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INTEGRATED EFFECT OF N-FORMS IN MINERAL AND ORGANIC WITH OR WITHOUT SYANOBACTERIA INOCULATION ON IMPROVING PEANUT PRODUCTIVITY

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ABSTRACT

A field experiment was carried out at Ismailia Agric. Res. Station during the summer season of 2005 to study the integrated effect of the application of different N-forms, i.e., mineral fertilizer (Ammonium sulphate) and\ or organic fertilizer (compost) combined with or without cyanobacterial inoculation on improving peanut productivity as well as the effect on soil organic matter content and some biological soil properties.

Results revealed that generally the integration between the organic (compost) and mineral fertilizers in peanut cultivation was more beneficial than the use of either compost or mineral nitrogen fertilizer each alone. Also cyanobacteria inoculation was better in enhancing the growth and yield of peanut. However, this integration phenomena, was more pronounced when the integration included the treatment of $^1/_2$ RN from compost + $^1/_2$ RN from mineral fertilizer in addition to cyanobacteria inoculation. This treatment gave significantly the highest values of peanut seed and foliage yields, NPK uptake for seed and foliage, soil microbial community and soil biological activity in terms of CO_2 evolution and dehydrogenase activity. The integration of organic and mineral fertilizers in combination with biofertilizers may become a promise of the eco-friendly future agriculture, especially in the newly reclaimed sandy soil.

INTRODUCTION

Peanut (*Arachis hypogaea L.*) is considered one of the most important legumeous and oil seed crops, which are cultivated and thrive in the newly reclaimed sandy soils in Egypt.

The Egyptian deserts are wide extensions representing about 94% of the total area of Egypt. The remaining area represents about 6% of the total area is considered for agriculture and foundations. According to the annual increase of the Egyptian population, it requires tremendous efforts to increase food production. The government aims toward reclaiming desert area along both sides of the River Nile. The soils of these areas are mainly sands and need organic and inorganic fertilizers to improve their properties for agriculture use.

Sandy soils in Egypt are very poor in organic matter content. It fluctuates between 0.02-0.002 percent due to the high rate of decomposition. Soil organic matter is labile (it can decline rapidly if the soil environment changes) and renewable (it can be replenished by inputs of organic material to the soil). Adequate levels of soil organic matter can be maintained with proper fertilization, crop rotations, and tillage practices. The functions of soil organic matter include; provide plant nutrients, maintain soil tilth condition, aid infiltration of air and water, promoting water retention, reduce erosion and buffer the effect of pesticides.

EL-Fayoumy and Ramadan (2002) found that peanut pod yield was significantly affected by organic manure application. It was increased from 2178.5 to 2986.3, 3161.9, and 3350.7 kg ha^{-1} as organic manure levels increased from zero to 23.81, 47.62, and 71.43 m^3 ha^{-1}, respectively. Moreover, the values significantly increased from 2391.5 to 2961.9 and 3215.7 kg ha^{-1} as nitrogen fertilizer levels increased from zero to 35.71 and 71.43 kg N ha^{-1}, respectively.

Rashid and Ryan (2004) stated that Mediterranean type soils generally have high pH, and low organic matter. Consequently, nutrients disorders in these soils are the most important limiting factor to crop production, second only to moisture stress. Major problems are deficiencies in nitrogen and phosphorus; however, recent researches have revealed that micronutrient problems are also hampering crop production.

Basyouny *et al.* (2004) studied the response of plants on sandy soil to organic and mineral fertilization. Peanut pods yield, grains, and straw yields of wheat were enhanced by the addition of compost combined with mineral fertilizers. The effect of compost application on the yields of peanut and wheat, gave higher yields than that of the untreated soil, whereas, the results indicated the superiority of compost for increasing the pod yields and 100 seed weight of peanut and grain and straw yields of wheat as compared to untreated one (without compost).

Organic matter application to soils is known to improve soil properties and consequently the growth of plant. Among the types of organic matter, farmyard manure could be one of the most economical ways to increase organic matter content in the soil. Several investigators indicated that the application of farmyard manure increased plant growth and dry matter (Khalil *et al.,* 2000). Organic fertilizer is considered as an important source of humus, macro and micro elements carrier, and at the same time increase the activity of the useful microorganisms (EL-Gizy, 1994).

It is well known that inorganic fertilizers are essential in most cropping systems if maximum yields are to be realized. However in long term field experiments where only inorganic fertilizers have been used, soil structure has been deteriorated and crop yield steadily decreased. Abd EL-Rasoul *et al.* (2004) in a field experiment in sandy soil Showed that the inoculation with cyanobacteria beside the partial substitution of the mineral nitrogen with the organic fertilizer (effective microorganisms) led to increase slightly wheat grain yield in addition to saving about 50% of the mineral nitrogen required for wheat production. Hanna *et al.* (2005) reported that the application of chicken manure as organic fertilizer in combination with nitrogen fixing biofertilizer in cucumber cultivation increased significantly vegetative growth, early and total yield and fruit quality. Furthermore, rhizosphere microbial symptoms (nitrogenase activity, number of associative diazotrophs, *Azotobacter*, *Azospirilla* spp., CO_2 evolution, dehydrogenase activity and bacterial population) were also increased compared with those resulted from the use of the chemical nitrogen fertilizer alone. The best means of maintaining soil fertility and productivity level could be achieved through periodic addition of proper organic materials in combination with inorganic fertilizers (Sakr *et al.*, 1992).

The objective of this work is to study the integrated effect of the application of different N-forms, i.e., mineral fertilizer (Ammonium sulphate) and\ or organic fertilizer (compost) combined with or without cyanobacterial inoculation on improving peanut productivity as well as the effect on soil organic matter content and some biological soil properties.

MATERIALS AND METHODS

A field experiment was carried out at Ismailia Agric. Res. Station during the summer season of 2005 to study the integrated effect of the application of different N-forms, i.e mineral fertilizer (Ammonium sulphate) and\ or organic fertilizer (compost) combined with or without cyanobacterial inoculation on improving peanut productivity as well as the effect on soil organic matter content and some biological soil properties.

The main physical and chemical properties of the experimental soil and the analyses of the organic compost are presented in Tables (1 & 2), and determined according to the standard methods described by Jackson (1973) and Page *et al.* (1982).

The experimental design was split-plot with three replicates, where the main plots were assigned to cyanobacterial inoculation (with or without inoculation), the sub plots were N-forms as follows:-

1- Full recommended N dose from compost (RNC).
2- Full recommended N dose from mineral fertilizer (RNM).
3- ¼ RNM + ¾ RNC
4- ½ RNM + ½ RNC
5- ¾ RNM + ¼ RNC

The sup plot area was 3m x 3.5 m =10.5 m^2 (1/400 fed.)

Peanut (*Arachis hypogaea L.*) seed c.v. Giza 6 was sowed in hills at 20 cm apart on rows of 60 cm apart, sprinkler irrigation was carried out four days intervals.

The recommended chemical fertilizers were applied at rates of 40, 15 and 24 kg for N, P_2O_5 and K_2O per faddan, in the form of ammonium sulphate (20.5 %N), superphosphate (15% P_2O_5) and potassium sulphate (48% K_2O), respectively. Both phosphorus and potassium were added before sowing, while nitrogen was added after 10 days from planting. Cyanobacteria at the rate of 10kg fed^{-1} were inoculated to peanut seeds using the soil based inoculum (10^{12} cfu g $soil^{-1}$) cyanobacteria. The inoculum was prepared according to the method described by Venkataraman (1972). The Inoculum containing the following cyanobacteria strains, i.e., *Nostoc muscorum, Nostoc calcicola, Anabaena oryzae and Clyndrospermum muscicola.*

All agricultural practices were carried out as recommended in this district by the Egyptian Ministry of Agriculture. Soil was sampled at different intervals, i.e., initial time, flowering time and at harvest to determine, total bacteria count (Allen, 1959), total Actinomycetes count (Williams and Davis, 1965), total fungi count (Martin. 1959) and total cyanobacteria count (Allen and Stanier, 1968). As well as, the soil samples collected after peanut harvesting were exposed to the determination of organic carbon per cent (Walkley and Black, 1934), carbon dioxide (CO_2) evolution (Pramer and Schmidt, 1964) and (DHA) dehydrogenase activity (Casida *et al.*, 1964). At maturity, plants were picked, pods were separated, air dried, weighted and pealed into seeds and husks. Samples of seeds and foliage were oven dried, weighed and ground. N, P and K content in both seed and foliage were determined according to methods mentioned by Chapman and Pratt (1961) and Jackson (1973).

All obtained data were statistically analyzed according to Gomez and Gomez (1984).

Table (1): Some physical and chemical properties for the experimental soil

Properties	Value	Properties	Value
Particle size distribution %		**Chemical analysis**	
Coarse sand	10.25	pH (1:2.5)	7.7
Fine sand	79.20	EC dSm^{-1}	1.25
Silt	5.15	**Soluble ions (meq/l)**	
Clay	5.40	Ca^{++}	4.10
Texture class	sand	Mg^{++}	2.00
$CaCO_3$%	1.50	Na^{+}	6.20
Organic matter %	0.40	K^{+}	0.30
Available nutrients (mg/kg)		$CO_3^{=}$	0.00
N	21.3	HCO_3^{-}	2.40
P	4.2	Cl^{-}	7.80
K	62.0	$SO_4^{=}$	2.40

Table (2): Some physical and chemical analyses of the organic compost based on dry weight except for density and moisture

Properties	Value	Properties	Value
Weight of one cubic meter	536 kg	Organic matter	42.5 %
Moisture content	44.3 %	Organic carbon	24.7 %
pH (1 : 10)	8.97	Ash	57.5 %
EC (1 : 10)	4.22 dSm^{-1}	C/N ratio	(16.5:1)
Ammonium nitrogen	506 ppm	Total phosphorus	0.23 %
Nitrate nitrogen	41 ppm	Total potassium	0.84 %
Total nitrogen	1.5 %		

RESULTS

1) Response of peanut to compost -N and mineral-N fertilization in presence and/or absence of cyanobacteria inoculation:

a) Response of peanut yield components:

Data in Table (3) indicate the response of peanut yield components to both compost and nitrogen fertilizations either each applied alone as a source of full N dose or both mixed together at different levels under the effect of cyanobacteria inoculation. However, inoculation with cyanobacteria leads to increase the peanut yield components compared to un-inoculated treatments. The use of full nitrogen recommended dose from compost (RN from compost) gave significantly less amounts due to pods, seeds and foliage yield fed^{-1} than those received full nitrogen recommended dose from mineral nitrogen (RN from fertilizer) (Table3). This trend was achieved in both inoculated and un-inoculated treatments. On the other hand the highest values for the aforementioned parameters were achieved in response to both $^1/_2$ RN from compost + $^1/_2$ RN from fertilizer with or without cyanobacteria inoculation. The corresponding values were 3800 kg fed^{-1} (pods). 3104 kg fed^{-1} (seeds) and 3226 kg fed^{-1} (foliage) without inoculation against 4050 kg fed^{-1} (pods) 3353 kg fed^{-1} (seeds) and 3314.10 kg fed^{-1} (foliage) with inoculation. However, the values recorded by these treatments accompanied with cyanobacteria inoculation were significantly higher than those received no inoculation. For the weight of 100- seeds (g), no significant trend was detected due to the tested treatments either under the effect of cyanobacteria inoculation or not. Also, the highest 100-seed weight of 111. 79 and 112.10 g for $^1/_2$ RN from compost + $^1/_2$ RN from fertilizer without and with inoculation, respectively. Generally, nitrogen fertilization either from compost or mineral nitrogen increased the yield components with priority to the treatment received $^1/_2$ RN from compost + $^1/_2$ RN from fertilizer. In addition peanut shelling percentage did not significantly affected by the tested treatments combined with cyanobacteria inoculation or did not.

Table (3): Effect of N-sources and cyanobacteria inoculation on yield and yield components of peanut

Cyanobacteria	Source of nitrogen	Pods kg/fed	Seeds kg/fed	Foliage kg/fed	Weight of 100 seed (g)	Shelling %
Without cyanobacteria	R N from compost	3380	2680.33	2333.30	103.91	79.30
	R N from fertilizer	3570	2902.41	2400.00	110.60	81.30
	1/4RN +3/4RN Com	3453	2775.17	2326.60	108.05	80.37
	1/2RN +1/2RN Com	3800	3104.23	3226.00	111.79	81.69
	3/4RN +1/4RN Com	3546	2944.60	2966.6	110.25	83.04
With cyanobacteria	R N from compost	3384	2748.40	2744.00	108.44	81.20
	R N from fertilizer	3578	2884.6	2889.60	112.90	80.10
	1/4RN +3/4RN Com	3600	2927.20	2919.10	109.00	81.31
	1/2RN +1/2RN Com	4050	3353.03	3314.10	112.10	82.86
	3/4RN +1/4RN Com	3550	2852.1	2858.50	108.70	80.34
L.S.D. at 0.05						
Nitrogen		27.15	23.87	12.32	6.64	1.89
Cyanobacteria		14.81	14.87	38.89	n.s	n.s
Nitrogen x Cyanobacteria		40.30	31.74	41.12	12.30	2.81

b) Response of peanut seeds and foliage NPK-uptake:

Data in Table (4) revealed that inoculation with cyanobacteria enhanced the NPK- uptake by both peanut seeds and foliage compared to those un-inoculated treatments. Mixing compost and mineral nitrogen fertilizer at the rat of $^1/_2$ RN from compost + $^1/_2$ RN from fertilizer recorded NPK – uptake values for both seeds and foliage did not significantly different from those recorded by RN from fertilizer. This behavior was true for both inoculated and un-inoculated treatment. The corresponding NPK-uptake values were 140.90, 18.36 and 14.13 mg kg^{-1} seeds and 50.00, 4.19 and 21.30 mg kg^{-1} foliage ($^1/_2$ RN from compost + $^1/_2$ RN from fertilizer treatment) against 140.5, 17.78 and 11.61 mg kg^{-1} seeds and 41.28, 2.06 and 17.76 mg kg^{-1} foliage (RN from fertilizer treatment) for un-inoculated treatments, while the relative NPK-uptake values for the inoculated treatments were 191.10, 20.40 and 17.70 mg kg^{-1} seeds and 52.74, 4.31 and 24.90 mg kg^{-1} foliage ($^1/_2$ RN from compost + $^1/_2$ RN from fertilizer treatment against 180.80, 18.52 and 13.80 mg kg^{-1} seeds and 47.41, 2.86 and 18.90 mg kg^{-1} foliages (RN from fertilizer treatment). However, it could be noticed that saving the full nitrogen recommended dose required for peanut cultivation as two equal split amount derived from both the organic compost and mineral nitrogen, gave the highest NPK-uptake values recorded by both peanut seeds and foliage. These values were not significantly different from those recorded due to saving all the required nitrogen from the mineral nitrogen fertilizer.

Table (4): Effect of N-sources and cyanobacteria inoculation on NPK-uptake by peanut seeds and foliage

Treatments		Seeds (mg kg^{-1})			Foliage (mg kg^{-1})		
Cyanobacteria	**Source of nitrogen**	**N**	**P**	**K**	**N**	**P**	**K**
Without Cyanobacteria	R N from compost	134.3	16.74	12.90	36.63	1.17	16.33
	R N from ertilizer	140.5	17.78	11.61	41.28	2.06	17.76
	/4RN +3/4RN Comp	129.9	16.85	13.04	39.55	2.79	17.68
	/2RN +1/2RN Comp	140.9	18.63	14.13	50.00	4.19	21.30
	/4RN +1/4RN Comp	128.7	17.13	13.04	48.95	2.97	18.69
With Cyanobacteria	R N from compost	173.42	16.52	14.30	44.18	2.36	17.00
	R N from fertilizer	180.8	18.52	13.80	47.71	2.86	18.90
	/4RN +3/4RN Comp	162.8	17.76	14.70	48.75	3.04	20.43
	/2RN +1/2RN Comp	191.1	20.40	17.70	52.74	4.31	24.90
	/4RN +1/4RN Comp	163.1	19.80	14.50	38.59	3.36	19.15
L.S.D. at 0.05							
Nitrogen		1.344	0.154	0.113	0.211	0.021	0.091
Cyanobacteria		0.760	0.104	0.131	0.565	0.049	0.265
Nitrogen x Cyanobacteria		2.110	0.200	0.413	0.705	0.070	0.302

2) Response of Soil microbial community, Soil organic carbon and soil biological activity to compost -N and mineral-N fertilization in presence and/or absence of cyanobacteria inoculation:

a) Response of microbial community at different growth stages of peanut:

Data in Table (5) showed that organic compost fertilizer and mineral nitrogen fertilizer when each applied alone or both in combination at different levels increased the microbial community of soil at the flowering stage of peanut growth, compared to both initial and harvest stages. However, the treatments received cyanobacteria inoculation had recorded higher microbial numbers compared to those received no cyanobacteria inoculation. Due to mixing compost and mineral nitrogen, the highest numbers of the tested microorganisms were recorded by the use of $^1/_2$ RN from compost + $^1/_2$ RN from fertilizer treatment either combined with cyanobacteria inoculation or did not. These data indicate that the microbial community initially was poor as a nature of the sandy soil, but the addition of compost and inoculation with cyanobacteria enriched the soil to initially increase the numbers of the soil microbial community to reach the maximum at flowering stage.

Table (5): Effect of N-sources and cyanobacteria inoculation on the total count of bacteria, Actinomycetes, fungi and cyanobacteria in soil at different growth stages of peanut (cfu = Colony formed per unit/gsoil)

Cyanobacteria	Treatments	Total count bacteria (cfu g soil^{-1})			Total count Actinomycetes (cfu g soil^{-1})			Total count fungi (cfu g soil^{-1})			Total count cyanobacteria (cfu g soil^{-1})		
		Initial time X10^4	Flowering stage X10^6	Harvest stage X10^4	Initial time X 10^3	Flowering stage X 10^3	Harvest stage X 10^3	Initial time X 10^3	Flowering stage X 10^3	Harvest stage X 10^3	Initial time X 10^2	Flowering stage X10^3	Harvest stage X10^4
Without cyanobacteria	R N from compost	30.00	42.67	33.33	11.00	44.67	16.00	4.33	17.67	5.33	18.00	20.00	20.00
	R N from fertilizer	46.67	48.0	41.33	10.67	40.33	18.00	5.67	24.67	9.00	20.00	15.00	10.00
	1/4RN +3/4R Comp.	42.33	69.67	40.33	14.67	45.67	19.33	5.33	31.67	8.00	18.00	22.00	18.00
	1/2RN +1/2R Comp	35.33	70.0	39.67	13.33	51.67	21.67	5.33	25.33	10.00	29.00	36.00	24.00
	3/4RN +1/4R Comp	32.67	73.67	43.67	12.33	50.67	18.67	5.00	40.33	12.33	25.00	33.00	21.00
With cyanobacteria	R N from compost	35.33	65.33	43.0	15.67	68.33	26.00	4.67	41.67	9.33	28.00	33.00	19.00
	R N from fertilizer	37.0	82.33	55.33	16.33	64.33	38.67	5.00	36.00	14.00	31.00	36.00	23.00
	1/4RN +3/4R Comp.	30.0	117.0	59.33	18.00	65.33	29.67	5.67	40.00	13.67	36.00	44.00	28.00
	1/2RN +1/2R Comp	32.0	125.67	60.33	20.67	91.00	27.33	5.33	45.33	15.67	39.00	50.00	30.00
	3/4RN +1/4R Comp	33.0	148.33	64.0	19.67	73.33	21.67	4.33	45.33	11.67	30.00	43.00	26.00

Thereafter, reaching the peanut harvesting stage, the numbers of soil microbial community came to be decreased but still recording numbers higher than those given initially due to all tested treatments. However, the highest recorded count numbers were 125.67×10^6 (Bacteria), 91.00×10^3 (Actinomycetes), 45.33×10^3 (fungi) and 50.00×10^5 cfu g^{-1} soil (cyanobacteria) due to the treatment of $^1/_2$ RN from compost + $^1/_2$ RN from fertilizer treatment combined with cyanobacteria inoculation at the flowering stage.

b) Response of soil organic carbon at harvest stage of peanut:

Due to the soil organic carbon per cent (OC %) after peanut harvesting, Table (6) showed slight changes in response to the tested treatments either they combined with cyanobacteria inoculation or did not,. However, the highest organic carbon percentage of 0.46 was due to $^1/_2$ RN from compost + $^1/_2$ RN from fertilizer treatment combined with cyanobacteria inoculation. This OC % was very close to same treatment but without cyanobacteria inoculation.

c) Response of soil CO_2 evolution and dehydrogenase activity (DHA) at harvest stage of peanut:

Generally, data in Table (6) revealed that the presence of compost either alone or mixed at different levels with different rates of nitrogen increased the soil biological activity as represented by the amount of CO_2 evolution and DHA activity. This increase in soil biological activity continued to increase as a result of cyanobacteria inoculation. The highest values were 68.53 mg CO_2 g soil-1 (CO_2 evolution) and 23.48 µL H_2 (DHA) activity due to the treatment of /2 RN from compost + $^1/_2$ RN from fertilizer without cyanobacteria inoculation followed by 95.84 mg CO_2 g soil-1 (CO_2 evolution) and 28.01 µL H_2 (DHA) activity due to the treatment of /2 RN from compost + $^1/_2$ RN from fertilizer combined with cyanobacteria inoculation.

Table (6): Effect of N-sources and cyanobacteria inoculation on organic carbon per cent, CO_2 evolution and dehydrogenase activity (DHA) in soil after peanut harvesting

Treatments		Organic carbon (%)	CO_2 evolution mg CO_2 100 g^{-1} soil	DHA (µL H_2 100 g soil^{-1})
Cyanobacteria	**Source of nitrogen**			
Without Cyanobacteria	R N from compost	0.40	64.13	18.48
	R N from fertilizer	0.33	58.08	19.68
	1/4RN +3/4RN Com	0.35	62.30	21.82
	1/2RN +1/2RN Com	0.45	68.53	23.48
	3/4RN +1/4RN Com	0.41	66.64	21.09
With Cyanobacteria	R N from compost	0.41	66.53	21.10
	R N from fertilizer	0.36	63.91	20.92
	1/4RN +3/4RN Com	0.45	67.00	22.59
	1/2RN +1/2RN Com	0.46	95.84	28.01
	3/4RN +1/4RN Com	0.42	66.96	21.22

DISCUSSION

Crops remove different levels of nutrients from soils and these nutrient have to be replenished not only to make up for the removal but also to make up for any deficit since majority of the soils even inherently are not able to meet the total requirements especially under the present intensity of growing and harvesting high yielding crops. Various organic and inorganic sources of the plant nutrients are therefore, used for insuring high level of production on long term basis for sustainable agriculture without any negative impact on the environmental including the soil, water and air. In the present work, mixing the organic and mineral fertilizers combined with cyanobacteria inoculation or not, was used to study their effect on peanut production. Results revealed that using a mixture of $^1/_2$ N from compost + $^1/_2$ N from mineral fertilizer led to increase significantly the peanut yield components (Pods, seeds and foliage) compared to the use of any of ether compost or mineral fertilizer alone. In this concern, the present results are in harmony with those obtained by Hanna and EL- Gizy (1999) who found that organic manure increased slightly both the plant growth parameters and yield components for common bean compared to the plants received the regular doses of the mineral NPK. While mixing the mineral nitrogen with organic fertilizer gave significantly higher yield than using any of them alone. Recently, there is a great deal of interest in creating novel association between agronomical important plants, particularly th strategic crops such as wheat, maize and peanut and N_2-fixing microorganisms including cyanobacteria (Spiller *et al.*, 1993). The heterocystous cyanobacterium *Nostoc sp.* is usually among characterized cyanobacteria in its ability to form tight association with the roots of these crops and other crops in which they penetrate both roots epidermis and cortical intracellular space (Gantar *et al.*, 1995). Consequently, in this work the treatments received either compost or mineral nitrogen each alone and\or in combination at different rates were inoculated with cyanobacteria and gave peanut seed and foliage yields significantly higher than those without inoculation Aref and AL-Kassas (2006) found that maize inoculation with cyanobacteria gave higher yield components values due to 50% N + 100% cyanobacteria treatment and these values were not significantly different from those attained due to 100% N. This may due to that the nitrogen released to soil through nitrogen fixed by cyanobacteria inoculated to soil becomes available to the cultivated plants. Moreover, cyanobacteria are known to excrete extra-cellularlly a number of compounds like polysaccharides, peptides, lipids...etc. during their growth in soil, these compounds hold or glue soil particles together in the form of micro-aggregates and hence improve nutrient availability and consequently enhanced the plant growth parameters (Mandal *et al.,* 1999). However, because of low efficiency nitrogen fertilizers especially in sandy soils due to leaching , its poor organic matter content and weak water retention which, cause a great loss for nitrogen fertilizer, microbial inoculants such as cyanobacteria can help to restore the fertility of soil but are effective under specific environments and specific crops. The best alternate is the use of organic fertilizers in conjunction with inorganic fertilizers, which can help in lowering the production cost by supplying cheap nutrition on one hand by improving the soil health and properties on the other hand (Rashid, 2001). In this Approach, the present work showed that the integration between compost and mineral nitrogen combined with cyanobacteria inoculation led to increase significantly the NPK uptake for both peanut seeds and foliage compared to the use any of compost or mineral nitrogen alone but moreover, the treatment $^1/_2$ N from compost + $^1/_2$ N from mineral fertilizer plus cyanobacteria inoculation was superior in increasing peanut yield components and nutrients uptake. This could be explained by that the organic compost contains small amount of nutrients but its main value lies in the supply of organic matter to the soil, which performs certain other essential functions. It promotes microbial activity in the soil (in the present study, the integration between organic and mineral fertilizers led increase the soil organic carbon content that increased the microbial activity as represented by the increase in both soil CO_2 evolution and dehydrogenase activity), and improve soil structure, areationand water holding capacity, thus creating a congenial environment for efficient use of nutrients by the plants. This is finally reflected on the crop production (EL- Shahat, 2007).

For Soil microbial community, the used treatments led increase the number of the tested microorganisms, i.e., bacteria, actinomycetes, fungi and cyanobacteria at peanut flowering stage compared to both initial and harvest stages. This trend is true because at the flowering stage, plants reached it maximum physiological activity that increased the root exudates in the rhizosphere area, which in turn promote the microbial proliferation in soil and increased their number. These conditions are not saved in the other two tested stages. However, due to the soil biological activity after peanut harvesting in terms of CO_2 evolution and dehydrogenase activity, it was noticed that both processes were correlated with the microbial numbers recorded at harvest due to the tested treatments, which again showed the priority to the integration between compost and mineral nitrogen at the rate of $^1/_2$ N from compost + $^1/_2$ N from mineral fertilizer either combined with or without cyanobacteria inoculation. AL- Kassas, (2002) Reported that Inoculation with the nitrogen fixing diazotrophs in addition to the integration of organic and nitrogen fertilizers to wheat increased the soil *Azospirilla* and other microbial population including fungi, actinomycetes, *Azotobacter* and cyanobacteria, and consequently increased both the dehydrogenase activity and CO_2 evolution, which are considered as index for biological activity and soil fertility (Ghazal, 1980).

From the abovementioned results, it could be recommended that the integration between the three partners of compost: mineral nitrogen fertilizer: cyanobacteria inoculation in peanut cultivation under sandy soil condition is more beneficial than the use of any of them individually. This integration may lead to reduce, the cost and the environmental pollution due to the extensive use of the mineral fertilizers. However, this work needs to be repeated with peanut and some other cereal crops to be confirmed and actually recommended.

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التأثير المشترك لاضافة النتروجين فى صورتية المعدنية والعضوية مع اضافة السيانوبكتيريا على تحسين انتاجية الفول السودانى فى الاراضى الرملية

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لقد أجريت تجربة حقلية بمحطة البحوث الزراعية بالاسماعيلية والتابعة لمركز البحوث الزراعية وذلك فى موسم صيف ٢٠٠٥ وذلك لدراسة التأثير المشترك لاضافة النتروجين فى صورتية المعدنية والعضوية مع اضافة السيانوبكتيريا على تحسين انتاجية الفول السودانى فى الاراضى الرملية حيث استخدم أى من السماد العضوى (الكمبوست) والسماد النيتروجينى المعدنى منفردا او فى مخلوط من أى منهما بمعدلات مختلفة فى وجود او عدم وجود السيانوبكتريا وقد اوضحت النتائج مايلى:-

١- ان استخدام السماد العضوى (كمبوست) بمعدلات مختلفة مع السماد النيتروجينى المعدنى بمعدلات مختلفة أعطى محصولا من الفول السودانى أفضل من ذلك المتحصل علية عند استخدام اى منهما كمصدر للنيتروجين منفردا.
٢- ان استخدام السماد العضوى (كمبوست) بمعدلات مختلفة مع السماد النيتروجينى المعدنى بمعدلات مختلفة أدى الى زيادة محتوى كل الحبوب والقش من كل من النيتروجين والفوسفور والبوتاسيوم عن تلك المتحصل عليها عند استخدام اى منهما كمصدر للنيتروجين منفردا.
٣- كان التفوق للمعاملة التى كان مصدر النيتروجين فيها مناصفة بين الكومبوست والسماد النيتروجينى المعدنى حيث أدت هذة المعاملة الى زيادة معنوية فى كل القياسات تحت الدراسة مثل محصول الحبوب والقش ومحتواهما من النيتروجين والفوسفور والبوتاسيوم وكذلك محتوى التربة من الميكروبات المختلفة تحت الدراسة وكذا النشاط البيولوجى بالتربة متمثلا فى كمية غاز ثانى أكسيد الكربون المتصاعدة ونشاط انزيم الديهيدروجينيز.
٤- أدى التلقيح بالسيانوبكتريا الى زيادة معنوية أكثر من تلك المتحصل عليها من نفس المعاملات بدون تلقيح وأيضا كانت الأفضلية للمعاملة التى كان مصدر النيتروجين فيها مناصفة بين الكومبوست والسماد النيتروجينى المعدنى بالاضافة للسيانوبكتريا.
٥- يمكن من هذه النتائج الاستدلال على انه من الممكن التكامل بين كل من الكمبوست والسماد النيتروجينى المعدنى بالاضافة للسيانوبكتريا وذلك فى انتاج الفول السودانى تحت ظروف الأراضى الرملية وذلك لتقليل التكلفة والتلوث البيئى الناتج من الاستخدام المكثف للاسمدة المعدنية.