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INTEGRATED FERTILIZATION FOR WHEAT CROP UNDER SANDY SOIL CONDITIONS

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ABSTRACT

A pot experiment was conducted in a sandy soil at Exp. Station of El-Mansoura Univ. Dakahlia Governorate during winter season of (2004-2005) to study the effect of biofertilizer (microbin and phosphorin), mineral fertilizer (soluble and slow release fertilizers as sulfur coated urea), and organic manure (compost) on the wheat yield (grain and straw) NPK, concentration in grain and straw of wheat plants at the harvesting stage and some soil properties. The experiment was split plot design where, in main plots were (biofertilizer) and in sub main plots were (organic and mineral fertilizers).

Results of studied parameters found that the interaction effect has highly significant increase in all treatments. The results show that straw and grain yield of wheat have a highest values by inoculation of nitrogen fixing bacteria (microbin) mixed with slow release fertilizer [sulfur coated urea, (S)] S100%. On the other hand the highest value of nitrogen concentration in straw at the harvesting stage was conducted with microbin + phosphate dissolving bacteria (phosphorin) mixed with S100%. But grain was found with microbin mixed S100% was but in, P and, K concentrations recorded the highest values were with microbin + phosphorin + S100% in straw and grain yields.

In soil the highest available N and K values were recorded with microbin + phosphorin mixed with S100%, while the highest value in soil available P was recorded with microbin + phosphorin mixed with M100%. Soil organic matter and hydraulic conductivity recorded the highest values were recorded with microbin + phosphorin mixed with O100%.

These study recommended that the use of microbin + phosphorin mixed with S100% give the highest grain and straw yields and also give the highest N, P, K concentration in plant and in soil such treatments reduced the use of chemical fertilizer and reduced the harmful effect on human health.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the most important grain crops in Egypt. Any efforts to increase wheat yield to face the increasing gab between wheat production and consumption, is highly appreciated. This could be achieved by applying recommended cultural practices such as using bio and chemical fertilizers (El-Zeky, 2005). Traditional agriculture systems are based on the use of chemical fertilizers to promote growth, and pesticides to control diseases and insects attacking the crops, addition to herbicides to fight herbage. Although the importance of these chemical fertilizers as intensive energy for production, there is a beneficial role of organic ones in improving the physical, chemical and biological properties of soil. Also, organic matter provides considerable part of macro and micronutrients for plant growth (Fanous, *et al.*., 2003).

The organic matter content of Egyptian soils is usually less than 2% in cultivated area. Frequent and high application of organic manure is necessary to maintain soil fertility. In Egypt farmyard manure is usually used as organic fertilizer while sheep, poultry manure, water hyacinth and industrial organic residues are slightly used in soil fertilization. These organic fertilizers vary greatly in their composition. Generally, soil organic matter is considered as an important factor for improving physical, chemical and biological properties of soil (Abd El-Moez *et al.*, 1999). In recent years, biofertilizers have emerged as an important component of the integrated nutrient supply system and hold a great promise to improve crop yields through environmentally better nutrient supplies. However, the application of microbial fertilizers in practice, somehow, has not achieved constant effects (Vessy, 2003).

Therefore, the present work was conducted to study the effect of organic, chemical (soluble and slow release) and bio- fertilizers on growth of wheat crop and its production, and also properties of sandy soil.

MATERIALS AND METHODS

A pot experiment was conducted using wheat plant (*Triticum Aestivum L*). CV Sakha 93 during the winter season of (2004-2005) at the Agric. Exp. Station of El-Mansoura Univ. The compost was added to each pot two weeks before sowing wheat seeds. Wheat seeds were sown in each pot at rate of 90 kg/fed on 15th November, 2004. The physical and chemical properties of studied soil were shown in Table (1).

Table (1): Some physical and chemical properties of the soil studied

Soil properties	Values	Soil properties	Values
Bulk Density (g/cm^3)	1.42	**Soluble cations (meq/100g soil**	
SP%	24.18	Ca^{++}	1.98
Coarse Sand %	48.23	Mg^{++}	1.40
Fine sand %	39.65	Na^{+}	1.28
Silt %	4.04	K^{+}	1.02
Clay %	8.08	**Soluble anions (meq/100g soil**	
Soil Texture Class	Sandy	$CO_3^{=}$	0.0
OM%	0.110	HCO_3^{-}	2.43
pH (soil paste)	7.5	$SO_4^{=}$	1.21
EC, dS m^{-1}	0.870	Cl^{-}	1.94

Organic manure: The Compost was used as organic manure in this study, it was at rate of 20 m^3/fed. The Compost was taken from (Horticulture Department, Mansoura Univ.). Data in Table (2) showed some chemical properties of compost used

Table (2): Some chemical properties of compost used:

Source	pH	Total N%	Total C%	C:N ratio	E.C dSm^{-1}	Total P (ppm)	Total K (ppm)	Fe%	Mn (ppm)	Zn (ppm)	Cu (ppm)
Compost	7.2	0.73	13.87	19:1	1.80	185	960	1.1	197	49	28

Biofertilizers: The seeds of wheat were coated with two types of biofertilizers used in this study, the first was N_2.fixing bacteria (Microbin), and the second was phosphate dissolving bacteria (phosphorin). The two types of biofertilizers used in this study were produced and distributed commercially by General Organization of Agriculture Equalization Fund (GOAEF), Ministry of Agriculture Egypt. All these biofertilizers were seed coated with Arabic gum as adhesive material.

Mineral Fertilizers : Nitrogen fertilizer was urea 46% N and slow release fertilizer (urea coated sulfur 40% N) each of them was added at rate of 163 Kg urea /fed as recommended dose at three equal doses. The recommended dose of phosphorus fertilizer 150 Kg super phosphate (15.5% P_2O_5) and 75kg potassium sulphate (48% K_2O).

Experimental design: Main plots were 4 treatments "Without biofertilizer, With biofertilizer (microbin), With biofertilizer (phosphorin) and With (microbin + phosphorin)

Sub main plots:

1- Control	6- M25% + O75%
2- Mineral (M) 100%	7- Slow release fertilizer (S) 100%
3- Organic manure (O) 100%	8- S75% + O25%
4- M75% + O25%	9- S50% + O50%
5- M50% + O50%	10- S25% + O75%

Soil analysis: pH value was determined in the soil paste using a Gallenkamp pH meter according to Jackson (1967), Electrical conductivity (EC) was determined in 1:2.5soil: water extract according to Jackson (1967), Particle size distribution was determined using the international pipette method as described by piper (1950), Organic matter was determined according to Walkley and Black method as described by Hesse (1971). Bulk density was determined by using paraffin wax method Dewis and Freitas (1970). Saturation percentage (SP%)was determined according to Dewis and Freitas (1970). Soluble cation and anions and available P were determined according to Jackson (1967). Available potassium was extracted using 1.0 N ammonium acetate (pH7), and determined by Flamphotometer according to Hesse (1971). Hydraulic conductivity coefficient (K) of the soil samples columns was determined using the constant head permeater in disturbed soil Singh (1980).

Compost analysis: pH value was determined in 1:2.5 compost :water extract using a Gallenkamp PH meter Jackson (1967), Total nitrogen (N%) in compost was determined using the conventional method of Kjeldahal Jackson (1967), Total carbon (C%) content of compost was determined by using Walkly and Black method as described by Hesse (1971), C/N ratio was calculated by dividing each determination on its molecular weight e.g. C/12 and N/14,then the obtained values of both C and N were divided (C/N). Total phosphorus was determined colorometrically by using Spectrophotometer as described by Jackson (1967). Total potassium was estimated by using Flame photometer according to Jackson (1967). Total contents of micronutrients in compost were determined by digesting organic materials with HNO_3, HF, and then dissolved in HCL according to Jackson (1967) and determined using the Atomic absorption spectrophotometer.

Plant analysis: Nitrogen was determined by the microkjeldahl method as aforementioned Hesse (1971), Phosphorus was determined colorimetrically at a wavelength of 660nm using stannous chloride reduced molybedo phosphoric blue color method, described by Jackson (1967). Potassium was determined using Gallen flame photometer as described by Jackson (1967).

Statistical Analysis: The statistical analysis of the obtained data was done according to the method described by Gomez and Gomez (1984). Using least significant differences (L.S.D) to compare the treatment values.

RESULTS AND DISCUSSION

Interaction effect of bio, mineral and organic fertilizers on the yield of wheat crop :

1- Grain yield:

Data in Fig. (1) showed the effect of bio fertilizer (microbin, and phosphorin), compost and mineral fertilizer (soluble and slow release fertilizers) on wheat grain yield.

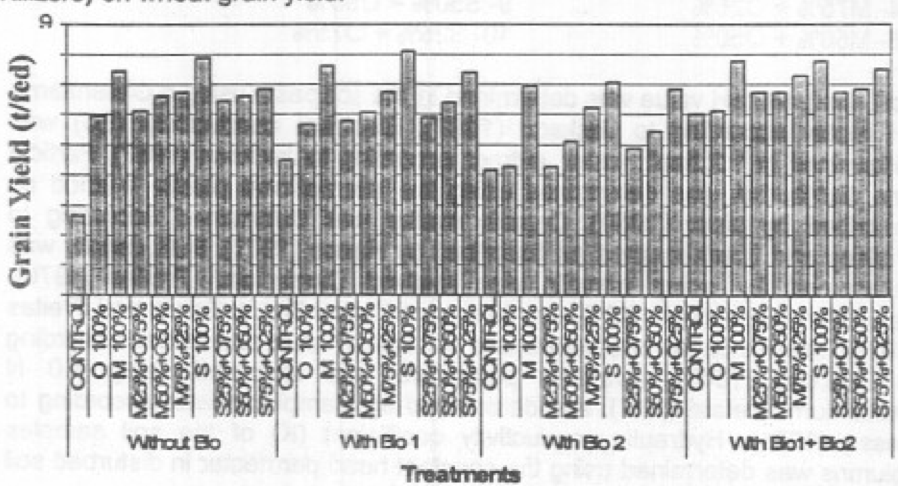

Fig. (1): Interaction effect of bio, mineral and organic fertilizers on the yield of wheat grain (t/fed)

Data revealed that there is high significant increase in all treatments compared to the control. The highest grain yield was found with application of microbin with S100% (sulfure coated urea) which was (8.12 t/fed), followed by adding microbin + phosphorin mixed with S100%.

This was referred to stimulating the effect of nitrogen either from organic or mineral source on activation of N_2 fixers and its enhancing effect on the availability of N for plant growth. The obtained results are in conceder with the finding of Amin (1997) and Ashour (1998).

2- Straw yield:

As shown in Fig. (2) there is highly significant increase of interaction effect between bio, mineral and organic fertilizers on wheat straw yield. The highest value was (3.26 t/fed) which was obtained with adding microbein with slow release fertilizer 100% of recommended dose.

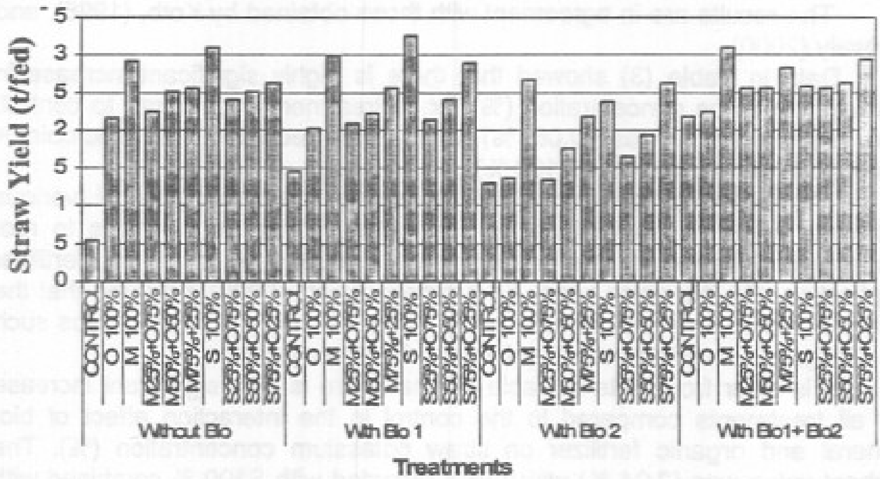

Fig. (2) Interaction effect of bio, mineral and organic fertilizers on the yield of wheat straw (t/fed)

The positive interaction effect between bio, mineral and organic fertilizers can be attributed to saving the bacteria of biofertilizer (microbin + phosphorin) to fix nitrogen and solublize phosphorus and avoid N losses of soluble chemical N fertilizer. This N helps for increasing plant growth, grain yield of wheat plants, Kaloosh and Koreish (1995) who concluded that biofertilizer and organic fertilizer increased wheat plant growth than mineral fertilizer. These findings may be attributed to the gradual release of available nitrogen due to the use of microbin and compost than mineral fertilizer. Fixer bacteria as Azotobacter and Azospirillum can secrete hormones, which encourage plant growth and increase nutreients uptake (Saber, 1993).

Interaction effect of bio, mineral and organic fertilizers on wheat straw N, P and K concentration (%) at the harvesting stage:

Data in Table (3) showed the effect of bio, mineral and organic fertilizers on wheat N concentration (%). There is high significant increase in all treatments compared to the control. The highest values were (1.54%) which was recorded with microbin + phosphorin mixed with slow release fertilizer 100%, followed by (1.15%) which was estimated either with microbin mixed with S 100% or with phosphorin + slow release fertilizer 100%.

These results could be attributed to:

1- The availability of more N fixed by free living bacteria which present in biofertilizer (microbin).

2- The availability of more phosphorus due to bacteria solubilizing phosphrus which present in biofertilizer (phosphorein).
3- The production of growth regulators substances such as indol acetic acid, gibberellins, pyridoxine and others which stimulate plant growth and subsequently affect wheat yield and its attributes.

The results are in agreement with those obtained by Kotb, (1998), and Metwaly (2000).

Data in Table (3) showed that there is highly significant increase in straw phosphorus concentration (%) for all treatments compared to control. The highest value was (0.06 %) which was recorded with microbin + phosphorin combined with (S 100 %).

These applications achieved increasing the availability of various nutrients by plants as well as increasing the resistance of plants to root disease and reducing the environmental pollution by chemical fertilizer application. On the other hand, EL-Kramany *et al.*. (2000) indicated that the effect of biofertilizer may be due to the effect of different strain groups such as nitrogen fixers and nutrient mobilizing of microorganisms.

It is clear from data in Table (3) that there is high significant increase for all treatments compared to the control in the interaction effect of bio, mineral and organic fertilizer on straw potassium concentration (%). The highest value was (2.04 %) which was recorded with S100 % combined with microbin + phosphorin followed by M 100 % mixed with microbin+ phosphorin (1.98 %).

Data revealed that the application of bio, mineral and organic fertilizer gave high significant increase of K concentration in wheat plants. This may be due to the stimulating effect of these fertilizers on plant growth where the bulk of potassium is mainly taken up during the vegetative growth stage consequently, increasing K concentration. It can be also occurred as a result of enhancing the metabolic activity of the plant root when mineral nutrients are supplied through the fertilizers addition to the soil, (Lin *et al.*., 1983).

Interaction effect of bio, mineral and organic fertilizer on wheat grain NPK concentration (%) at the harvesting stages :

Data in Table (3) showed the interaction effect of bio, mineral and organic fertilizer on nitrogen grain concentration (%). There is high significant increase in all treatments compared to the control. The highest value was recorded with microbin mixed with S 100 % (1.78 %) followed by microbin +phosphorin mixed with S100 % (1.77 %).

The increase of N percentage in rice grain could be attributed to the beneficial effect of N application through its both bio and mineral sources on the grain formation beside the stimulation effect of phosphorus on development of the plant root system, which in turn stimulates the root absorption function. These results are in accordance with those of Hammad *et al.*. (1997) and EL-Mancy *et al.*. (1997).

As shown in Table (3) the data indicated that there is highly significant increase in phosphorus concentration (%) in wheat grains as a result of interaction effect of bio, mineral and organic fertilizers. The highest value was

(0.51 %) which was recorded with microbin + phosphorin mixed with S100 % followed by microbin+ phosphorin mixed with S75%+O25% (0.47 %).

Table (3): Interaction effect of bio, mineral and organic fertilizer on wheat straw and grain NPK concentration (%) at the harvesting stages

Treatments		Straw			Grain		
		N%	P%	K%	N%	P%	K%
Without Bio Fert.	CONTROL	0.43	0.02	1.07	0.49	0.08	0.94
	O 100%	0.55	0.03	1.10	0.70	0.08	1.03
	M 100%	0.82	0.04	1.89	1.39	0.36	1.45
	M25%+O75%	0.48	0.03	1.38	0.76	0.18	1.16
	M50%+O50%	0.54	0.03	1.57	0.94	0.27	1.13
	M75%+25%	0.55	0.03	1.74	1.03	0.32	1.39
	S 100%	0.84	0.04	1.95	1.51	0.42	1.55
	S25%+O75%	0.54	0.03	1.43	0.98	0.19	1.17
	S50%+O50%	0.61	0.03	1.50	1.39	0.30	1.20
	S75%+O25%	0.74	0.04	1.60	1.26	0.35	1.34
With Bio 1	CONTROL	0.48	0.03	1.22	0.62	0.12	1.97
	O 100%	0.49	0.03	1.35	0.73	0.21	1.16
	M 100%	0.91	0.05	1.94	1.34	0.21	1.69
	M25%+O75%	0.53	0.03	1.95	0.91	0.21	1.19
	M50%+O50%	0.59	0.04	1.65	1.13	0.21	1.50
	M75%+25%	0.71	0.04	1.86	1.24	0.44	1.61
	S 100%	1.15	0.05	1.94	1.78	0.24	1.73
	S25%+O75%	0.55	0.03	1.46	1.02	0.31	1.20
	S50%+O50%	0.79	0.03	1.52	1.25	0.37	1.20
	S75%+O25%	0.84	0.04	1.70	1.66	0.37	1.41
With Bio 2	CONTROL	0.43	0.03	1.31	0.51	0.23	1.18
	O 100%	0.48	0.03	1.38	0.75	0.26	1.24
	M 100%	0.89	0.05	1.98	1.29	0.42	1.69
	M25%+O75%	0.50	0.03	1.51	0.82	0.30	1.27
	M50%+O50%	0.57	0.04	1.67	1.04	0.36	1.56
	M75%+25%	0.57	0.04	1.89	1.05	0.41	1.60
	S 100%	0.99	0.05	1.96	1.64	0.46	1.83
	S25%+O75%	0.68	0.04	1.49	1.03	0.29	1.20
	S50%+O50%	0.70	0.04	1.56	1.21	0.36	1.30
	S75%+O25%	0.74	0.04	1.82	1.34	0.42	1.56
With Bio1+ Bio2	CONTROL	0.48	0.03	1.47	0.88	0.27	1.33
	O 100%	0.52	0.03	1.51	0.90	0.31	1.35
	M 100%	0.91	0.05	1.98	1.55	0.51	1.81
	M25%+O75%	0.54	0.04	1.53	0.91	0.35	1.46
	M50%+O50%	0.77	0.04	1.87	1.19	0.41	1.63
	M75%+25%	0.77	0.04	1.97	1.26	0.47	1.84
	S 100%	1.54	0.06	2.04	1.77	0.51	1.86
	S25%+O75%	0.73	0.05	1.60	1.04	0.39	1.36
	S50%+O50%	0.82	0.04	1.76	1.34	0.42	1.43
	S75%+O25%	0.91	0.04	1.89	1.64	0.47	1.66
LSD	5%	0.072	0.003	0.029	0.044	0.004	0.036
	1%	0.096	0.004	0.038	0.059	0.006	0.048

This effect could be due to that biofertilizers play a fundamental role in converting P or K fixed form to be soluble ready for plant nutrition making the uptake of nutrients by plants more easy. Similar results were found by Quastel (1965) and Zayed (1998) who found that soil microorganisms known as phosphate solubilizing bacteria (PSB) play a fundamental role in converting P-fixed form to be available.

As illustrated in Table (3) data showed that there is high significant increase in all treatments compared to the control on k-concentration in wheat grains as a result of interaction between biofertilizer, mineral, and organic fertilizers. The highest value was recorded with microbin+phosphorin combined with S100 % (1.86%), these results are in agreement with findings of Quastal (1965) and Zayed (1998).

Interaction effect of bio, mineral, and organic fertilizers on soil NPK (ppm) after harvesting of wheat crop:

Data in Table (4) showed the interaction effect between bio,mineral and organic fertilizer on soil nitrogen(ppm).In all treatments there is high significant increase compared to the control. The highest value (217.00ppm) was recorded with microbin+phosphorin combined with S 100%.

The depot fertilizers are particularly slow acting nitrogen fertilizers. They are necessary since the above mentioned N-fertilizers, even those considered to be slow acting, usually act too quickly. Depot fertilizers were therefore developed as a" slowly flowing source of nitrogen "in order to better adapts N-supplies to the N-demand of plants (Fink, 1982).

As mentioned in Table (4) there is high significant effect of interaction between bio, mineral ,and organic fertilizers on soil available-P in all treatments compared to the control .The highest value was(247.60ppm)which was recorded with microbin+ phosphorin mixed with M100%.

Quastal(1965)reported that soil microorganisms known as phosphate solubilizing bacteria (PSB)play a fundamental role in converting P-fixed form to be soluble and available for plant nutrition .As well as, the microbial breakdown of soil organic matter is associated with an increase of CO_2 Production which possibly increase the solubility of soil phosphate .

As clear from data in Table (4) that there is highly significant effect of interaction between bio, mineral, and organic fertilizers on soil available-K .The highest value (820.70 ppm) was recorded with microbin+phosphorin mixed with S100%.

The significant effect of biofertilizers may be due to the effect of different strain groups such as nitrogen fixers, nutrients mobilizing microorganisms which help in availability of nutrients and their forms in the compost material and increase levels of extractable N, P, K, Fe, Zn, Mn, (EL.karmany *et al.*., 2000).

Interaction effect of bio, mineral, and organic fertilizers on some soil properties:

1- Soil organic matter (%):

As shown in Table (4) there is high significant effect of interaction between bio, mineral, and organic fertilizers on soil organic matter. The highest value (0.97%) was recorded with microbin+phosphorin in combined with O100%.

Table (4): Interaction effect of bio, mineral and organic fertilizer on soil NPK (ppm), OM% and hydraulic conductivity (cm/h) after harvesting stage of wheat.

Treatments		Soil N, ppm	Soil P, ppm	Soil K, ppm	Soil OM%	H.C., cm/h
Without Bio	CONTROL	46.67	114.80	271.40	0.18	63.87
	O 100%	65.33	148.00	281.00	0.81	194.50
	M 100%	100.33	195.90	562.00	0.32	73.70
	M25%+O75%	65.33	160.10	297.00	0.62	159.13
	M50%+O50%	72.33	172.20	421.50	0.55	128.83
	M75%+25%	70.00	172.00	510.90	0.48	108.17
	S 100%	121.33	208.00	705.70	0.40	88.33
	S25%+O75%	70.00	166.10	383.20	0.67	190.13
	S50%+O50%	74.67	189.30	549.27	0.62	137.03
	S75%+O25%	79.33	196.10	578.00	0.54	116.27
With Bio 1	CONTROL	58.33	139.00	303.40	0.28	68.40
	O 100%	70.00	150.67	408.67	0.68	235.83
	M 100%	147.00	202.10	643.67	0.43	83.87
	M25%+O75%	74.67	163.10	463.00	0.74	187.87
	M50%+O50%	86.33	178.20	574.80	0.66	130.87
	M75%+25%	86.00	187.10	590.80	0.58	108.90
	S 100%	198.33	226.50	731.30	0.52	100.47
	S25%+O75%	79.33	169.20	494.97	0.82	191.63
	S50%+O50%	88.67	192.90	616.30	0.69	147.27
	S75%+O25%	98.00	192.90	680.20	0.61	125.13
With Bio 2	CONTROL	58.33	161.90	281.00	0.21	63.87
	O 100%	65.33	157.10	402.37	0.86	235.80
	M 100%	95.67	205.00	670.60	0.35	83.87
	M25%+O75%	67.67	163.10	434.30	0.73	184.17
	M50%+O50%	86.33	181.20	495.00	0.60	129.83
	M75%+25%	86.33	199.10	574.80	0.49	108.87
	S 100%	130.67	229.50	728.10	0.45	100.50
	S25%+O75%	79.33	172.20	437.50	0.78	190.13
	S50%+O50%	86.33	199.30	574.80	0.68	141.47
	S75%+O25%	88.67	214.40	590.80	0.59	116.27
With Bio1+ Bio2	CONTROL	58.33	159.70	351.30	0.60	73.73
	O 100%	86.33	163.10	456.63	0.97	250.47
	M 100%	154.00	247.60	740.83	0.62	88.30
	M25%+O75%	86.33	171.80	485.40	0.85	187.87
	M50%+O50%	86.33	192.90	593.97	0.80	130.87
	M75%+25%	88.67	193.97	590.80	0.66	109.67
	S 100%	217.00	232.17	820.70	0.63	107.53
	S25%+O75%	74.67	181.00	522.43	0.86	194.53
	S50%+O50%	100.33	235.50	705.70	0.80	156.23
	S75%+O25%	147.00	241.60	737.67	0.71	128.83
LSD	5%	6.757	17.684	25.690	0.104	0.105
	1%	8.987	23.520	34.168	0.138	0.140

These results are in confirmation with those obtained by Wu *et al.*,(2005) who found that the organic matter content was increased due to bacterial inoculation increased by 75%, in comparison with the inoculated control. However ,the results imply that the increase was not directly indicated by the activity of soil microorganisms.

2- Hydraulic conductivity:

Data in Table (4) showed the interaction effect between bio, mineral, and organic fertilizers on hydraulic conductivity. It is clear from data in this Table that there is highly significant increase in all treatments compared to the control. The highest value was (250.47cm/h) which was recorded with microbin+phosphorin mixed with O100%.

FlieBbach, *et al.* (2006) mentioned that there is appears to be a threshold soil organic carbon level beyond which significant increase in crop yields may be obtained. The favorable effect of soil organic matter on crop productivity can also be attributed to increase soil water holding capacity, nutrient availability for plants, improvement of soil physical properties and efficiency of fertilizer nutrients by organic amendments (Benbi *et al.*., 1998).

Khalil *et al.* (1997) found that addition of sheep dung at a rate of 2%decreased hydraulic conductivity of sandy soil by 49.2% compared to control. The effect of manuring in reducing hydraulic conductivity of the sandy soil could be attributed to the increase in medium and small pores rather than the larger ones.

REFERENCES

Abdel-Moez, M. R.; A. L. Saleh and Sh. A. H. Wanas.(1999):Influence of some organic composts on yield, nutrients uptake and consumptive use of fennel and coriander plants and some soil physical properties .J.Agric.Sci.Mansoura.Univ.,24(10):6237-6253.

Amin, I.S. (1997): Effect of bio and chemical fertilization on growth and production on (Cariandrum Satuvum, feoniculum vulgare and carumcarvil) wheat plants. Annals of Agric.Sc, Moshtohor, 35(4):2327-2337.

Ashour, S. A. (1998): Influence of biofertilizers and phosphorus application on growth and yield of potat. J. Agric. Sci. Mansoura Univ., 23(7):3351-3358.

Benbi, D. K.; Biswas, C. R., Bawa, and S. S. Kumar (1998): Influence of farmyard manure, inorganic fertilizers, weed control practices on some physical properties in along-term experiment. Soil USA Manage, 14, 52-54.

Dewis, J. and F. Freitas (1970):"Physical and chemical methods of soil and water analysis" food and Agriculture organization of United Nations., Rome.

EL-Karmany, M.F., Ahmed, M.K.A., Bahr, A. A. and Kabesh, M.O. (2000): Utilization of biofertilizers in field crop production.Egypt.J.Appl.Sci.15 (11), 137.

El-Mancy, M. H.; M. Th. A. Kotob; Kh. EL-Hamdi and S. A. Hammad (1997): N, P and K contents of rice crop in relation to legalization combined with N, P fertilization. J. Agric. Sci. Mansoura Univ., 22(9)3053-3065.
EL-Zeky. M. M: (2005): Response of wheat to biofertilizer inoculation under different levels of inorganic nitrogen. J. Agric. Sci. Mansoura Univ., 30(1):701-710.
Fanous, N.E.; Sh. M. Abd EL-Rasoul and M. M. Hassan (2003): Sustainable peanut production through integration between bio, organic and chemical fertilizers. J. Agric. Sci. Mansoura Univ., 28(5):4243-4258.
Fink,A.(1982):Fertilizers and fertilization .Introduction and practical guide to crop fertilization .winheim Deerfield Beach,Florida .Basel.pp: 154-168.
FlieBbach .A; H. R. Oberholzer.; L. Gunst and P. Mader (2006):Soil organic and biological soil quality indicators after 21 year of organic and conventional farming. Agric, Ecosystems and Environment 118,273-284.
Gomez ,K.A..and ,A.A.Gomez(1984):"Statistical Procedures for Agricultural Research "2nd Ed.John Wiely sons, Inc. New York.
Hammad, S.A.; M.H.EL-Mnacy and M. Th. A. Kotb (1997): Alkalizations efficiency for rice production and reducing some of the pollution sources. J. Agric Sci. Mansoura Univ. 22(9)3027-3038.
Hesse, P.R.(1971):"A Text Book of Soil Chemical Analysis" Joon Marry (publishers)Ltd,50 Albemarle street, London.
Jackson, M.I. (1967): Soil Chemical Analysis .printice. Hall of India, New Delhi.
Kaloosh, A.A And E.A Koreish (1995): Nitrobin, ammonium nitrate and chicken manure effects on wheat growth, soil nitrate, soil microbial biomass and carbon dioxide evolution. J. Agric. Sci Mansoura Univ., 20(8):3943-3949.
Khalil, K.W.; EL-Sersawy, M. M.; Bouthaina, F. A. and Awadalla, S. Y. (1997) :Sustainable improvement of saline calcareous soils by bio-organic technique and the impact on wheat crop .Egypt .J. Soil Sci.37:399-423.
Kotb, M. Th. A. (1998): Response of wheat to biofertilizer and inorganic N and P-Levels. J. Agric. Sci. Mansoura Univ., 12(9):4067-4078.
Lin, W.;Y. Okon and R. W. F. Hardy (1983): Enhanced mineral uptake by Azospirillum brasilense. Appl. Environ, Microbial. 45:1775-1779.
Metwally, S. Gh.(2000):Fertilizer use efficiency of wheat as affected by microbial inoculation and soil conditions Ph.D. Thesis fac.of Agric Mansoura Univ.,Egypt.
Piper, C.S (1950): Soil and Plant Analysis .Univ. Adelaide, Australia.
Quastel, Z. H. (1965): Soil metabolism. Ann. Rev. Plant physiol.16, 217.
Saber, M.S.M.(1993):A multi-strain biofertilizer The sixth international symposium on Nitrogen fixation with non legumes,Ismailia,Egypt.P.82
Singh, R.A. (1980): Soil Physical Analysis kalyani publishers New Delhi Luddhiana, India.
Vessey, J. k. (2003): Plant growth promoting rhizobacteria as biofertilizers. Plant soil.255:571-586.

Wu, S. C.; Z. H. Cao; Z.G. Li, K. C. Cheung and M. H. Wong. (2005).Effects of biofertilizer containing N-fixer and k solubilizers and AM fungi on maize growth: a greenhouse trial.Geoderma.125:155-166.

Zayed, G. (1998): Can the encapsulation system protect the useful bacteria against their bacteriophagaes. Plant and soil 197,1.

التسميد المتكامل لمحصول القمح تحت ظروف الاراضى الرملية

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أقيمت تجربة أصص في أرض رملية تم الحصول عليها من المزرعة البحثية بقلابشو بالمحطة البحثية – كلية الزراعة – جامعة المنصورة محافظة الدقهلية خلال الموسم الشتوي (٢٠٠٤ – ٢٠٠٥) لدراسة تأثير الأسمدة الحيوية (الميكروبين – الفوسفورين) والأسمدة المعدنية (الذائبة والبطيئة الذوبان وهى اليوريا المغلفة بالكبريت) والأسمدة العضوية (الكمبوست) على محصول القمح (القش – السنابل) وكذلك على تركيز العناصر (النتروجين – الفوسفور – البوتاسيوم) فى القش وفى السنابل عند الحصاد وكذلك على تركيز العناصر الصالحة بالتربة وبعض صفات التربة (التوصيل الهيدروليكي والمادة العضوية).

صممت التجربة فى قطع منشقة وضع فى القطع الرئيسية الأسمدة الحيوية بنوعيها أما فى القطع تحت الرئيسية وضعت الأسمدة العضوية والمعدنية بمعدلاتها المختلفة (بنسب من التوصية السمادية).

أظهرت النتائج على محصول القمح أن جميع المعاملات كانت عالية المعنوية مقارنة بالكنترول وكانت أفضل معاملة الخلط بين السماد الحيوي ميكروبين + السماد البطئ الذوبان(اليوريا المغلفة بالكبريت)عند ١٠٠% من الجرعة السمادية الموصى بها اما بالنسبة لتركيز عنصرى النتروجين والفوسفور فى القش كانت اعلى قيمة مع ميكروبين + فوسفورين + معدني بنسبة ١٠٠%. أما بالنسبة للبوتاسيوم فى القش كان أفضل معاملة له مع إضافة ميكروبين + فوسفورين + اليوريا البطئة الذوبان بنسبة ١٠٠%.

و فىالتربة وجد أن تركيز العناصر الصالحة كانت أفضل المعاملات بإضافة ميكروبين + فوسفورين + سماد بطئ الذوبان (اليوريا المغلفة بالكبريت) عند ١٠٠% من الجرعة السمادية الموصى بها.

وبالنسبة للتوصيل الهيدروليكى كانت أعلى قيمة له مع إضافة الفوسفورين + الميكروبين مخلوطاً مع السماد العضوي (الكمبوست ١٠٠%).و كذلك بالنسبة للمادة العضوية.

ولذلك وجد أنه يمكن إعطاء توصية بأن أفضل محصول للقمح يمكن الحصول عليه من إضافة السماد الحيوي ميكروبين + السماد الحيوي فوسفورين + السماد البطئ الذوبان (اليوريا المغلفة بالكبريت عند مستوى ١٠٠%). كذلك يمكن خفض هذه النسبة إلى ٧٥% من التوصية السمادية مع عدم وجود فروق معنوية.

لذلك توصى الدراسة باستخدام الأسمدة الحيوية والكمبوست كبدائل للأسمدة الكيماوية مما يقلل من التلوث والآثار الضارة للأسمدة الكيماوية على صحة الإنسان و البيئة.