Mixture of *Azotobacter* and *Azospirillum* till 50% was quite enough to produce high marketable yield of sweet potato. Organic manure was found to play an important role in increasing growth, yield and its components of many crops. Hanna & Gizy (1999) found that organic manure gave positive and significant increment for snap bean plant growth, leaf area and number of pods per plant. Sarig *et al.*, 1984 showed that *Azospirillum* inoculation increased dry matter and mineral accumulation in plant parts of legumes. Shahaby (1981) found that cowpea and pea inoculated with *Azospirillum* recorded increased weight of dry pods/ plants, number of pods/plant along with a significant increase in the yield of green pods/ pea plant. EL-Shimi (2004) found that vegetative growth characteristics of snap bean cv. Bronco expressed as plant height, number of branches and leaves, leaf area as well as fresh and dry weights per plant were significantly increased when the plants were fertilized with biofertilizer, organic manure compared with the control. Samira EL-Gizy (1990) studied the effect of chicken manure on common bean, the results showed that weight and length of pods were increased by manure application Singer *et al.*, 2000 on snap bean; EL-Bassiony 2003 and Ewais 2003 on common bean they found that biofertillizer increased nitrogen, potassium and sugar content in pods and decreased fiber percentage as compared to bean without biofertilizer.

(EL- Kholy, 1998) application of organic fertilizer and/or biofertilizer in agriculture are potential substitute substances for chemical fertilizers and they are environmentally safe and appropriately effective. Such improvements in soil biological activity that achieved due to the application of organic manure combined with biofertilizer were also noted by Mervat and Dahdoh (1995) who reported that organic manure (chicken manure and farmyard manure) stimulate biodegradation through increasing the population and activity of microorganisms in the soil and in turn increased the biological activity and soil fertility. Khalil *et al.*, (2004) found that the combination between chicken manure and biofertilizer (*Azospirillum brasilence* and *Bacillus megatherium phosphaticum*) enhanced wheat growth increased yield and NPK uptake by straw and grain. They also added that bioorganic farming in sandy soil improved the biological activity in terms of increasing nitrogenase and dehydrogenase activities and the manure of microorganisms in the sandy soil. Samira EL-Gizy *et al.* (1999) working on snap bean found that Azospirillum increased significantly pod average fruit weight compared to control treatments. Abd EL- Latif et al., (2005) stated that organic fertilizer and biofertilizer applied to maize crop cultivated under sandy soil condition improved yield and yield components due to the increase of nutrient availability resulted from high microbial activity.

The aim of the present work is to study the effect of organic manure (Biogreen compost and chicken manure) and biofertilizer (*Azotobacter* and *Azospirillum*) on plant growth, yield and its components as well as fruit quality of snap bean and some microbiological activities under clear polyethylene low tunnel conditions.

MATERIALS AND METHODS

An experiment was conducted at Borollous site, Kafr EL-Sheikh Governorate, North Nile Delta under clear polyethylene low tunnels conditions during the winter seasons of 2003 and 2004, to study the effect of organic and biofertilizers on snap bean plant growth, yield and its components as well as pod quality.

Seeds of snap bean (*Phaseolus vulgaris* L.) cv. paulista were sown on the 5^{th} of January 2003 and 2004 on beds, the width of the bed was 1m and the length was 20m. Four rows have been planted on each bed at a distance of 20cm between rows and 5-7cm between seeds on the row. Every bed has two lateral drip irrigation pipes and the distance between drippers was 30cm.

The experiment included 11 treatments as follows:

1- 10 m^3 of Bio- green compost / fed.
2- 10 m^3 of Bio- green compost with biofertilizer / fed.

3- 20 m^3 of Bio- green compost with biofertilizer / fed.
4- 30 m^3 of Bio- green compost with biofertilizer/ fed.
5- 40 m^3 of Bio- green compost with biofertilizer/ fed.
6- 10 m^3 of chicken manure / fed..
7- 10 m^3 of chicken manure with biofertilizer / fed.
8- 20 m^3 of chicken manure with biofertilizer / fed.
9- 30 m^3 of chicken manure with biofertilizer / fed.
10- 40 m^3 of chicken manure with biofertilizer / fed.
11- Control chemical fertilization according to recommedes of ministry of agriculture.

The compost and chicken manure were added during soil preparation. The biofertilizer was added at three split doses.

1- The first dose 50ml (40 spors mL^{-1}) Kg^{-1} was applied by inoculating the seeds before sowing.
2- The second dose (20 L $fed.^{-1}$) after twenty five days from sowing by adding liquid culture of biofertilizer to the soil through irrigation system.
3- The third dose (20 L $fed.^{-1}$)during the flowering period.

Uniform cultivation practices were performed according to the recommendation of Ministry of Agricultural, in Egypt.

The previous treatments were arranged in four 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).

Inoculum preparation:

Azotobacter chrococcum and *Azospirillum* were initially isolated from the soil rhizosphere of maize in the Agric. Res. Center (ARC), Giza, Egypt. The most efficient strains were screened and used as an inoculants for 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 *Azospirillum* strain was grown on N. deficient lactate medium of Dobereiner 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 Inoculation:

Before sowing, seeds were soaked in a culture suspension for 30 minutes using 16% Arabic gum solution as sticking agent, then air dried and then sown. While, for the uninoculated plots (control), the seeds were similarly treated with the medium without *Azotobacter* or *Azospirillum*. When the seedlings were at 3-4 leaf stage added to soil nearly the seedlings hills through the drip irrigation system. Similarly it was added for the second and third inoculation doses.

Table (1) : Chemical and physical analyses of the soil at Borollous

pH	Ec	CaCo3	PPm		Cations meq			Anions meq			Mechanical Analysis			
	DS/m	%	N	P	K^+	Ca^{++}	Mg^{++}	Hc_{03}^-	$C1^-$	$So4^-$	Sand %	Silt %	Clay %	Texture
8.20	1.5	4.50	Traces	0.46	1.52	2.55	1.30	1.87	2.10	1.40	88	5	7	Sand soil

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

	Macro nutrients mg/100g			Micro nutriants ppm				pH	C / N	C
Organic source	N	P	K	Fe	Za	Mn	Cu		ratio	organic
Chicken manure	3.21	0.73	1.15	5873	67.3	128	25	7.5	19.81	63.60
Bio – green compost	1.29	2.19	1.65	7777	253	28.4	7.3	9.14	15.66	20.2

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

	CO_2 evolution mg CO_2/100g soil	Nitrogenase activity nmoleC_2H_4 g^{-1} soil h^{-1}	Dehydrogenase activity µL H_2 100g $soil^{-1}$	N2 – fixing bacteria count *CFU x 10^5/100g soil
Sandy soil	247.00	21.94	17.72	6.7
Bio – green compost	247.00	98.60	13.71	5.40
Chicken manure	334.00	102.40	37.91	199.00

* CFU = Colony formed / unit

Measurements were as follows:

1- Vegetative growth:

Random samples of ten plants from each replicate were chosen at the flowering stage and following data were recorded:-

- Plant height (cm) was determined from the cotyledon up to the highest growing tip.
- Number of leaves / plant.
- Stem diameter (cm.).
- Plant dry matter percentage: Sample of fresh plants were weighed and dried at 70^{0}C until reached a constant weight and percentage of dry matter was calculated.
- Number of branches / plant.
- Leaf area (cm^2) the six leaf from the meristemic tip of the main stem of each treatment was measured using LI- 3000 portable Area Metter (PAM).

2- Yield and its components:

- Pod length (cm.)
- Pod diameter (cm.)
- Average fruit weight (gm.)
- Early yield (ton/feddan) pods of first four harvests from each treatment were weighed to calculate the early yield per feddan.
- Total yield (ton/feddan). All pods harvested from each treatment along the harvesting period were weighed to calculate the total yield per feddan.

3- Chemical composition:

A- Total nitrogen, phosphorus and potassium were determined in the dry matter of leaves and pods according to the methods described by Pregl (1945), Trough and Mager (1939) and Brown and Lilliand (1946), respectively.

B- Chlorophyll content (A, B) and total carotenoids (mg/100g fresh weight) were determined in plant foliage according To A. O. A. C. (1980).

C- Fiber content (%) and total sugars (%) were determined in pods according to the methods described by A.O.A.C. (1980) and Smith *et al.* (1956).

All obtained data were statistically analyzed for variance and the mean values were compared at 5% levels of LSD according to Snedecor and Cocharn, 1982).

4- Microbiological determination:

At harvest, the remained soil was subjected to determine total number of nitrogen fixing bacteria (*Azotobacter* and *Azospirillum*) (Cocharn 1950), Co_2 evaluation (Pramer and Shmidt 1964) and dehydrogenase activity (Casida *et al.*, 1964), while, nitrogenase activity (N –ase) was estimated in snap bean 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 in Table (4) show the response of plant vegetative growth to different tested treatments on both years of study. Vegetative growth, i.e., plant height, number of leaves, stem diameter, plant dry weight percentage, number of branches per plant and plant leaf area exhibited different responses towards the use of organic and biofertilizer compared with chemical fertilizers (Control). Chicken manure with biofertilizer increased the values of vegetative growth parameters than Bio-green compost. Application of chicken manure with biofertilizer at the rate of $20m^3$, $30m^3$ and $40m^3$ /fed. gave the highest values in most vegetative growth parameters i.e. plant height, number of leaves, number of branches and leaf area compared with the chemical fertilization. The lowest values for plant height, number of leaves, stem diameter, number of branches and leaf area were observed with the application of the compost in both seasons. These results are in agreement with those of EL-Shimi (2004) who stated that the vegetative growth characteristics i.e. plant height, number of branches and leaves, average leaf area as well as fresh and dry weight per plant of snap bean were significantly increased when the plants were fertilized with biofertilizer or organic manure compared with the control treatment. Regarding the effect of biofertilizer on vegetative growth, results are in accordance with those reported by Cupta *et al.*, (1995) and Badawy *et al.* (1997) on tomato; Samara EL-Gizy *et al.* (1999); Jagnow *et al.* (1991) and Nayak *et al.* (1979) on snap been and Hana and EL-Gizy (1999) on common bean.

2- Yield and its component:

a- Pod characteristics.

Concerning pod characters, Table (5) indicated that no significant difference in pod diameter was noticed in both seasons. The pod diameter ranged between 0.5 - 0.7 cm.

Both 20 m^3 and 30 m^3 / fed. chicken manure accompanied with biofertilizer increased pod length and average fruit weight in both seasons compared with other treatments and control. Meanwhile average fruit weight obtained from compost treatment was significantly lower than control. However chicken manure gave similar average fruit weight as control this was time in both years of study. These results are similar to those of Samira EL-Gizy *et al.* (1999) worked on snap bean who found that *Azospirillum* inoculation increased significantly pod average fruit weight compared to control treatment. Samira EL-Gizy (1990) studied the effect of chicken manure on common bean, the results showed that weight and length of pods were increased by manure application.

b- Early and total yield:

Results in Table (5) indicated that $10m^3$ chicken manure + biofertillizer / fed. gave greater early yield than the same rate of chicken manure without biofertilizer being significant in the first season only. Higher rate of chicken manure i.e. 30 m^3 /fed. + biofertilizer resulted in significantly higher early yield than either 10,20,40 m^3 /fed.

Table (4): Effect of organic and bio-fertilizer on vegetative growth of snap bean grown in winter seasons of 2003 and 2004.

Characters / Treatments	First season						Second season					
	Plant height (cm)	No. of leaves /plant	Stem diameter (cm)	dry weight plant %	No. of branches /plant	Leaf area (cm^2)	Plant height (cm)	No. of leaves /plant	Stem diameter (cm)	dry weight plant %	No. of branches /plant	Leaf area (cm^2)
1- 10m3 compost+ bio.* / fed.	21.3	10.2	0.3	11.7	3.0	91.23	23.6	10.3	0.3	11.8	3.2	108.12
2- 20m3 compost + bio. / fed.	23.3	10.5	0.3	11.6	3.4	106.89	25.6	11.0	0.3	11.6	3.4	121.15
3- 30m3 compost + bio. / fed.	25.0	10.7	0.3	12.2	3.4	110.00	26.3	11.2	0.5	12.6	3.6	125.00
4- 40m3 compost + bio. / fed.	29.0	13.0	0.4	12.0	3.5	115.69	31.3	13.3	0.5	12.8	3.6	130.17
5- 10m3 chicken manure + bio. / fed.	38.3	14.2	0.4	12.5	4.9	131.38	42.0	18.2	0.5	13.2	5.2	141.39
6- 20m3 chicken manure + bio. / fed.	40.0	15.6	0.5	12.3	5.5	161.86	44.3	18.6	0.6	12.8	5.5	181.86
7- 30m3 chicken manure + bio. / fed.	41.0	17.0	0.6	12.3	5.6	194.74	44.6	19.7	0.6	12.2	5.7	202.62
8- 40m3 chicken manure + bio. / fed.	44.6	19.0	0.6	13.0	5.9	197.16	46.3	19.9	0.7	13.2	6.1	206.76
9- 10m3 compost / fed.	20.6	9.7	0.3	11.4	2.9	90.02	21.3	9.0	0.3	10.4	3.0	102.16
10- 10m3 chicken manure / fed.	33.0	13.0	0.3	12.9	4.3	120.11	38.0	15.0	0.5	12.9	4.9	127.84
11- Control	38.6	15.0	0.5	12.8	4.6	145.32	42.0	15.6	0.6	12.2	4.7	155.63
L.S.D. at 5%	2.05	1.13	0.08	0.75	0.19	7.31	1.49	1.02	0.19	1.25	0.28	10.28

* bio = biofertilizer

Table (5) Effect of organic and bio-fertilizer on snap bean yield and its components in winter seasons of 2003 and 2004.

Characters / Treatments	First season					Second season				
	Pod length (cm)	Pod diameter (cm)	Average fruit weight (g)	Early yield ton/fed.	Total yield ton/fed.	Pod length (cm)	pod diameter (cm)	Average fruit weight (g)	Early yield ton/fed.	Total yield ton/fed.
1- 10m3 compost+ bio.* / fed.	9.5	0.5	3.6	1.16	2.93	9.3	0.5	3.2	0.68	2.34
2- 20m3 compost + bio. / fed.	9.9	0.5	3.8	1.17	3.20	9.6	0.5	3.7	0.80	2.71
3- 30m3 compost + bio. / fed.	11.2	0.6	4.1	1.40	3.26	10.8	0.6	4.3	0.91	2.71
4- 40m3 compost + bio. / fed.	11.9	0.6	4.5	1.50	3.56	10.6	0.6	4.6	0.95	2.91
5- 10m3 chicken manure + bio. / fed.	12.1	0.7	5.4	1.94	5.51	11.9	0.7	5.4	1.53	4.07
6- 20m3 chicken manure + bio. / fed.	12.4	0.7	5.6	2.34	5.97	12.6	0.7	5.8	1.82	5.28
7- 30m3 chicken manure + bio. / fed.	12.5	0.7	5.7	2.41	6.11	12.8	0.7	5.8	2.11	5.54
8- 40m3 chicken manure + bio. / fed.	12.0	0.7	5.3	2.04	5.84	12.1	0.7	5.4	1.55	4.87
9- 10m3 compost / fed.	9.2	0.5	3.5	0.93	2.47	9.0	0.5	3.4	0.54	2.13
10- 10m3 chicken manure / fed.	12.0	0.7	5.1	1.27	3.36	12.2	0.6	5.2	1.47	3.04
11- Control	12.1	0.7	5.4	1.69	4.74	12.1	0.6	5.4	1.93	4.51
L.S.D. at 5%	**1.7**	**N.S.**	**0.8**	**0.71**	**1.26**	**1.6**	**N.S**	**0.9**	**0.58**	**1.09**

* bio = biofertilizer

chicken manure, any compost treatment used or control in both years of study. It seems that 30 m^3 chicken manure + biofertilizer was the most reliable treatments in producing high early yield of snap beans under the conditions of this experiment Regarding total yield, chicken manure at a rate of 10 m^3 /fed. + biofertilizer gave significantly greater total yield than the same rate when applied in two years of study without biofertilizer. In the mean time chicken manure at a rate of 30 m^3 /fed. + biofertilizer had similar trend on total yield as that of the early yield. The increase in yield of snap been could be due to the increase in average pod weight and / or number of pods.

These results are in parallel with those reported by Samira EL-Gizy *et al.* (1999) on green bean; Bashan *et al.* (1989) and Gupta *et al.* (1995) on tomato; Shahaby (1981) and Safaa Mansour (2002) on sweet potato.

3- Chemical compositon:

3-1- Plant foliage.

Data in Table (6) showed that there were significant differences between treatments in N, P, K, chlorophyll content and total corotenoids of plant foliage in both seasons. Significantly high N, P, K of the plant foliage was obtained with 30 m^3 chicken manure + biofertilizer / fed. compared with control.

Similar trend was found for chlorophyll and carotenoids contents. Generally, compost treatments gave lower N,P,K chlonophyll and carotenoids contents compared with controls. The results obtained by Omar and Hassan 1993 on cereal crops; Sarig *et al.*, 1984; Sterrett *et al.*, 1988 and Harrison and Staub 1986 on cucumber.

3-2- Pod chemical composition.

Data in Table (7) illustrated that chicken manure + biofertilizer at any rate gave greater N content of the pods. Similar result was obtained with chicken manure without biofertilizer. On the other hand all compost treatments apart from the rate of 40 m^3 /fed. compost + biofertilizer gave significantly lower pod N content compared with control. This was true in both seasons.

Concerning pod phoshorus content data revealed that application of chicken manure at a rate of 40 m^3 /fed. + biofertilizer resulted in significantly greater pod phosphorus content than control in the mean time. Most compost treatments gave significantly less pod phosphorus content than control in both years of study. Regarding pod potassium and fiber contents, no significant differences were observed due to the treatments in both years of study.

With respect of pod total sugars content data showed that 40 m^3 chicken manures + The biofertilizer gave significantly greater pod total sugar content compared with control in the first year only. In the second year no significant effect was noticed.

Singer *et al.* (2000) investigated the response of snap bean to inoculation with biofertilizer and they stated that biofertilizer decreased fiber percentage and increased protein percentage and carbohydrate content of green pod.

Table (6) :Effect of organic and bio-fertilizer on chemical composition of plant foliage of snap beans (2003 and 2004).

Characters / Treatments	First season					Second season				
	N %	P %	K %	Chlorophyll A+B mg/100g F.W.	Total Carotenoids mg/100g F.W.	N %	P %	K %	Chlorophyll A+B mg/100g F.W.	Total Carotenoids mg/100g F.W.
1- 10m3 compost+ bio.* / fed.	2.66	0.072	2.28	145.9	127.1	0.9	0.136	2.12	93.9	123.2
2- 20m3 compost + bio. / fed.	2.03	0.057	2.66	167.7	137.2	1.4	0.102	2.20	109.6	146.6
3- 30m3 compost + bio. / fed.	2.66	0.170	2.44	171.1	138.4	1.6	0.266	2.36	157.4	170.9
4- 40m3 compost + bio. / fed.	2.63	0.248	2.70	247.9	157.2	1.7	0.377	2.52	166.2	183.4
5- 10m3 chicken manure + bio. / fed.	2.36	0.304	3.09	263.5	166.0	2.3	0.581	3.08	227.1	196.1
6- 20m3 chicken manure + bio. / fed.	2.90	0.532	3.11	294.0	166.0	2.5	0.593	3.24	244.9	196.4
7- 30m3 chicken manure + bio. / fed.	3.20	0.609	3.57	357.3	199.8	2.9	0.771	3.52	279.7	199.3
8- 40m3 chicken manure + bio. / fed.	2.66	0.449	2.93	309.5	176.8	2.7	0.488	3.04	255.2	198.2
9- 10m3 compost / fed.	1.66	0.144	2.10	140.2	117.2	1.0	0.094	2.04	76.7	88.9
10- 10m3 chicken manure / fed.	1.96	0.297	2.85	229.5	121.4	1.7	0.386	2.76	196.8	161.4
11- Control	2.83	0.498	2.71	258.3	171.4	1.9	0.511	2.80	236.2	191.4
L.S.D. at 5%	**0.36**	**0.062**	**0.95**	**16.0**	**12.8**	**0.68**	**0.108**	**0.58**	**6.32**	**8.02**

* bio = biofertilizer

Table (7): Effect of organic and biofertilizer on pod chemical composition of snap bean (2003 and 2004).

Characters / Treatments	First season					Second season				
	N %	P %	K %	Fiber %	Total sugar %	N %	P %	K %	Fiber %	Total sugar %
1- 10m3 compost+ bio.* / fed.	1.2	0.441	1.9	9.22	8.65	1.1	0.573	2.4	10.09	10.33
2- 20m3 compost + bio. / fed.	1.2	0.534	1.9	9.03	8.90	1.8	0.576	2.7	9.82	11.52
3- 30m3 compost + bio. / fed.	1.4	0.535	2.0	8.91	9.61	1.9	0.683	2.8	9.56	11.70
4- 40m3 compost + bio. / fed.	1.5	0.626	2.2	8.77	9.91	1.9	0.666	2.9	9.37	11.91
5- 10m3 chicken manure + bio. / fed.	2.0	0.654	2.7	7.43	10.74	2.1	0.774	3.6	7.85	13.32
6- 20m3 chicken manure + bio. / fed.	2.8	0.766	2.9	7.02	11.82	2.3	0.781	3.6	7.54	13.57
7- 30m3 chicken manure + bio. / fed.	2.8	0.778	3.0	6.47	12.67	3.0	0.796	3.6	7.45	13.61
8- 40m3 chicken manure + bio. / fed.	3.2	0.794	3.2	6.36	12.92	3.0	0.799	3.7	7.32	13.47
9- 10m3 compost / fed.	1.4	0.431	1.7	9.52	8.11	1.8	0.573	2.2	10.19	9.63
10- 10m3 chicken manure / fed.	1.5	0.536	2.2	8.61	9.96	2.6	0.642	3.1	8.97	12.73
11- Control	1.9	0.646	2.6	8.32	10.53	2.8	0.776	3.0	8.88	12.93
L.S.D. at 5%	**0.43**	**0.091**	**N.S**	**N.S**	**1.13**	**0.58**	**0.12**	**N.S**	**N.S**	**1.08**

- bio = biofertilizer

EL-Bassiony (2003) found that inoculation of common bean seeds with biofertilizer increased nitrogen, protein, potassium and sugar contents in pods and decreased fiber percentage as compared to bean without biofertilizer. Same results were found by Ewais (2003) also on common bean and pea.

4- Biological activity of the post harvest soil aspects:

Data in Table (8) show the effect of both organic fertilizer and biofertilizer on the biological activity of the post harvest soil characteristic, i.e. dehydrogenase activity (DHA), total bacteria count, CO_2 evolution amount, N_2- fixer bacterial count and nitrogenase activity (N-ase) in both tested seasons. However, addition of biofertilizer (*Azospirillum* and *Azotobacter*) to any of compost or chicken manure applied at all levels led to enhance the biological activity for the post harvest tested soil compared to the use of $10m^3$ fed either from compost or chicken manure without biofertilizers. The highest biological soil activity was due to the treatment received $40m^3$ chicken manure accompanied with biofertilizer in both tested seasons. Also, the highest values recorded in the second season was slightly higher than those recorded by the first season, i.e. DHA values were 42.00 μL H_2 100g $soil^{-1}$ for the first season and 47.30 μL H_2 100g $soil^{-1}$ for the second season. Additionally, increasing either compost or chicken manure level from 10, 20, 30 to 40 m^3 /fed. when accompanied with biofertilizer increased all the tested soil biological characters than those received organic manure only without biofertilizer. It is worth to note that application of 20 m^3 compost combined with biofertilizer had recorded similar results to those obtained the control treatment (chemical fertilizer). The lowest soil biological values were recorded by the treatment received 10 m^3 /fed compost without biofertilizer.

Regarding the effect of biofertilizer on biological activity of the post harvest soil aspects results were in accordance with those reported by EL-Kholy 1998; Mervat and Dahdoh 1995; Khalil *et al*. 2004 and Abd EL-Laty *et al*., 2005.

It can be concluded here that the obtained higher early and total yields of snap beans due to the application of 30m3 chicken manure /fed. + biofertilizer would be related to the biological activitiy of the added chicken manure. Thus addition of the above mentioned rate of chicken manure would be matching or even surpass the effect of chemical fertilization in terms of snap bean yield and pod quality.

Table (8): Effect of organic and biofertilizer on biological activity of the post harvest soil aspects (seasons 2003 and 2004).

Treatments	First season						Second season					
	DHA[d] Activity μLH_2 $100g^{-1}$ soil	Total Bacteria x 10^6	CO_2 Evolution Mg CO_2 g^{-1} soil	N_2-fixers x 10^4 Azotobacter	N_2-fixers x 10^4 Azspirillum	N-ase[e] activity Moles C_2H_4 $g^{-1}h^{-1}$	DHA** Activity μLH_2 $100g^{-1}$ soil	Total Bacteria x 10^6	CO_2 Evolution mg CO_2 g^{-1} soil	N_2-fixers x 10^4 Azotobacter	N_2-fixers x 10^4 Azspirillum	N-ase*** Activity moles C_2H_4 $g^{-1}.h$
$10m^3$ comp+bio[a]	9.3	7.1	133	2.3	1.2	109.9	11.1	7.2	144	2.5	1.7	113.9
$20m^3$ comp[b]+bio	18.3	22.6	299	4.6	2.1	117.3	13.9	19.4	249	2.8	2.2	131.0
$30m^3$ comp. +bio	14.2	14.0	300	3.9	2.2	141.5	14.8	15.7	272	3.1	2.4	142.7
$40m^3$ comp+bio	15.0	16.5	306	3.2	3.1	144.5	16.2	19.9	315	3.3	3.5	156.0
$10m^3$ Chick[c]+bio	18.9	28.0	358	4.5	4.1	179.0	19.2	28.9	370	4.6	4.4	183.6
$20m^3$ Chick+bio	26.1	33.2	402	5.4	4.9	390.6	30.8	36.0	416	5.6	5.2	415.1
$30m^3$ Chick+bio	34.0	41.0	431	5.8	5.6	416.5	35.2	41.9	437	6.3	6.0	546.9
$40m^3$ Chick+bio	42.0	53.7	461	7.0	6.3	552.9	47.3	57.3	470	9.1	7.9	889.7
$10m^3$ comp without bio	7.0	4.7	93	1.9	1.0	63.5	9.2	5.8	111	2.0	1.1	79.6
$10m^3$ Chick without bio	13.3	12.5	344	3.9	3.6	156.2	18.8	25.5	356	4.3	3.9	161.6
Control	19.9	29.1	372	4.7	4.6	183.6	20.4	22.6	390	5.2	4.8	257.0
LSD at 0.05	8.044	12.45	22.58	0.25	0.213	7.76	7.13	8.64	16.95	0.38	0.29	92.44

(a) bio = Biofertilizer (b) comp = Compost (c) chick = Chicken manure
(d) DHA = Dehydrogenase (e) N-ase = Nitrogenase

REFERENCES

Abd EL- Latif, Amina M., Magda A. Ewais, Awatif A. Mahmoud and Mona M. Hanna. (2005). The response of maize to inorganic, organic manure, biofertilizer and foliar spray with citric acid under sandy soil condition. Egypt. J. Appl. Sci., 20(68): 662-681.

Abd EL-Malek; Y. and Y. Z. Ishac (1968). Evaluation of method used in counting Azotobacter. J. Appl. Bact. 31: 367-375.

Allen, O.M. (1959). Experiments in soil bacteriology. 1st Ed Burgss publishing Co. Minneapolis, Minnesota. USA.

A.O.A.C. (1980). Association of official Agricultural chemists. Official methods of analysis, 12th edition, Washington, D.C., USA.

Badawy, F.H.; G. A. S. Gharably; M. A. Gammea; H. Rageb and M.A. EL-Desoky (1997). *Azospirillum* inoculation of cereal crops in upper Egypt. Egypt. J. Microbiol., 32 (1): 17-40.

Bashan, Y.; Y.Ream; H. Levanony and A. Sade (1989). Non specific responses in plant growth, yield and root colonization of noncereal crop plants to inoculation with *Azospirillum brasilense* Cd. Can. J. Bot. 67: 1317-1324.

Brown, J. D. and O. L. Lilleland (1946). Rapid determination of potassium and sodium in plant material and soil extracts by flame photometry. Proc. Amer. Soc. Hort. Sci. 48: 341-346.

Cochran, W.G. (1950). Estimation of bacterial densities by means of the "Most Probable Number". Biometrics, 6: 105-116.

Dobereiner, J., I.E. Marriel and M. Nery (1976). Ecological distribution of *Spririllum beiserinck*, Can. J. Microbiol., 22; 1464- 1473.

EL-Araby, A. (2003). Prospective of organic agriculture in Egypt. Acta Hort. 608: 127-131.

EL-Bassiony, A.M. (2003). Response of some bean (*Phaseolus vulgaris* L.) cultivars to organic and bio-fertilizer. Ph.D. Thesis, Fac. Agric., Ain Shams Univ. Egypt 113pp.

EL- Kholy, F. A. (1998). Essentially of biofertilizer with special reference to biological nitrogen fixation. Egypt. J. Soil Sci., 38: 339-352.

EL-Shimi, N. M.M. (2004). Physiological studies on growth and productivity of common bean. Ph. D. Thesis, Fac. Agric., Moshtohor Zagazig Univ., Egypt 133pp.

Ewais, N. A. (2003). Biochemical studies on some vegetable legumes. M. Sc. Thesis, Fac. of Agric. Moshtohor, Zagazig Univ. Egypt 122pp.

Gupta, S.; D.K. Arora and A.K. Srivastava (1995). Growth promotion of tomato plants by rhizobacteria and imposition of energy stress on *Rhizoctonia solani.* Soil Biology and Biochem., 27: 1051-1058.

Hanna, M. M. and S. EL-Gizy (1999). Influence of organic fertilization on soil microbial activity cultivated with some new cultivars of common bean, Egypt. J. Appl. Sci.; 14 (12): 462-485.

Harrison, H. C. and J.E. Staub (1986). Effect of sludge, bed and genotype on cucumber growth and elemental concentrations in fruit and peel. J. Amer. Soc. Hort. Sci., 111: 209-211.

Jagnow, G.; G. Hoflic and K.H. Hoffman (1991). Inoculation of non-symbiotic rhizesphere bacteria possibilities of increasing and stabilizing yields. Angew, Botanik, 65: 97-126.
Khalil, A. A., M. A. Nasef, F. M. Ghazal and M. A. EL -Emam. (2004). Effect of organic maturing and biofertilizer on growth and nutrient uptake of wheat plants grown in diverse textured soils. Egypt. J. Agric. Res., 82(2): 221-234.
Leth Bridge, G., M.S. Davidson and G. P. Sparling (1982). Critical evaluation of the acetylene reduction test for estimating the nitrogenase activity of nitrogen fixing bacteria associated with the roots of wheat and barley. Soil Biology and Biochem. 14: 27-35.
Mervat, A. Amara and M.S.A. Dahdoh. (1995). Effect of inoculation with plant growth promoting rhizo bacteria (PGPR) on yield and uptake nutrients by wheat grown on sandy soil. Fifth National Congress on Bio-agriculture Relation to Environment, Nov., 20-21, Cairo Egypt.
Nayak, D.N.; J.K. Ladha and I. Watanabe (1986). The fate of marker *Azospirillum Lipoferum* inoculated into rice and its effect on growth, yield and N_{25} fixation of plants studied by acetylene reduction, N_2 feeding and N_2 dilution techniques. Biol. Fertil. Soils, 2 (1): 7-14.
Omar, M. M. A. and A. A. Hassan (1993). A new biofertilizer formula to increase and improve cereal crops in Egypt. International symp. On Biological Nitrogen Fixation with Non- Legumes, Sept. 6-10 Ismailia, Egypt.
Pramer and Schmidt (1964). Experimental soil microbiology Burgess publishing compony, Minnesota, U.S.A.
Pregl, E. (1945) Quantitative Organic Micro Analysis 4th Ed. J. Chundril, London.
Safaa, Mansour A. (2002). Effect of bio-fertilizer, Nitrogen fertilizer levels on growth and productivity of sweet potato plant. J. Agric. Sci. Mansoura Univ., 27 (10): 6961-6972.
Samira, M. H. EL-Gizy (1990). Effect of some fertilizer treatments on some features and productivity of common bean plants (*Phaseolus vulgaris* L.) ph. D. Thesis, Fac. Agric. Ain Shams Univ. Egypt 170pp.
Samira, M. H. EL-Gizy, S.M.; A.M. Shalaby and M.M. Hanna (1999). Effect of *Azospirillum* inoculation and nitrogen fertilization on the yield of some cultivars of (*Phaseolus vulgaris* L.) J. Agric. Sci. Mansoura Univ. 24 (8): 4201-4210.
Sarig, S.; Y. Kapulnik; I. Nur and Y. Okon (1984). Response of non-irrigated sorghun bicolor to *Azospirillum* inoculation. Exp. Agric. 20: 59-66.
Shahaby, A. F. (1981). N2 fixing bacteria in the rhizosphere of certain plants. M. Sc. Thesis, Fac. of Agic., Cairo Univ. pp 138.
Singer, S.M.; A. H. Ali; M. M. EL-Desuki, A. M. Gomaa, M.A. Khalafallah, N.J. fokkema, M.A. Beek, N.A. M. Van steekelenburg, G. Samyn, J. L. Maas, T. L. Robinson and M. N. J. verhoyen (2000). Synergistic effect of bio and chemical fertilizers to improve quality and yield of snap bean grown in sandy soil. Acta Hort. 513: 213-220.

Smith, E.; M. A. Gilles, J. K. Hamiltion and P.A. Godees (1956). Colorimetric method for determination of sugar and related substances. Annal Chem. 28: 350-356.

Snedecor, G. W. and W.G. Cochran (1982). Statistical Methods, Iowa state, university press, USA . 569-571.

Sterrett, S. B.; R. L. Changy; C.W. Reynolds; F. D. Schalrs, and L.W. Douglas (1988). Transplant quality and metal concentration in vegetable transplants grown in media containing sewage sludge compost. Hort. Sci., 17: 920-922.

Subba-Rao, N.S. (1979). Response of crops to *Azospirillum* inoculation in India. Int. Workshop on associative N_2 – fixation (E.NA, Piracicaba Brazil).

Trough, E. and A. H. Meyer (1939). Improvement in denies colorimetric method `for phosphorus and arsenic. Ind. Eng. Chem. Anal. Ed. 136-139.

اثر استخدام الأسمدة العضوية والحيوية على نمو وإنتاج محصول الفاصوليا الخضراء تحت الأنفاق البلاستيكية فى الأراضى المستصلحة

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أجريت تجربتان فى منطقة البرلس – محافظة كفقر الشيخ بشمال الدلتا أثناء فصل الشتاء فى عامى ٢٠٠٣، ٢٠٠٤ وذلك لدراسة تأثير التسميد العضوى والحيوى على النمو والمحصول ومواصفات الجودة فى محصول الفاصوليا الخضراء وذلك تحت ظروف الأقبية البلاستيك وكذلك الرى والتسميد عن طريق شبكة الرى بالتنقيط.

وكانت أهم النتائج المتحصل عليها هى :-

١- التسميد بسماد الدواجن بالإضافة للتسميد الحيوى أعطى أفضل النتائج بالنسبة لمقايس النمو الخضرى مثل طول النبات وعدد الأوراق وعدد الأفرع على النبات وقطر الساق ونسبة المواد الجافة بالعريش.

٢- أعطى التسميد بسماد الدواجن المقرون بالتسميد الحيوى أفضل النتائج بالنسبة للتسميد بالـ بيوجرين كومبوست.

كما أعطى التسميد بسماد الدواجن المقرون بالتسميد الحيوى أفضل النتائج لمواصفات القرون الجيدة من حيث طول القرن ومتوسط وزن القرن والمحتوى من .N.P.K والسكريات.

٣- وكانت أفضل النتائج بالنسبة للمحصول المبكر والكلى عند التسميد بسماد الدواجن بمعدل ٣٠م٣/فدان مع التسميد الحيوى.

٤- أدى إضافة التسميد الحيوى إلى أى من الكومبوست أو سماد زرق الدواجن إلى تحسين وتنشيط النشاط البيولوجى بالتربة بعد الحصاد متمثلا فى زيادة العدد الكلى للميكروبات وعدد الميكروبات المثبته للنيتروجين الجوى ونشاط انزيمى الديهيدروجينيز والنيتروجينيز وكمية ثانى أكسيد الكربون المتصاعده وذلك بالمقارنة مع استخدام أى من نوعى السماد العضوى تحت الدراسة (الكومبوست وزرق الدواجن) بمعدل ١٠ م٣/ للفدان بدون السماد الحيوى.

هذا وقد أوضحت النتائج أن أعلى نشاط بيولوجى بالتربة كان عند استخدام سماد زرق الدواجن بمعدل ٤٠ م٣/ للفدان مصحوبا بالتسميد الحيوى وذلك فى موسمى الزراعة. وعلى أى حال فإن أهم نتائج هذه الدراسة أن استخدام التسميد العضوى مصحوبا بالتسميد الحيوى كان أفضل من استخدام أى من السماد العضوى أو المعدنى منفردا وذلك فى موسمى الزراعة تحت الدراسة.