Zagazig J.Agric. Res., Vol. 29 No.(4) 2002 1185-1198

A COMPARATIVE STUDY ON THE SIGNIFICANCE OF APPLIED FARMYARD MANURE AND OTHER AFFORDING MATERIALS FOR BARLEY GROWN ON A SALINE SOIL.

Madlain M., Salib, R. N. Zaki and M. A. Negm

Soils. Water & Environ. Research Inst. Agric. Res. Centre, Giza, Misr (Egypt).

Received 30 / 3 / 2002 ***Accepted 28 / 7 / 2002***

ABSTRACT: To evaluate the role of farmyard manure, (FYM) common organic manure for the most of farmers in Egypt, as a soil amendment and nutrient supplying source, especially in some cases of soil salinity, a field experiment was carried out in a saline soil at Kome Osheem farm, El Fayoum Agriculture Research Station, El Fayoum Governorate, Egypt. To identify the beneficial effect of farmyard manure (FYM), as compared to other nutrient affording materials. i.e., bio (Cerealin) and mineral fertilizers of nitrogen phosphrae and potassium sources. Barley plant was the chosen test crop as a tolerant cereal crop.

Obtained data could be summarized in the following:

Inoculating barley grains with Cerealin and combined with 7.5 m^3 FYM/fed was the best treatment in case of grain, straw yields, harvest index, 1000 grain weight, grain dry matter, and N uptake whereas, each of applied ammonium sulphate and FYM alone resulted in the highest values of straw- N uptake and dry matter, respectively.

Farmyard manure was preferred for increasing P uptake by barely straw and K uptake by both grains and straw, while mineral P and K fertilization was preferred in P uptake by grains and whole plants.

Application of FYM was partly increased Fe and Zn uptake by both plant parts (grains and straw) but the opposite was true in case of Mn in plants. The available contents of Fe, Mn were of very high levels in such soils and increased more by FYM application, while available Zn was found in moderate level and raised by FYM to be high moreover some soil improvement occurred by FYM application

Finally, it could be recommended with continuous application of FYM at a rate of 7.5 m^3 combined with cerealin inoculation for obtained a good barley yield, yield components, nutrient uptake and improvement of such saline soil.

Key Words: Saline soil, FYM, Cerealin, mineral fertilizers, barley, El Fayoum soils.

***Cerealin (inoculation by *Bacillus polymyxa*) was the bio technique for N gain by fixation in cereal roots.**

INTRODUCTION

Barley is a major cereal crop for human and animal feeding as well as in molt production. Therefore, more efforts and studies should be done to improve its production, particularly in too saline soils to wheat tolerance.

From the fact that maximum productivity of crops under salinity condition depends largely on optimizing the various factors under control, organic and bio fertilizers are suggested.

In this respect, farmyard manure (FYM) could be considered as a common manure in the area of El Fayoum, where the studies revealed that crop productivity was significantly increased as a whole bulk and yield content when 30 m^3 added to sorghum at Tamia farm, El Fayoum, (Fathi et al., 1992 and Negm et al., 1993), 15 m^3 added to barley in a saline calcareous soil at Nourbaria farm, Alexandria Gov. (Negm et al., 1994) and 10 m^3 added to sorghum at Kome Osheem, El Fayoum (Hassan et al., 1994). Nutrients could be satisfactory provided by FYM application in a rate of 20 m^3 to wheat grown on a saline sandy loam soil in the studies of El-Maghraby et al. (1996). Also, biological nitrogen fixation contributes to soil productivity in both cases of directly by fixing nitrogen or indirect and in turn enhancement soil fertility by remaining nitrogen into the soil.

The association of *Bacillus polymyxa* with the root of wheat in a symbiotic action was well established by Chanway et al. (1988). Also, studies of Rennie and Thomas (1987), Omar et al., (1991) showed that the Bacillus supplied more nitrogen to wheat plants. Kennedy et al., (1997) detected the advantage of the almost cost-free input of nitrogen when nitrogen fixed plants are grown according to safe agrotechnologies based on biological processes including biological nitrogen fixation and plant growth. The inoculation of wheat (Sakka 69) by *B. polymyxa* had highly significant effect on grain yield when it was combined with nitrogen fertilizer, Omer and Basilioius (1998). In a more recent study, Shahaby et al. (2000) found that mixed culture of *Azospirillum Lipoferum* and *Azotobacter Chroococcum* produced by a general organization for agricultural equalization which was used for maize seed inoculation. El- Shafie; Fatma(2001) concluded that Cerealin was of more pronounced action on wheat planted in a clay soil received 75% from the recommended N fertilizer than that received mineral fertilizer alone, the studied parameters were wheat dry matter and nutrient uptake. Barley as one of cereal crops did not put yet under studying to investigate the effect of that biofertilizer.

According to Khater et al. (1997) in their studies on El Fayoum area, the content of macronutrients (N, P and K) are not high enough for plant needs.Thus, regular and annual application of them are necessary. The total contents of micronutrient (Fe, Mn and Zn) are not only associated to the clay and silt contents, but also to their mineralogical composition..

So, the present investigation was carried out to study the different benefits of FYM and maximize this role when it was applied to such saline soil using barley the most suitable crop under these conditions as a test crop.

MATERIALS AND METHODS

A field experiment was carried out at Kome Osheem experimental farm, El Fayoum Agric. Res. Station, El Fayoum Governorate, Egypt during the winter season of 2000/2001 including the following treatment: A) Control, B) 15 m3 FYM/fed, C) 200 g Cerealin* / fed D) 7.5 m3 FYM+200 kg Cerealin, E) 25 kg N/fed as ammonium sulphate (20% N). and F) 6.55 kg P + 20.75 kg K / fed as calcium super phosphate and potassium sulphate.

Each treatment was replicated 4 times in a complete randomized block design in plots (3.5 X 6) m^2. Farmyard manure was added in its concerned plots one week before planting and Cerealin inoculation was mixed with barley grains just before planting. All plots were planted with barley (Hordeum vulgare) variety Giza 116 on the 4th December 2000. After 3 weeks of planting one third of the mineral fertilizers were added according to the used design, while the two thirds were added at the 7th week. Furrow irrigation was applied every 21 days till maturity where plants were harvested.

The bulk yield was recorded for each plot. From each plot, plants of ½ m^2 area and soil samples were collected, air dried, and prepared to chemical analysis. Yield and yield components such as harvest index (the percentage of grains to whole plant) and specific weight (1000 grain weight) were recorded. The studied physical and chemical properties of the investigated soil are presented in Table (1). The detemination of the main components of the FYM conducted after Brunner and Wasmer (1978) are shown in Table (2). Determination of plant macro and micro nutrients was done as the methods described by Chapman and Pratt (1961).

Statistical analysis of divisions was calculated according to Snedecor and Cochran (1971).

RESULTS AND DISCUSSION

The discussion of the obtained data was divided into four items as follows:

1. ***Effect of farmyard manure and other affording materials as sources of nitrogen :***

a) Yield and its components:

Data presented in Table (3) indicated that applied FYM alone was not significantly over the control, treatment for barley grain & straw yields and 1000 grain weight as well as dry matter production of grains, straw and whole plant while harvest index showed significantly increased by FYM application Meanwhile application of grain inoculation with Cerealin alone or combined with FYM of as well as mineral fertilization with ammonium sulphate resulted in significant differences over the control in grain yield, harvest index and dry matter of grains therefor while combination of Cerealin with FYM and mineral fertilization treatments were significantly superior to FYM alone in grain

Table (1). Soil physical and chemical analysis.

(1a) Soil mechanical fractions

(%) without CaCO3 removal				Texture	Distribution of $CaCO_3$ in the different soil mechanical fractions %			
Clay	Silt	F. sand	C. sand		Clay + silt	F. sand	C. sand	Total
46.8	20.5	23.9	8.8	Clayey	6.3	2.4	1.25	9.95

(1b) Soil chemical analysis in 1: 5 water extract.

EC* (dS/m)	T.S.S %	Anions (meq/100 g soil)				Cations (meq/100 g soil)			
		CO3=	HCO3-	Cl-	SO4=	Ca++	Mg++	Na+	K+
2.68	0.86	-	3.37	5.7	4.47	4.22	2.5	6.5	0.32

(1c) Available content of some nutrient in soil

Nutrient	Available content (mg/ kg)	High and low limits (mg/ kg)		Method
P	9.08	15.0	10.0	0.5 M NAHCO3
K	420.80	120.0	60.0	1 N NH4OAc (pH 7)
Fe	23.48	6.0	4.0	DTPA
Mn	49.95	5.0	2.0	DTPA
Zn	1.40	2.0	1.0	DTPA

Table (2). Some main characters of the farmyard manure used in the experiment.

(%)							(ppm)		
Moist.	OM	N	P	K	Ca	Mg	Fe	Zn	Mn
17.13	52.54	0.53	0.35	1.25	0.42	0.11	500	192	80

❖ Cerealin is a commercial material containing a symbiotic bacteria *(Bacillus polymyxa)* prepared by Soil Microbiology Res. Dept., Soils, Water and Environment Research Institute, Agric. Res. Center, Ministry of Agriculture Giza, Egypt.

yield and dry matter. In spite of the difference between FYM – Cerealin and control. There were no significant differences among treatments in case of 1000 grain and weight straw yield. Dry matter of straw and whole plant were statistically equals in all the treatments.

b)N-content and uptake by plant:

Concering nitrogen concentration and uptake, it could be observed from data in Table (3) that combined treatment of FYM - Cerealin produced the highest N concentration in grains but ammonium sulphate treatment was the best for N in straw. The previous trend was reflected on N uptake where it showed significant differences over each of applied FYM, inoculation alone or control for grains and whole

Table (3): Effect of FYM, Cerialen and mineral fertilization as sources N on barley yield values, chemical composition and available form in soil.

Treatment	Grain yield (ard/fed)	Straw yield (ton/fed)	Harvest index (%)	100 grain weight (g)	Dry matter (kg/fed)			N content (%)		N uptake (kg/fed.)			Total N in soil (%)
					Grains	Straw	Whole	Grains	Straw	Grains	Straw	Whole plant	
A - Control	7.11	2.72	31.61	54.86	845.3	1818.8	2664.1	1.39	0.37	11.74	6.72	18.46	0.035
B - FYM	7.73	2.76	33.51	51.50	908.8	1823.9	2731.9	1.47	0.45	13.35	8.20	21.55	0.046
C - Cerealine	11.20	3.17	45.51	54.78	1318.1	1602.9	2921.0	1.24	0.44	16.22	7.05	23.27	0.044
D - FYM+C	13.17	3.33	47.19	59.50	1530.4	1714.9	3245.3	1.75	0.55	26.91	9.35	36.26	0.049
E - Amm. sulph.	12.55	3.28	46.18	58.97	1412.1	1750.5	3162.6	1.62	0.84	22.91	11.12	34.03	0.084
LSD (at 0.05)	3.92*	0.54	1.59*	6.22	488.4*	532.5	946.1	Not calculate	Not calculate	8.26*	2.83*	10.42*	0.003*

Table (4): Effect of FYM, and mineral fertilization P and K on barley yield values, chemical composition and available forms of P and K in soil.

Treatment	Grain yield (ard/fed)	Straw Yield (ton/fed)	Harvest index (%)	1000 grain weight (g)	Dry matter (kg/fed)			P content (%)		K content (%)		P uptake (kg/fed)			K uptake (kg/fed)			Available (ppm)	
					Grains	Straw	Whole	Grains	Straw	Grains	Straw	Grains	Straw	Whole	Grains	Straw	Whole	P	K
A - Control	7.11	2.872	31.61	54.86	845.3	1818.8	2664.1	0.19	0.09	0.59	1.85	1.54	1.54	3.08	4.70	33.64	38.34	8.6	242.4
B - FYM	7.73	2.76	33.56	51.50	908.8	1823.9	2731.9	0.26	0.12	0.63	2.18	2.36	2.18	4.54	5.83	39.17	44.80	8.9	289.3
F - Min +PK	6.49	1.86	41.76	55.49	728.5	1021.0	1749.5	0.52	0.06	0.72	2.47	3.84	0.61	4.45	5.30	24.84	30.14	8.9	277.6
LSD (at 0.05)	1.59	0.41*	4.34*	6.07*	210.8	404.1*	597.2*	Not calc.	Not calc.	Not calc.	Not calc.	1.03*	0.63*	1.23*	1.43	6.98*	8.11*	0.7*	15.8*

plant as well as over the control only for N uptake by straw. Ammonium sulphate treatment was significantly increased N uptake by grains over both FYM or control as well as N uptake by straw and whole plant over each of FYM, Cerealin alone or the control treatment.

c)Residual N- content in soil:

As for total N remained in the soil after the studied growth season, it could be arranged its contents in the following order, with significant differences ammonium sulphate > FYM – cerealin > FYM = Cerealin alone> control.

Generally, inoculation grains by Cerealin in combination with 7.5 m^3 FYM/fed was the best treatment for grain, straw yields, harvest index, 1000 grain weight, grain dry matter, N concentration and uptake, followed by ammonium sulphate treatment except of straw dry matter which obtained the highest value at FYM treatment These results were in accordance with Omar and Basilious (1998), Shahaby et al (2000) and El-Shafie, Fatma (2001).

2. Effect of farmyard manure and other mineral fertilization as sources of P and K.

a)strow and dry matter yields

Data of the effects of applied 15 m^3 FYM/fed and 6.55 kg P + 20.75 kg K / fed as compared to the control treatment represented in Table (4). Both P & K organic and inorganic sources were statistically as the same as control in their effect on grain and dry matter yield. As for straw yield and dry matter, it was observed that a significant depression than FYM and control which were statistically equals, this was due to the imbalance in added nutrients where the treatment plots did not received nitrogenous fertilizers. According to Mengel and Kirkby (1979), the maximum effect of one particular plant nutrient can only be expected, if the supply of other plant nutrients is adequate. For this reason, the ratio of N : P : K must be taken up for cereals is in the order 1: 0.3 : 0.8. Thus, depression of straw dry matter was explained due to the dry matter of whole plant which was significantly lower than the control and FYM. Otherwise, this depression caused significant increment in the harvest index over the other both treatments.

b)P & K contents and uptake by plants:

Regarding to the concentrations of P and K in the two parts plant, Table (4) revealed that ascending increases in the order, of mineral P and K > FYM > control in all cases. As for phosphorus uptake by the barley grains, FYM and control treatments were statistically as the same and lower than that of mineral application, with significant differences. Phosphorus uptake by straw was insignificantly appeared for FYM treatment while P uptake by whole plant as a result of applied FYM or mineral sources was significantly higher than that of the control treatment.

On the contrary, potassium uptake by barley grains insensated to different treatment, in spite of increases in case of FYM over the control and mineral application but insignificantly. However, K amount in cereal grains is very low than that of straw. K uptake by straw was significantly lower In case of mineral application treatment than the other treatments, due to the depression in straw dry matter. Application of FYM raised K uptake by straw and whole plant over the control but insignificantly.

c)Available P and K in soil.

With respect of available P in soil after the studied growth season, its content was almost the same in all treatment. Its characterized by a relatively low ready available form regardless the added quantity. Also data reveled that available K was higher insignificantly in plots received FYM over those received mineral form, but each of these treatments was significantly higher than the control treatment.

Generally, FYM was preferred for increasing P uptake by barley straw and K uptake by both grains and straw while mineral P and K application was preferred for P uptake by grains and whole plants under such soil conditions. These results are in agreement with those obtained with Fathi et al (1992), Negm et al (1993), Hassan et al (1994) and El – Maghraby et al (1996).

3. Effect of farmyard manure as a source of micronutrients:

A considerable contents of micronutrient presented in the farmyard manure and released gradually by advancing in manure decomposition in soil. The current

work also studied FYM as a source of Fe, Mn and Zn in comparison with the control treatment as show in Table (5).

It could be observed that concentration of Fe and Zn were higher in grains, straw and whole plants for the plots manured with FYM than those of the control, particularly in case of Zn, which reached 2 and 4 folds in grains and straw, respectively. The opposite trend was true in case of Mn concentration and uptake by straw and somewhat by grains treated with FYM where those concentrations declined with about 28 and 14% of the control values respectively. The decline percentages of Mn uptake were about 6 ,23 and 31% of the control for grains, straw and whole plants respectively. This observation may be due to the relative low content of Mn in the added FYM as compared to the other two elements (80 to 500 and 192 ppm for Mn, Fe and Zn, respectively, Table, 2) also this case may be explained, according to Mengel and Kirkby (1979), who pointed out that Mn behavior shows properties of both alkali earth cations such as Mg^{2+} and Ca^{2+} and the heavy metals of Zn and Fe. In Hewitt (1948) consideration , it is therefore not suppressing that these ion species affect uptake and translocation of Mn in the plant.

b) Available forms of micronutrient in soil :

The DTPA extractable Fe, Mn and Zn, values Table, (5) clarified, an extremely increase in case of both Fe and Zn as well as slightly increase in case of Mn as a result of FYM application. The levels of available Fe and Mn in soil were relatively high in the control and manured plots, while Zn was in a moderate level in the control plots and raised by FYM application to be high according to Lindsay and Norvel (1978). These available contents are in harmony with the total contents at show in such area, Khater et al. (1997).

4- Farmyard manure as soil amendment for such saline condition:

The changes of some chemical properties of the soil sample after the growth season as affected by applied FYM are presented in Table(6).

Data revealed that soluble Cl^-, SO_4^-, Ca^{++} and Mg^{++} were show slightly decrease vs slightly increase for HCO_3^-, Na^+ and K^+ as a result of FYM application than that in the control treatment,

whereas total soluble salts were actually unaffected, where the difference before and after application it increased with about 0.01%. Increasing in HCO_3^- may be due to the effect of FYM on converting native calcium from insoluble carbonates to soluble bicarbonate because of CO_2 pressure increase as an acid condition result of FYM decomposition. Also, the increases in Na^+ and K^+ may be due to the enhancing of FYM instead of the monovalent ones, which were released in the soil solution, particularly the contents of Na and K in manure was associated also in that increase.

From data presented in Table (6) also, saturation per cent (SP) was higher in the amended plots than that without application. This may be due to degradation of FYM particles and increasing the colloidal portion regardless the coagulating effect on the dispersed soil particles.

Table (5): Micronutrient concentrations, uptake by plants and ava ilable form in soil as affected by FYM application.

Nutrient	Treatment	Concentration in plant part (ppm)		Nutrient uptake			Available form in soil (ppm)
		Grains	straw	Grains	Straw	Whole	
Fe	A – Control	360	557	0.30	1.01	1.31	17.48
	B – FYM	375	595	0.34	1.09	1.43	24.23
Mn	A – Control	21	25	0.017	0.054	0.071	51.58
	B – FYM	18	18	0.016	0.033	0.049	52.65
Zn	A – Control	105	22	0.078	0.041	0.110	1.2
	B – FYM	210	90	0.191	0.165	0.356	2.4

Table (6): Changes in some chemical properties of soils after the growth season by FYM application.

Treatment	T.S.S(%)	Anions (meq/100 g soil)				Cations (meq/100 g soil)			
		CO3=	HCO3-	Cl-	SO4=	Ca++	Mg++	Na+	K+
A – Control	0.79	-	2.78	5.02	4.61	5.05	2.12	4.92	0.32
B – FYM	0.80	-	3.10	4.70	4.52	5.00	1.83	5.11	0.38

Treat.	SP (%)	PH (1: 2.5 susp)	CEC (me/ 100g soil	ESP	Organic matter (%)	Organic C (%)	Total N (%)	C/N ratio
A-Control	66.3	7.95	32.28	11.25	0.71	0.41	0.035	11.68
B-FYM	69.0	7.80	35.13	9.75	0.81	0.47	0.046	10.20

Soil pH decreased by 0.15 pH unit in the plots received organic manure than those untreated. This drop was due to producing organic acids and decrease exchangeable Na Cation exchange capacity increased also application of FYM which increased the exchanging sites and organic acids through decomposition process. Exchangeable sodium percentage was decreased, this is not only due to the real reduction in exchangeable Na from 3.63 to 3.42 meq / 100g soil but also due to the increase in the CEC value.

Organic carbon, organic matter (org. C X 1.72) and total N contents were tended to increase by FYM application than those of the control due to the addition of these quantities of organic manure rich in both organic materials (52.5% of a material having 83% dry matter) and nitrogen (5% N on dry matter basis). Also the ratio between C and N was more narrow in the amended plots.

Generally, application of 15m^3 FYM/fed to such saline soil represented a first step to reclaim it through out one season and need continuos application of FYM to prevail this favourite effects. These results are in agreement with El-Maghraby et al. (1996).

CONCLUSION

Through saline soil amelioration programme some early available amendments such as farmyard manure (FYM) should be undertaken to obtain the suitable productivity. To reply that target the current study was planed and carried out in a saline soil at Kome Osheem area, El Fayoum using farmyard manure alone or in combination with some other nutrient affording materials to barley plant as a salt-tolerant cereal crop. Results indicated that the applied treatment of 7.5 m^3 FYM/fed and inoculation with 200 g Cerealin produced the best grain yield and quality. The manure was preferred in supplying straw with K and P while applied mineral fertilization of P and K give a relatively high P uptake by grains. Moreover, farmyard manure provided plants with more Fe, Mn and Zn nutrient and slightly improved soil properties. So it could be recommended with using FYM associated with Cerealin and mineral P and K fertilizers to obtain the relatively high barley yield with good quality and sufficient nutrient uptake under such saline soil condition.

REFERENCES

Black.; C.A., D. D. Evans; L. E. Ensmiger; J. L. white and F.E. Clark (1965): Methods of Soil Analysis, Am. Soc. Agron, Publisher, Medison. U.S.A.

Brunner, P.H. and H. R. Wasmer (1978). Methods of Analysis of Sewage Sludge, Solid Wastes and Compost. WHO International Reference Center for Wastes Disposal CH – 8600 Dubendor, Switzerland.

Chanway, C.P.;F.B. Holl and R. Turington (1988). Genotpic coadaptation in plant growth promotion of forage species by Bacillus polymyxa. Plant and Soil, 106 : 281 – 284

Chapman, H. D. and P. E, Pratt (1961). Methods of Analysis for Soils, Plants and Water. Univ. of California, Division of Agric. Sci.

El – Maghraby, S. E.; F. A. Hashem and M. M. Wassif (1996). The use of sulphur and organic manure for controls soil salinity pollution Under high saline water irrigation. Egypt J. Soil Sci., 36 : 269 – 288

El-Shafie, Fatma S. (2001). Response of wheat to inoculation with associative diazotrophs under different N level- Minufiya J. Agric associated with Cerealin and Res., 26 (6): 1709-1722.

Fathi, A. I. ; M . A. Negm ; S. M. Abed – Aziz and H. M. Hassan (1992). Effect of organic manuring and zinc application on sorghum Grown on calcareous soil. Egypt J. Agric. Res., 70 (1): 19-27.

Hassan, H. M.; S. M. El-Basioni and N. N. Michail (1994). Sorghum production as influenced by farmyard manure and sulphur addition in clay desert soil. Zagazig J. Agric. Res., 21 (5): 1581 – 1591.

Hewitt, E. J. (1948): Relation of manganese and other metal tonicities to the iron status in plants. Nature, 161: 489-490

Kennedy, I. R.; L. Pereg Gerk; C. Wood; R.; Deaker; K. Grichrist and S. Katupitiya (1997). Biological nitrogen Fixation in non leguminous Field crops: facilitating the evolution of an effective association between *azospirillum* and wheat. Plant and Soil, 194 : 65 – 79.

Khater, E. A.; T. S. Abd El – Aal; A. A. Abou Arab; A. A. Awadalla (1997). Mineralogical and chemical composition of the main soil types in Fayoum area. Egypt. J. Soil Sci, 37 (2) : 153 – 174.

Lindsay, W. L. and W. A. Norvell (1978). Development of a DTPA soil test of Zn, Fe, Mn and Cu. Soil Sci. Soc. Amer. J., 42 (2) : 421 – 428.

Mengel, K. and E. A. Kirkby (1979). Principles of Plant Nutrition. International Potash Inst., Berne, Switzerland.

Negm. M. A.; H. M. Hassan and R. N. Zaki (1993). Effect of farmyard manure and gypsum applications on sorghum growing on an alkali soil in El – Fayoum Governorate. Desert Inst. Bull. Egypt, 43 (2): 243 – 257.

Negm, M. A.; M. Hussein and A. Layla (1994): Response of barley to farmyard manure and abscisic acid treating in a saline calcareous soil. Fayoum. J. Agric & Devl , 8 (2): 94-110.

Omar, M. N. A. and S. I. Basillious (1998): Response of some wheat varieties to inoculation by cerealin *(Bacillus polymyxa)* using N – 15 dilution technique. Egypt. J. Agric. Res., 76 (4): 1363-1370.

Omar, M. N. A ; M. H. Hegaz, Abd El – Aziz - M. S. M. Abo Soliman and M. M. Sobh (1991): Effect of inoculation with rhizobacteria anyield of wheat under graded level of nitrogen fertihization. Annals. Agric . Sci., Ain Shams Univ, Cairo, 36 (1): 99 – 104.

Omar, M. N. A., Fangping and Jia xiaomaing (2000): Effect of inoculation with Azospirillum Brailense No 40 isolated grom Egyptian soils on rice growth in China. Egypt J. Agric. Res., 76 (3): 1005-1014.

Page, A. L.; R. H. Miller and D. R. Keeny (1982): Methods of Soil Analysis. II: Chemical and Microbiological Properties. Soil Sci. Amer., Madison, Wisconsin, USA.

Rennie, R. J. and J. B. Thomas (1987). W – 15 determined eddect of inoculation with N – fixing bacteria on nitrogen assimilation in western Candian wheals. Plant and Soil, 100 : 213 – 233.

Shahaby A. F.; M. Fayez; M. N. A. Omar and S. H. Heba Shehata (2000): Integration of diazotrophs inoculation with organic and inorganic fertieization to improve wheat and maize productivity in sandy soils. Egypt. J. Agric. Res., 78 (2) : 499-519.

Snedecor; G. W. and W. G. Cochran (1971). Statistical Methods. 6th ed., lowa State Univ. Press, Ames.

دراسة مقارنة عن أهمية إضافة السماد البلدي والمواد الأخرى الحاملة للمغذيات بالنسبة لمحصول الشعير النامي في أرض ملحية

مادلين ميخائيل صليب – رأفت نظمي زكي – محمد عبد السلام نجم
معهد بحوث الأراضي والمياه والبيئة مركز البحوث الزراعية الجيزة – مصر

لتقييم دور السماد البلدي الأكثر انتشاراً واستخداماً بين المزارعين في مصر خاصة في بعض الحالات مثل الأراضي التي تعاني من الملوحة كمصدر إمداد لها بالعناصر المغذية للنبات وكمادة محسنة لخواص التربة أجريت تجربة حقلية في أرض ملحية بمزرعة كوم أوشيم / التابعة لمحطة البحوث الزراعية بالفيوم – محافظة الفيوم – مصر لإجراء دراسة مقارنة عن السماد البلدي وكذا أسمدة أخرى حيوية (السريالين)* ومعدنية (كبريتات الأمونيوم، سوبر فوسفات الكالسيوم وكبريتات البوتاسيوم) كمصادر موفرة للنتروجين والفسفور والبوتاسيوم وقد اختير نبات الشعير كمحصول اختبار نجيلي ذي قدرة على تحمل للملوحة.

ويمكن تلخيص النتائج المتحصل عليها فيما يلي: –

أدى تلقيح حبوب الشعير بالسريالين مع معدل إضافة ٧,٥م^{٣} سماد بلدي/ فدان للحصول على أفضل محصولي حبوب وقش، ودليل محصولي ووزن ١٠٠٠ حبة ومادة جافة للحبوب ومحتواها من النتروجين والكمية الممتصة منه بواسطتها وتلت تلك المعاملة معاملة إضافة كبريتات النشادر من حيث محتوى القش من النتروجين والكمية الممتصة منه أما معاملة السماد البلدي بمفرده فقد أعطت أعلى قيمة للمادة الجافة للقش.

كذلك كان لإضافة السماد البلدي أثر إيجابي في امتصاص الفوسفور بواسطة قش الشعير وامتصاص البوتاسيوم في القش والحبوب، بينما تفوقت الأسمدة المعدنية في زيادة الممتص من الفوسفور بواسطة الحبوب والنبات الكامل.

من ناحية أخرى فقد أدت إضافة السماد البلدي إلى زيادة في محتوى أجزاء النبات (الحبوب والقش) من الحديد والزنك وكذا الكمية الممتصة منهما بواسطة الحبوب و القش والعكس صحيح في حالة المنجنيز في النبات. وكانت مستويات الجزء الميسر في التربة من عنصري الحديد والمنجنيز مرتفعة جداً في مثل هذه الأرض وقد زادت أكثر بإضافة السماد البلدي بينما الصورة الميسرة للزنك كانت في المستوى المتوسط وقد رفعها السماد البلدي إلى المستوى العالي حسب المستويات الخاصة بطرق الاستخلاص المتبعة.

ولقد لوحظ أيضاً تحسن طفيف في صفات الأرض تحت الدراسة بإضافة السماد البلدي.

وأخيراً فإنه يمكن التوصية بالإضافة المستمرة للسماد البلدي بمعدل ٧,٥م^{٣} مشتركاً مع التلقيح بالسريالين للحصول على محصول مرتفع ذي مواصفات محصولية عالية ومحتو مرتفع من العناصر الممتصة بالإضافة إلى تحسين خواص مثل هذه الأراضي.

---

* سماد حيوي لتثبيت النيتروجين بواسطة جذور النجيليات (مادة ملقحة بسلالة باسيلس بولي ميكسا).