J. Agric. Sci. Mansoura Univ., 29 (3): 1473 - 1485, 2004

RESPONSE OF WHEAT PLANTS GROWN IN SANDY, CALCAREOUS AND CLAYEY SOILS TO THE INTEGRATED APPLICATION OF ORGANIC MANURES AND BIOFERTILIZATION

Mostafa, H. M.
Agric. Microbiol. Dept., Soils, Water and Environ. Res. Inst., Giza, Egypt

ABSTRACT

A seventy days pot experiment was conducted in season of 2002 to study the effect of farmyard manure (FYM) and chicken manure (CM) individually and / or together combined with or without a biofertilizer (BF) of *Azospirillum brasilense* and *Bacillus megaterium* var. *phosphaticum* on wheat growth grown on sandy, calcareous and clayey soils. Results revealed that all manure treatments whether combined with biofertilizers or not led to significant increase in wheat dry weights. Weights of plants grown on clayey soil were higher than the corresponding grown in sandy or calcareous soils. Response of wheat to organic manure treatments was more pronounced in sandy and calcareous soils than in the clayey one. Although N, P and K contents of wheat plants were higher in the clayey soil, yet the response to organic manuring was more obvious in sandy and calcareous soils. Organic manures application enhanced the biological activity in the remained soil in terms of dehydrogenase activity, CO_2 evolution and total bacterial count.

INTRODUCTION

Most of the newly reclaimed soils in Egypt are sandy and calcareous soils. constitute marginal soils of poor available nutrient elements. To increase their productivity, organic matter application plays an important role to retain the inorganic elements in complex and chelate forms. In this accord organic manures are well established to be involved in fertilization of plants in almost worldwide, due to their beneficial effects on the physico-chemical and biological characteristics of the soils, which in turn, influence the growth and increase plants production (Youssef *et al.*, 2001). Adding organic manures as fertilizer led to decreasing soil pH which results in increasing solubility of nutrients and nutrient availability to the plants (Salem, 1988). Besides these organic manures stimulate biodegradation through increasing the population and activities of microorganisms in the soil (Amara and Dahdoh, 1995) and minimize the loss of nutrients by leaching (Balba, 1975). Abou EL- Defan (1990) found that addition of chicken manure increased fresh and dry yields of tomato shoots, fruits and the concentrations of N, P and K in both shoots and fruits.

Some organic materials are known to mineralize and release available plant nutrients rapidly as a result of microbial attack. On the other hand, poor fertile soils would benefit from application of organic materials having a degree of microbial stability in soil and the organic materials in some cases may act as a slow release fertilizer. So, farmers in developing countries such as Egypt' often have the occasion to use both rapidly and slow release organic fertilizers in their farming systems. (Abdel-Sabour *et al.*, 1999). Both farmyard and chicken manures have been traditionally applied as a fertilizer of slowly released nutrients, for some crops and to improve the physio- chemical soil properties (Abdel-Sabour *et al.,* 1999).

This work was designed to evaluate the impact of organic manures application [farmyard manure (FYM) and chicken manure (CM)] and biofertilizer (a mixture of *Azospirillum brasilense* and *Bacillus megaterium*) to sandy, calcareous and clayey soils on wheat growth and nutrient uptake as well as to determine the biological activity of the remained soil in terms of dehydrogenase activity, CO_2 evolution and total bacterial count.

MATERIALS AND METHODS

A pot experiment was conducted at greenhouse of the Plant Nutrition Research section, Soils, Water And Environment Research Institute, Agricultural Research Center, Giza, Egypt in winter season of 2002. This is to study the effect of farmyard and chicken manures combined with a biofertilizer (a mixture of *Azospirillum brasilense* and *Bacillus megaterium*) on wheat (cv. Sids-1) grown on sandy, calcareous and clayey soils. The organic manures were mixed thoroughly with 5 kg portion of each soil immediately before seed cultivation at the equivalent proper wheat recommended rate of N based on the total nitrogen content of each organic manure. In case of inoculation, wheat seeds were spread immediately before cultivation on a plastic sheet and thoroughly mixed with the biofertilizer inoculum which allowed to adhere to the seeds when rinsed with liquid Arabic gum and then air dried for two hours. Each pot was sown with 10 wheat seeds, which were then thinned out to 7 healthy seedlings and watered at regular intervals to keep 55 % of saturation percentage. The added organic manures contain C% 5.44 and 26.62, total N% 0.38 and 2.20, total P% 0.15 and 1.6, total K% 0.80 and 2.00, organic matter % 9.38 and 45.90 and C/N ratio 14.30 : 1 and 12.10 : 1 for FYM and CM, respectively. Physical and chemical analyses of the used soils are present in Table (1).

The experiment included the following treatments with 3 replicates in complete randomized design:

1-Control (un-inoculated treatments).
2- *Azospirillum brasilense* + *Bacillus megaterium* var. *phosphaticum* (BF).
3-Farmyard manure at a rate equivalent to 100 kg N fed^{-1} (FYM 100%)
4-FYM 100% + BF
5-Chicken manure at a rate equivalent to 100 kg N fed^{-1} (CM100 %)
6-CM 100% + BF
7-FYM 25% + CM 75%
8-FYM 25% + CM 75% + BF
9-FYM 50% + CM 50%
10-FYM 50% + CM 50% + BF
11-FYM 75% + CM 25%
12-FYM 75% +CM 25% + BF

Plants at maximum tillering stage (70 days after sowing) were then cut just above the soil surface and determined for plant dry weight (oven dried plants at 70 °c), N (Chapman and Pratt, 1961), P and K contents

(Jackson, 1976). The remained soils were sampled to determine dehydrogenase activity (Casida *et al.*, 1964), CO_2 evolution (Pramer and Schmidt, 1964) and total bacterial count (Allen, 1959).
Results obtained were subjected to the statistical analysis according to Gomez and Gomez (1984).

Table (1): Some physical and chemical analyses of the investigated soils

Soil characteristics	Soil types		
	Sandy	**Calcareous**	**Clayey**
Chemical analysis			
Calcium carbonate %	3.80	37.00	3.18
Saturation percent	21.67	70.00	88.30
pH (1:2.5)	8.29	8.26	8.15
EC ($dS.m^{-1}$) Soil paste extract	5.10	5.90	1.70
Organic matter %	0.10	0.50	2.55
Available N ($mg\ kg^{-1}$)	6.00	9.00	15.00
Available P ($mg\ kg^{-1}$)	4.00	5.00	10.00
Available K ($mg\ kg^{-1}$)	85.00	240.00	1000.00
Total N%	0.03	0.08	0.18
Total P%	0.02	0.07	0.14
Total K%	0.08	0.35	0.65
Soluble cations and anions ($me\ L^{-1}$)			
Ca^{2+}	20.40	26.00	6.63
Mg^{2+}	9.45	10.75	2.68
Na^{+}	22.50	26.46	6.54
K^{+}	1.28	1.08	1.00
CO_3^{2-}	-	-	-
HCO_3^{-}	2.33	1.94	4.33
Cl^{-}	16.49	25.22	4.85
SO_4^{2-}	34.81	37.13	7.67
Mechanical analysis			
Coarse sand %	38.50	3.25	6.25
Fine sand %	55.90	37.45	27.95
Silt%	2.60	20.50	13.70
Clay%	3.00	38.80	52.10

RESULTS AND DISCUSSION

1- Wheat dry matter:

Results in Figure (1) revealed that inoculation with biofertilizer alone did not significantly affect the dry matter weight of wheat plants in any of the tested soils. Mixing the biofertilizers with both organic manures increased significantly the dry matter of wheat plants compared with either the control treatment or treatments receiving biofertilizers only in all examined soils.

On the other hand, addition of either farmyard, chicken manure or a mixture of both to any of the tested soils increased significantly the dry matter weight of wheat plants.

In sandy soil, the use of either FYM or CM alone or mixed together with or without biofertilizers significantly increased the dry matter of wheat plants in comparison with the control. The highest dry matter weight (15.9 g pot^{-1}) and the lowest one (12.27 g pot^{-1}) were achieved by the treatments receiving FYM 75% + CM 25% + BF and FYM 75% + CM 25%, respectively. Moreover, the highest wheat biomass (15.90 g pot^{-1}) achieved due to FYM 75% + CM 25% + BF was significantly higher than those achieved due to the other treatments except that of the treatment of FYM 50% + CM 50% + BF.

In case of calcareous soil, the use of any of the organic manures alone or mixed together with different doses of biofertilizer led to significant increase in the dry matter of wheat plants. The highest record (15.66 g pot^{-1}) was recorded with the use of CM 100 % + BF treatment. This treatment was significantly higher than the other treatments except the treatments receiving FYM 25% + 75 % CM + BF (15.39 g pot^{-1}) and the one received FYM 50% + CM 50 % + BF (15.01 g pot^{-1}).

Biofertilizer inoculation to both FYM 100% and CM 100% treatments did not increase significantly the wheat plant dry weight. This can be attributed to the presence of high nitrogen content in the manure, in effect inhibits the fixation of nitrogen; that is the bacteria use the nitrogen in manure rather than nitrogen from the atmosphere (Alexander, 1982), thus the bacteria immobilize the manure nitrogen which in turn reflect on wheat biomass.

In case of clayey soil, the highest dry weights of wheat plant were 25.04, 23.84, 22.96, 22.37 and 22.08 g pot^{-1} for the respective treatments of FYM 25% + CM 75%, FYM 75% + CM 25%, FYM 100 %, FYM 50% + CM 50% and CM 100 %.

It was also noticed that wheat biomass was higher in clayey soil than in sandy and calcareous soils. This can be explained by that the biological activity is higher in clayey soil the other two soils which increase the number of microbes capable to decompose the soil organic matter as well as the added organic manures. This organic matter decomposition led to increase the availability of soil nutrients to the cultivated plants (Sakr *et al.*, 1992). This might reflect the different characteristics of the tested soil.

These results are in accordance with Sakr *et al.* (1992) who found that dry matter of wheat and maize showed pronounced increases in response to organic manure application. They added that such increases were higher in plants grown in calcareous soil than alluvial one. The dry matter yield of sunflower leaves, stems and flowers at either vegetative or flowering growth stage were significantly increased by previous single compost manure (Abdel-Sabour *et al.,* 1999). Addition of farmyard manure led to the maximum increase in plant growth and consequently wheat yield productivity (Awad *et al.,* 2000).

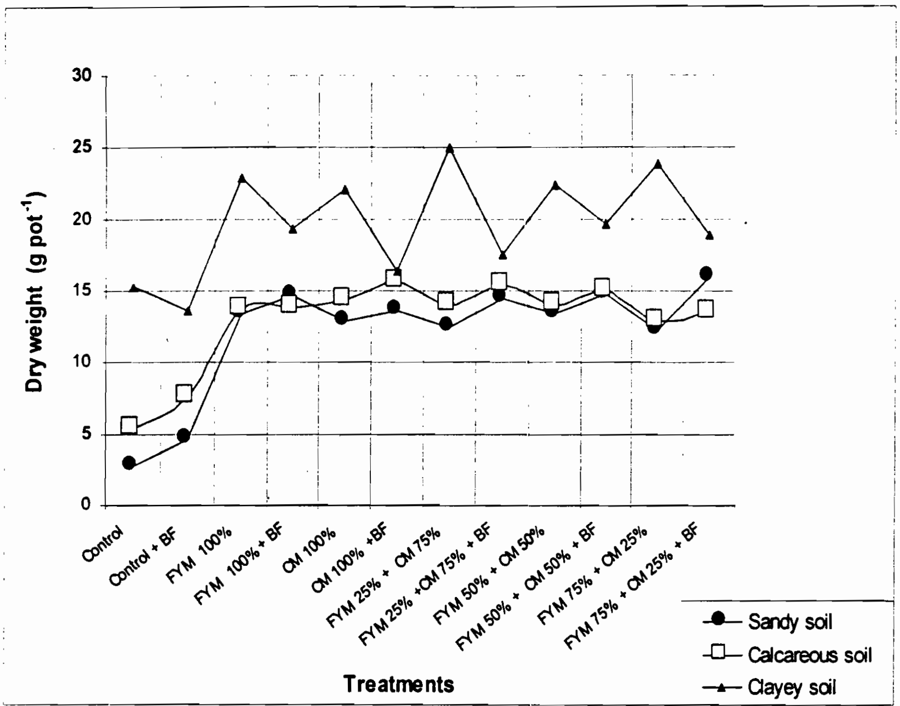

Fig (1): Wheat dry matter as affected by different types of organic manures and soils.

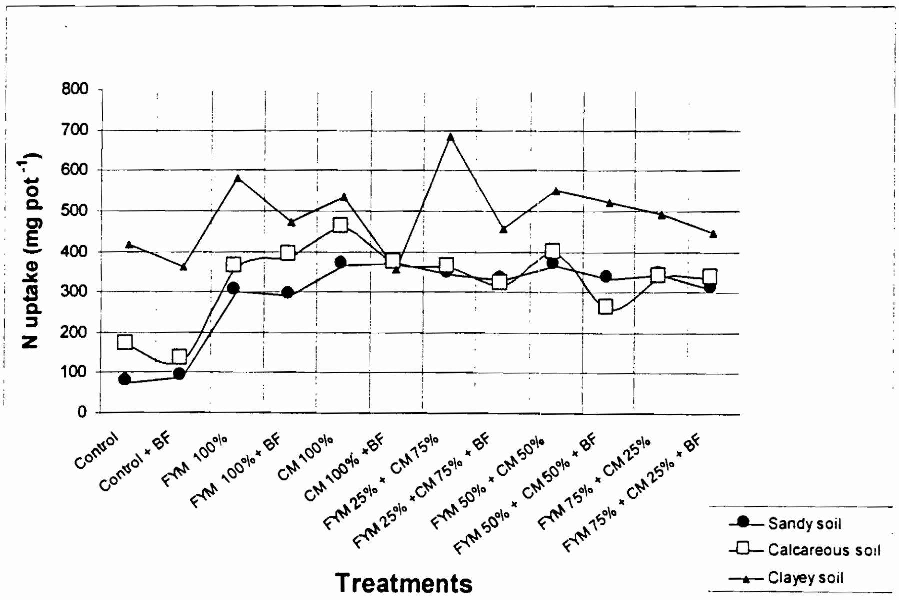

Fig (2): Nitrogen uptake of wheat plants as affected by different types of organic manures and soils.

2- Wheat nitrogen uptake:

Concerning to the nutrient uptake by wheat plants (Figure 2), the highest N-uptake value (373.85 mg N pot^{-1}) was attributed to CM 100 % + BF followed 364.65, 364.60, 343.5, 341.38, 333.39, 328.77, 305.46, 300.49 and 289.46 mg N pot^{-1} for the treatments of FYM 50% + CM 50%, CM 100%, FYM 75% + CM 25%, FYM 25% + CM 75%, FYM 50% + CM 50%+ BF, FYM 25% + CM 75%+ BF, FYM 75% + CM 25% + BF, FYM 100 %, and FYM 100 % + BF treatment, respectively.

It is worthy to state that inoculation with biofertilizer did not cause any significant increase in nitrogen uptake of wheat plants grown in sandy soil. This can be attributed to the immobilization of the available nitrogen by the inoculated bacteria which need to proliferate and to build their cellular protoplasm, this in turn decrease nitrogen plant uptake (Zaghloul *et al.*, 1996).

In case of calcareous soil, all the studied treatments exerted significant effect on nitrogen uptake by plants and gave significantly higher N-content compared to control or control + BF treatments.

However, the highest N-uptake (457.76mg N pot^{-1}) was obtained due to CM 100 %. This was significantly higher than and different from the other treatments except those of FYM 50% + CM 50% and FYM 100% + BF.

In case of the clayey soil, the addition of organic manure increased significantly the N-uptake over the control treatment or the control + BF treatment. The highest estimate (686.74) mg N pot^{-1} was observed with the treatment of FYM 25 % +CM 75 %. This was significantly higher than the uptake of plants received either organic manure alone or in combination with biofertilizer. The lowest N-uptake (446.35 mg N pot^{-1}) was due to FYM 75 % + CM 25 % + BF treatment.

3- Wheat phosphorus uptake:

Regarding the effect of organic manures on phosphorus uptake by wheat plants grown in the sandy soil (Figure 3), application of organic materials and combined with BF increased significantly P-uptake over both the control or control + BF treatments.

The highest P-uptake (25.58 mg P pot^{-1}) was recorded by the treatment FYM 25 % + CM 75 % + BF. This value was significantly higher than the corresponding recorded by the treatments of FYM or CM alone or together with or without the biofertilizer. However, some treatments FYM 50 % + CM 50 % + BF, FYM 75 % + CM 25 %, FYM 50 % + CM 50% and CM 100 % had scored values of P-uptake is not significantly different from the highest one. The corresponding P-uptake values were 25.23, 23.31, 23.15 and 22.21 mg P pot^{-1}, respectively.

In case of calcareous soil, P-uptake by manured wheat plants was significantly higher than those of the control or control + BF treatment.
The highest P-uptake estimate (27.8 mg P pot^{-1}) was due to CM 100 % treatment. Biofertilizer application along with organic manuring treatments did not result in any significant increase over organic manuring only.

However, it should be pointed out that the organic manure treatments when received biofertilizer showed no further increase in P-uptake. On the contrary, a decrease in P-uptake occurred when the organic manure treatment received biofertilizer. Such decreases in P-uptake were significant in some treatments but not in others. For example, a significant decrease in P-uptake was recorded when the treatment of CM 100 % received BF inoculation, that decrease was from 27.8 to 21.93 mg P pot^{-1}.

Regarding the clayey soil, all treatments received organic manures tended to increase significantly the P-uptake of wheat plants over the control and / or BF treatments. The addition of BF to treatments receiving organic manure exhibited different effects on P-uptake of wheat. A significant reduction in P-uptake from 41.87 to 27.79 mg P pot^{-1} occurred when the treatment FYM 25 % + CM 75 % was combined with BF. While a significant increase from 24.44 to 30.75 mg P pot^{-1} occurred when the treatment FYM 50 % + CM 50 % was provided with BF. The highest value of P-uptake (41.87 mg P pot^{-1}) exported with FYM 25 % + CM 75 %.

4- Wheat potassium uptake:

Concerning K- uptake in sandy soil, manuring led to significant increases over the control treatment (Figure 4). The highest K plant uptake of 329.15 mg K pot^{-1}. was recorded by the application of CM 100 %. This high K- amount was different from those of other treatments except for CM 100 % + BF treatment. The corresponding K-content was 311.22 mg K pot^{-1}.

In case of calcareous soil, all manured plants with or without biofertilizer showed higher K- contents than the control treatment. The highest K-uptake amount (384.98 mg K pot^{-1}) was recorded by CM 100 % treatment.

However, Application of either FYM or CM accompanied with BF or not, led to significant increase in K-amount compared to control treatment. The highest K- amount of 800.26 mg K pot^{-1} was recorded by the treatment FYM 25 % + CM 75 %. Again this high K-uptake was significantly higher compared with the other manure treatments with or without biofertilizer.

The use of organic manure to all soils had enhanced the NPK uptake by wheat plants in different degrees. This enhancement was almost in equal degree in sandy and calcareous soils. However, the NPK- uptake enhancement was higher in clayey soil than those of sandy and calcareous soils. This can be attributed to that organic manure may enhance the metabolic activity within plants and promote the migration of the metabolites through roots and stems toward leaves, thereby it may increase the percentage of nutrients in leaves and stems (Sikander, 2001). On the other respect, it is well known the marginal soil such as sandy and calcareous soils are very poor in nutrients and posses low organic matter content. Small amount of organic matter can modify the soil properties as well as strongly affect chemical, physical and biological features (Zeia *et al.*, 2001). Organic manures improve moisture retention and nutrient use efficiency and thereby contribute to enhance nutrients availability to plants.

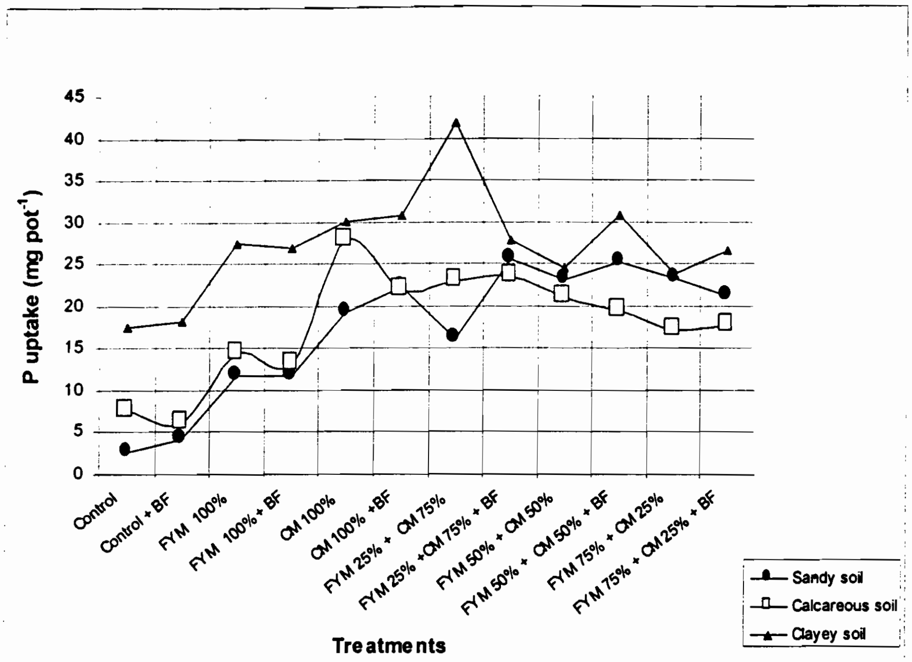

Fig (3): Phosphorus uptake of wheat plants as affected by different types of organic manures and soils.

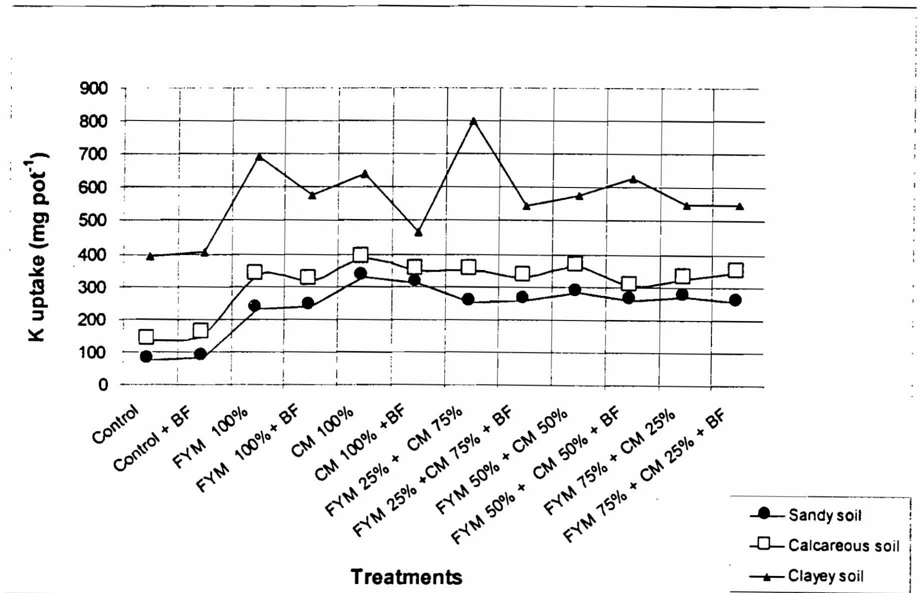

Fig (4): Potassium uptake of wheat plants as affected by different types of organic manures and soils.

Addition of compost to sandy soils increased N, P and concentration in all plant organs, as most of them reached the level of significance (EL-Sirafy *et al.*, 1989). Cucumber plants fertilized with chicken manure and cattle manure had higher N, P and K than those grown in sandy soil free from manuring (Eissa 1996). Farmyard manure and \ or Chicken manure and their mixture had significantly increased N, P and K contents in cucumber leaves (Alphonse and Saad, 2000). In addition Eneji *et al.*, (2001) stated organic manures (chicken manure, cattle manure and swine manure or their mixture) fertilized to rice plants had increased significantly the N, P and K contents of rice plants. They added that the general increases in rice nutrient uptake in manured pots suggested that manure mineralization soon after application resulted in greater pool of plant available nutrients.

5- Soil biological activity:-

Data in Table (2) indicate the biological activity of the remained soils in terms of dehydrogenase activity (DHA), CO_2 evolution and total bacterial count. Application of organic manures individually or in a mixture with or without biofertilizer increased any of DHA, CO_2 evolution and total bacterial count in soil over the control treatments. The increases were higher in the clayey soil than in both sandy and calcareous soils. This can be attributed to high organic matter content initially exist in the clayey soil (2.55%) than sandy (0.1%) and calcareous (0.50%) soils. It is well known that rich organic matter in soil lead to increase the bacterial population and therefore increased both DHA and CO_2 evolution (Zeia *et al.*, 2001). However, addition of organic manures to soils very poor in organic matter such as sandy and calcareous soils improves their physical, chemical and biological properties (Antoun *et al.*, 1991). Herein, addition of biofertilizer to manure treatments increased the biological activity in the tested soils. FYM 25 % + CM 75 % + BF treatment (Table 2) gave the highest DHA, CO_2 evolution and bacterial count values in all soils compared to the other treatments. Hanna and El-Gizy (1999) reported that FYM application caused an increase in the compartment active microorganisms, CO_2 and ATP concentration. According to N'Dayegamiye and Anger (1990), manure application could improve soil organic matter directly by promoting microbial activity and accumulation of CO_2. The rate of organic matter mineralization was correlated with the CO_2 production, as a result of microbial activity.

Table (2): Dehydrogenase P activity (DHA), CO_2 evolution and total bacterial count in the remained soils

Treatments	DHA µg TPF $100g^{-1}$ soil			CO_2 evolution mg CO_2 $100g^{-1}$ soil			Total bacterial number cfu g^{-1} soil x 10^6		
	Soil Type			Soil Type			Soil Type		
	Sandy	calcareous	clayey	Sandy	Calcareous	Clayey	Sandy	calcareous	Clayey
Control (un-inoculated)	19.05	60.06	115.20	45.00	89.10	216.83	8.06	14.81	58.20
Control + BF	22.18	78.20	126.93	62.00	101.90	243.15	10.10	19.83	63.62
FYM 100%	26.26	91.91	235.67	80.06	141.60	267.27	15.14	26.25	82.60
FYM 100% + BF	33.12	130.90	259.36	96.30	196.90	292.25	19.41	34.37	95.47
CM 100%	36.73	102.79	241.92	82.60	23.53	328.57	26.47	39.85	88.20
CM 100% + BF	41.52	124.13	280.96	107.67	250.00	253.73	29.59	48.12	94.11
FYM 25% + CM 75%	50.52	145.60	295.90	130.62	270.87	380.40	37.06	58.62	151.30
FYM 25% + CM 75% + BF	68.84	183.33	320.16	162.23	300.93	415.73	45.95	67.08	196.12
FYM 50% + CM 50%	40.62	100.12	260.63	95.47	253.27	248.60	28.90	52.70	110.80
FYM 50% + CM 50% + BF	37.84	120.95	273.52	128.47	290.60	331.50	33.14	55.72	122.52
FYM 75% + CM 25%	34.16	100.57	229.30	110.70	262.25	295.50	20.06	49.68	106.00
FYM 75% + CM 25% + BF	39.40	136.87	252.60	133.70	295.45	312.43	26.28	56.20	121.00

CONCLUSION

This work gave an idea to believe that organic manures can be replaced entirely the mineral fertilizers especially in the poor margin soils like sandy and calcareous soils. However this idea needs to be confirmed in the field scale which is already accomplished in the season of 2004.

REFERENCES

Abdel-Sabour, M.F.; M.A. Abo-El-Seoud and M. Rizk (1999). Physiological and chemical response of sunflower to previous organic waste compost application to sandy soil. Egypt. J. Soil. Sci., 39: 407-420.

Abo-El-Defan, T. R. (1990). Effect of organic manure on plant growth and nutrient uptake under saline condition. M. Sc. Thesis, Fac. Agric., Ain Shams Univ., Cairo, Egypt.

Alexander, M. (1982). Introduction to Soil Microbiology. (Ed) :John Wiley & Sons, Inc. New York. 157-171.

Allen,- O. M. (1959). Experements in soil bacteriology. 1st Ed. Burgess Publishing Co., Minneapolis, Minnesota.

Alphonse, M. and E. M. Saad (2000). Effect of some organic media and micronutrients on mineral contents of plastic house cucumber. Egypt. J. Hort. 27: 385-408.

Amara, Mervat, A. T. and M.S. A. Dahdoh (1995). Effect of inoculation with plant growth promoting rhizo bacteria (PGPR) on yield and uptake of nutrients by wheat grown on sandy soil. Fifth National Congress on Bio-agriculture Relation to Environment., Nov., 20-21, Cairo Egypt.

Antoun, G. G., F. M. Abdalla and E. M. Gaffar. (1991). Effect of certain organic manures on wheat yield. Egypt. J. Agric. Res. 69(2): 465- 472.

Awad, Y.H.; M.M. Abdel-Ghani, M.H.S. Naim and Skina, A. Mohamed (2000). A comparative study on the effect of some organic and inorganic amendments on sandy soil physical properties and yield of corn. J. Agric. Mansoura Univ., 25 (3): 1865-1871.

Balba, A. (1975). Organic and inorganic fertilization of sandy soils. *FAO*. Soils Bull. No. 21.sandy Soils, 23-46, Rome (1975).

Casida, L . E., Klein, D. A. and Santoro, T. (1964). Soil dehyderogenase activity. Soil Sci. 98: 371-376.

Chapman, H.D. and Pratt, P. E. (1961). Methods of analysis for Soils, Plant and Water. Univ. of California, Division of Agric. Sc.

Eissa, N. M. (1996). Studies on sustainable agriculture for some vegetable crops using animal manure. M. Sc. Thesis. Institute of Environmental Studies and Research. Ain Shams Univ. Cairo Egypt.

El-Sirafy, Z.M.; Kh. H. El-Hamdi; A.A. Taha and H.M. Abdel-Naby (1989). Pepper production on sandy soils as affected by compost addition and nitrogen fertilization. J. Agric. Sci., Mansoura Univ., 14: 1793-1802.

Eneji, Egrnya . A, S. Yamamoto and T. Honna (2001). Rice growth and nutrient uptake as affected by livestock manure in four Japanese soils. J. plant Nutr., 24: 333-343.

Gomez, K. A. and A. A. Gomez (1984). Statistical procedures for Agricultural research, (2nd ed), pp. 20-29 & 359-387.

Hanna, Mona, M. and El-Gizy, Samira, M. (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.

Jackson, M. L. (1976). Soil chemical analysis. Prentice-Hall, Englewood Califfs, New Jersey.

N 'Dayegamiye, A. and d. A. Anger (1990). Effect of de l'apport prolonge de fumier de bovines sur queques proprietes physiques et biologiques d'un loam limoneux sons culture de mais. Can. J. Soil Sci., 70: 259-262.

Pramer, D. and Schmidt, E. L. (1964). Experimental soil microbiology. Burgess Publisher Company. Minnesota, U. S. A.

Sakr, A.A.; S.A. Rizk and A.S. El-Sebaay (1992). Effect of organic manures on plant growth and NPK uptake by wheat and maize plant. Egypt. J. Soil. Sci., 32: 249-263.

Salem, N. (1988). Evaluation of some parameters influencing the use of conditioners in soils. Inter. Symp. Soil Conditioner, Egypt. pp. 81-91.

Sikander, A. (2001). Effect of organic manure and inorganic fertilizers on the dynamics of soil microorganism: biomass, composition and activity. In: "Alternate/ organic fertilizers" D8 Workshop, Islamabad, Pakistan, 19-20, June, 2001.

Youssef, A. M.; A. H. M. EL-Fouly.; M. S. Youssef and S. A. Mohamedien (2001). Effect of using organic and chemical fertilizers in fertigation system on yield and fruit quality of tomato. Egypt. J. Hot. 28: 59-77.

Zaghloul, R. A., M. H. Mostafa and A. A. Amer (1996). Influence of wheat inoculation with *Mycorrhizae* fungi, phosphate solubilizing bacteria and *Azospirillum* on its growth and soil fertility. Annals of Agric. Sci. Moshtohor. 34 (2): 611-626.

Zeia, S. M., N. I. Hashmi, M. Aslam and Fayyaz Hussain. (2001). Sustaining Productivity of rice-wheat system through integrated nutrient management approach. In: "Alternate/ organic fertilizers" D8 Workshop, Islamabad, Pakistan, 19-20, June, 2001.

J. Agric. Sci. Mansoura Univ., 29 (3), March, 2004

استجابة نبات القمح النامى فى التربة الرمليـــة والجيريـــة والطينيـــة للاســتخدام المتكامل للأسمدة العضوية مع التسميد الحيوى

محمود حلمى مصطفى
قسم الميكروبيولوجيا الزراعية ــ معهد بحوث الأراضى والمياة والبيئة - الجيزة- مصر

فى هذه الدراسة أجريت تجربة أصص في صوبة تغذية النبات- معهد بحوث الأراضــي والمياة والبيئة – مركز البحوث الزراعية بالجيزة في موسم ٢٠٠٢ وذلك لدراسة أثـــر اســتخدام التسميد العضوى الكامل مع التسميد الحيـــوى (*Azospirillum brasilense* + *Bacillus megaterium* var. *phosphaticum*) أو بدونه على نمو نبا ت القمح وكذلك محتواه من العناصر مثل النيتروجين والفوسفور والبوتاسيوم. لقد تم زراعة بذور القمح (صنف ســدس) فــي أصص تم تعبئتها بثلاثة أنواع من التربة هي الرملية والجيرية والطينية وسمدت كاملا بـــاى مــن السماد البلدي أو سماد الدواجن أو مخلوط منهما بإضافة أو بدون إضافة التســميد الحيــوي. بعــد سبعين يوما من الزراعة تم قطع النباتات من فوق سطح التربة مباشرة ثم جففت لتقديـــر الــوزن الجاف لنباتات القمح وكذا محتواها من كل من النيتروجين والفوسفور والبوتاسيوم. كما قـــدر فـــي التربة المتبقية نشاط إنزيم الديهيدروجينيز وكمية ثاني أكسيد الكربون وأعداد الميكروبات بالتربـــة المتبقية بعد حصاد نباتات القمح منها. كانت أهم النتائج المتحصل عليها كما يلي:

١- أدى استخدام التسميد العضوي مع التسميد الحيوي أو بدونه إلى زيادة معنوية في الـــوزن الجاف لنباتات القمح وذلك بالمقارنة مع معاملة المقارنة بدون اى تسميد.
٢- كان الوزن الجاف لنباتات القمح المنزرعة في التربة الطينية أعلى من تلك المنزرعة فـــي أى من التربة الرملية أو الجيرية.
٣- لقد كانت الاستجابة للتسميد العضوى أكثر وضوحا فى التربة الرملية والجيرية عنها فـــى التربة الطينية.
٤- بالنسبة لمحتوى نباتات القمح من النيتروجين والفوسفور والبوتاسيوم فانـــه بـــالرغم مـــن ارتفاعها في نباتات التربة الطينية فان الاستجابة للتسميد العضوي كان أكثر وضوحا فـــي التربة الرملية والجيرية.
٥- التسميد الحيوى لم يحقق أى زيادة معنوية سواء فى الوزن الجاف لنباتات القمـــح أو فـــى محتواه من العناصر تحت الدراسة.
٦- أدى استخدام أى من الأسمدة العضوية منفردا أو في مخلوط مع إضافة السماد الحيـوي أو بدونه إلى زيادة نشاط إنزيم الديهيدروجينيز وكمية ثاني أكسيد الكربون وأعداد البكتيريـــا بالتربة المتبقية بعد حصاد نباتات القمح منها.