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EFFECT OF MINERAL NITROGEN, SULPHURE, ORGANIC AND BIO-FERTILIZATIONS ON MAIZE PRODUCTIVITY IN SALINE SOIL OF SAHL EL-TINA

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***ABSTRACT** : Two field experiments were conducted at, Sahl El- Tina plain in two successive summer seasons, 2006 and 2007 to study the effect of using organic farm, Sulphure, Bio-fertilization, N–mineral fertilizer and their combinations on soil properties and productivity of (Zea mays L) cultivar Triple hybrid 310 on sandy clay soil under saline condition 10.75 dSm^{-1}. This area irrigated with El-Salam canal water, (Nile water mixed with agricultural drainage water , 1 :1). The obtained results showed decrease in pH values from 8.41 to 8.03 and EC value from 10.75 to 4.55 dSm^{-1} . These results were attributed to the combined effect of bio + sulphur, Bio + organic and Bio + organic + sulphur at the rate of 85 kg N /fed, respectively.*

The treatments resulted in an increase in the available N, P and K and the available micronutrients (Fe, Mn , Zn and Cu) concentrations . On the other hand, there was significant increase in N, P and K content of maize plant whose seeds were inoculated with bio-fertilizer and combined with organic farm and sulphure. The applying of the amendments caused increases in the concentrations of Fe, Mn, Zn and Cu for straw and grains. Straw and grains yield of maize tended to increase with the combination treatments of (Bio-fertilizer + O.M + S + 85kgN/fed) , which the straw and grains increased to 2.99 and 1.77 ton /fed compared with other treatments.

***Key word :** Saline soils – organic farm – sulphuer – Bio-fertilizer- zea maize productivity.*

INTRODUCTION

The current study was conducted on salt affected sandy clay soil at Sahl El-Tina plain of east suize canal of Por Said Governorate. This area irrigated from El-Salam canal (El-Shikh Zayid canal). El-Salam canal is one of the national promising projects involves the reuse of drainage water, after reducing its salinity levels by mixing the Nile water with Bahr Hadoos drains (1: 1) , (DRI, 1993) and *Shaban (2005).

Saline soils often recognized by the presence of a white surface crust. The SAR value less than 13, reflects a relatively low level of adsorbed sodium. Whereas , the high salt concentration gave the saturation extract of EC values

have greater than 4 dS/m and soil pH less than 8.5 , (FAO 1973). Shaban and Helmy (2006) revel that soil pH and EC were decreased due to the applied N-treatments as compared to control one .However, the decrease in pH and EC when nitrogen applied with bio-fertilizer was rather higher than the nitrogen individually. Shaban and Abd El-Rhman (2007) found that the corresponding percentage of the soluble salts improvement out were 1.6 , 13.2 and 25.2 % for soil inoculation 28 , 38 and 46 Kg N/fed respectively as compares to the un inoculated soil . EC (dS/m) of the soil was decreased due to use bio-fertilizer and cause some changes in soil physical and chemical characteristics. Nasf et al (2004) reported that the application of N at different levels and inoculation with bio-fertilization led to an increase in total porosity, improves soil aggregation and possible moving salt soil under irrigation water. Buth and Goh (2007) found that the added urea at three rates (0 , 25 and 50 kg/N/year) due to grates changes in pH soil and cations occurred in soil directly below the emitter in 50 kg N/ ha/ year treatment where the soil pH decreased by 1.6 pH units at soil. Marwa (2007) found that the organic matter in soil play an important role through building up soil aggregates and enhancing proper soil physical and chemical properties. The application of organic matter to examined sand soil improved its physical as well as chemical and fertility properties. Soliman and Hassan (2004) showed that the application of organic materials either alone or in combination with chemical fertilizers caused a substantial increase in soil available N, P and K.

Corn *(Zea mays L.)* is an important crop and one of two sources for cereal flour used in Egypt for making bread .The average area of corn on 1999 was 1.648 million feddan which produced 5.438 million tons (ACSRT, 1999). Abou Yuossef and El-Kot (2000) indicated that corn grain yield increased with increasing N rate up to 50 kg N/fed . Abd El- Nour et al (1999) showed that application of N- fertilizer up to 60 Kg N/fed resulted in significant increases in all yield components. El-Sbaey (2006) found that application of organic manure and inoculation seed plant results in significant increase in N with growth period, such increase was more pronounced with treatment of compost, 50 kg N/fed +ammonium sulphat 50 kg N/fed + inoculation. Yavinder et al (1994) reported that added FYM + Urea adjusted to 150 kg N/ha produced the greatest grain and straw yields. Zayed et al (2005) stated that the application of FYM at the level of 5.0 ton/fed produced the highest mean values of yield and yield biomasses as well as grain yield and straw yield as compared to the other FYM treatment. Mohamed et al (2001) revealed that using *Azospirllium braslinse* or commercial bio-fertilizer cerealin with half N rate (144 kg N /ha) resulted in significant increase in maize yield (straw and grains) .

MATARIAL AND METHODS

Two filed experiment were conducted in this work and carried out under field farm condition at the Sahl El-Tina plain , east Suize canal of North Sina Governorate, during two successive summer seasons of 2006 /2007 to evaluate the use of organic farm , sulphure and bio-fertilizer and their combination in sandy clay soil of El- Amal, village at Sahl El-Tina plain. Some chemical and physical properties of soil and organic farm are shown in Tables (1 & 1a).

Table (1) Physical and chemical properties in soil study

Location	Crosse sand (%)	Fin sand (%)	Silt (%)	Clay (%)		Texture	O.M (%)		$CaCO_3$ (%)
El-Amal village	10.46	44.89	18.57	26.08		Sandy Clay	0.52		5.72
	pH (1:2:5)	EC (dS/m)	Cations (meq/l)				Anions (meq/l)		
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO^{-}_3	Cl^{-}	SO^{--}_4
	8.41	10.75	8.37	12.64	86	0.69	6.32	59	42.38
	Macronutrients (mg/kg)			Micronutrients (mg/kg)					
	N	P	K	Fe	Mn	Zn	Cu		
	38	4.6	214	3.68	6.39	1.52	0.12		

Table (1a) Some chemical properties of the addition organic farm :

O.M %	Organic carbon %	N %	P ppm	K ppm	pH
44	24.98	1.27	15.76	114	6.9

The investigated material of organic farm manure was added at rate of 12 m^3/fed during soil tillage , sulphure (300kg S/ fed) before 30 days from planting, urea (46 %/N) at 120 Kg N/fed after 21 , 42 and 64 days from planting and bio-fertilization, *Azospirillum brasilense NO 40* (Salt Tolerant PGPR) by coating grains with the gum media carrying the bacteria strain on the same day of sowing. The inoculated grain plots were soil applied with liquid bacteria strain three times after 21, 42 and 62 days of planting (Omar et al. 2000). Calcium super-phosphate (15.5% P_2O_5) was added in a rate of 31 kg P_2O_5 /fed during soil preparation while potassium sulphate (48 % K_2O) in a rate of 100kg/fed was added on three doses after 21 ,42 and 60 days of planting to conserve it from leaching due to soil leaching requirement, the recommended by Egyptian Ministry of Agriculture bulletin (Publication No: 1016) (2006). The

combinations between all treatments added were 85 kg N/fed , (organic farm +85 Kg N /fed , Bio- fertilizer + 85kg N/fed , sulphure + 85 kg/N , Bio +sulphure +85 kg N /fed , organic + bio +85 kg N/fed and Bio + sulphure + organic + 85 kg N/fed) . The experimental design was complete randomized , treatments being replicated 3 . The pilot units are subjected to alternatively leaching processes every 10 days before planting and during the cultivation of zea maize crop .

Grains of maize (*Zea mays L*) cultivar Triple hybrid 310 supplied from Maize Department Filed Crop Res Inst. ARC, were sown on the 2th of May 2006, and same 2007 in the half number of plots without any inoculation. till crop maturity every 8 days which was stopped on the 17th September 2006 and 2007. Maize ears were harvested on the 20th October of the two seasons 2006 and 2007 where ears of each plot were counted and weighed. Grains and cobs were weighed, 100 grain weight was recorded, suitable part of each grains and cobs were weighed 75 ^{0}C oven dried and chemically analyzed to determine their contents of macronutrients according to Chapman and Pratt (1961) .

Sample of the investigated soil were taken from 0- 30 cm depth , air dried and ground to pass through a 2 mm sieve. Soluble cations and anions, pH, organic matter , calcium carbonate, electrical conductivity and available N, P and K , Fe ,Mn , Zn and Cu were determined as follows:

The international Pipette method was used to determine the particle size distribution as described by Piper (1950). the chemical analysis of soil sample were carried out according to Jackson (1967) . pH by pH- meter, EC in saturated extract, organic matter, by Black were determined according to Hesse (1971). Calcium carbonate by calcimeter Piper (1950). Available nitrogen in soil by kjeldahl according to Hesse (1971) and determined. Available phosphorus in the soil was extracted by 0.5 M $NaHCO_3$ and determined by spectrophotometer (Jackson, 1967) Available potassium determined by flame photometer (Hesse , 1971).

The micronutrients available in soil were dertermined using Inductively Coupled Plasma (ICP) model 400 as Soltanpour, (1985). The plant part samples were ground, 0.5 g of each sample was digested using $H_2SO^{-}_4$, $HClO_4$ mixture according to the methods described by Soltanpoure (1985). The plant content of N, P, K, Fe, Mn, Zn , B and Pb was determined in plant digestion using the methods described by Jackson (1967), Cottenie et al (1982) , Black (1965) and Soltanpoure (1985).

The obtained data were statistically analyzed according to Snedecore and Cochran (1979).

RESULTS AND DISSCUSION .

Soil chemical properties as affected by different amendments.

Soil pH .

Soil pH is an important consideration for farmers and graders for several reasons , including the fact that many plants and soil life forms prefer either alkaline or acidic conditions, that some diseases tend to thrive when the soil is alkaline or acidic, and that pH can affect the availability of nutrients in the soil , (smith et al 1994) .

Data presented in Table (2) show that the soil pH values decreased in all soil treated with amendments soil. The effect is more pronounce in the soil treated than in the soil untreated . Such decrease in pH values could be attributed to the production of CO2 and organic acids by soil microorganisms, acting on the soil organic matter . The trend was in agreement with Selem et al (2000) .

Table (2) Chemical properties of soil after maize harvest (2006/ 2007) .

Treatments	pH (1:2:5)	EC (dS/m)	Cations (meq/l)				Anions (meq/l)		
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO^{-}_{3}	Cl^{-}	SO^{--}_{4}
Mineral 120 kg N/fed	8.32 a	7.95 a	11.42 a	8.79 a	59 a	0.71 a	5.69 a	48 a	26.23 a
O. M +85 Kg N/fed	8.24 a	7.30 a	13.72 a	8.47 a	50 b	0.76 ab	5.38 a	42 b	25.57 a
Bio- + 85 Kg N/fed	8.17 a	6.48 ab	13.76 a	8.31 a	42 c	0.79 ab	5.21 a	36 c	23.65 a
Sulpher +85 Kg N/fed	8.15 a	6.17 abc	13.89 a	7.98 a	39 d	0.81 bc	4.25 a	31 d	26.43 a
Bio +sulpher + 85 kg N/fed	8.12 a	5.33 bc	13.92 a	7.54 a	31 e	0.84 bc	4.18 a	24 e	25.12 a
O.M + bio- +85 Kg N/fed	8.06 a	4.89 bc	12.85 ab	7.15 a	28 f	0.86 bc	4.10 a	19 f	25.76 ab
Bio+ sulpher+ O.M + 85 Kg N/fed	8.03 a	4.55 c	13.94 b	6.88 a	24 g	0.88 c	3.87 a	16 g	25.83 b
LSD 5%	1.75	1.73	1.75	1.75	2.23	0.08	1.75	2.89	1.63

The corresponding relative decreases were 0.96; 1.80; 2.04; 2.40; 3.13 and 3.49 % for soil treated with organic matter; Bio-fertilizer; sulphure; Bio + Sulphure ; organic + bio and organic + Bio + sulphure + 85 kg N respectively, than the soil treated with 120 kg N alone .

Soil EC :

Soil electrical conductivity is one of soil important character. Data in Table (2) showed a highly significant of soil electrical conductivity as affected by all soil treatments with different amendments. The EC varied between 4.55 and 10.75 dSm^{-1}. This result may be attributed to the combination effect of bio + sulphur, Bio + organic and Bio + organic + sulphur at the rate of 85 kg N /fed respectively, resulted the decrease salt in soil . similar results were found by Abd El- Aal et al (2003) and Shaban and Abd El-Rahman (2007). The corresponding relative decreases were 26.60, 32.10, 39.72, 50.2, 54.51 and 57.67 % for soil treatments with 120 kg N /fed, organic matter +85 kg N/fed ,Bio-fertilizer + 85kg N/ fed, sulphure +85 kg N/fed , Bio + S + 85kgN/fed, respectively. These results were in agreement with those of Abd El-Fattah et al (2005) who found that the EC of alkali clay loam soil exhibited continuous release of soluble salt with increasing the applied sulphure.

Macro elements content in soil as affected with amendments addition:

Data presented in Table (3) show the available N, P and K (mg /kg soil) as affected by the used amendments, and combination on soil studied . Data revealed that available N, (mg/kg soil) ranged between 58 to 79 , P (mg/ kg soil) 5.23 to 7.59 and for K between 274 to 297 mg/kg soil. The soil treated with amendments combination obtained an the increase of N , P and K values in all studied. This results one in agreement with those obtained Abd El-Fattah et al (2005) , Marwa (2007) and Shaban and Abd El-Rahman (2007). The corresponding relative increases were 52.6, 60.35, 68.80, 89.47, 89.47 and 107.89 % for N ; 13.69 , 36.52 , 37.39 , 37.61, 60.43, 61.19 and 65 % for P; and 26.64, 22.18, 30.37, 30.84, 34.58, 36.62 and 38.32% for K with treatments 120 kg N/fed, organic matter + 85 kg N/fed ,Bio-fertilizer + 85kg N/ fed , sulphure + 85 kg N/fed, Bio + S + 85kgN/fed , respectively.

Micronutrients content in soil studied :

Data presented in Table (3) show that pronounced increases in soil available micronutrients content (Fe, Mn , Zn and Cu) were achieved as a result of amendments addition. according to (El-Sheikh 2003), the increasing of micronutrients in surface soil layers (0- 30 cm) depending on long time of using treatments, may be due to the increase of soil organic mater +Bio-fertilizer + Sulphure in layer (0-30) ,

Table (3) Mean values of available elements content in soil after maize harvest (2006/2007).

Treatments	Macro elements (mg/kg soil)			Microelements (mg/kg soil)			
	N	P	K	Fe	Mn	Zn	Cu
Mineral 120 kg N/fed	58 a	5.23 a	271 a	4.36 a	8.12 a	1.63 a	0.22 a
O. M +85 kg N/fed	61 b	6.28 a	275 a	4.42 a	8.18 a	1.67 a	0.26 ab
Bio- + 85 kg N/fed	63 bc	6.32 a	279 a	4.52 a	8.22 a	1.69 a	0.27 bc
Sulpher +85 kg N/fed	64 cd	6.33 ab	280 a	4.59 a	8.25 a	1.73 a	0.28 bc
Bio + sulpher + 85 kg N/fed	68 cde	7.38 ab	288 a	5.25 a	8.34 a	1.76 a	0.29 c
O.M + bio- +85 Kg N/fed	72 de	7.45 ab	293 a	5.38 a	8.37 a	1.75 a	0.32 cd
Bio+ sulpher+ O.M + 85 kg N/fed	79 c	7.59 b	296 a	5.52 a	8.42 a	1.79 a	0.34 d
LSD 5 %	4.92	1.75	101.5	1.75	1.62	1.74	0.042

Concerning the applied amendments as a single and combination treatments showed a relative increase for Fe, Mn , Zn and Cu reached 18.48 , 27.07, 7.24 and 83.33 % for soil treatment with mineral N 120kg/fed, 20.10, 28.01, 9.87 and 116.67 % for soil treatment with organic matter + 85kg N/fed ; 22.83, 28.64, 11.18 and 125.00 % for soil treatment with sulphure fertilizer +85 kg N/fed; 42.66, 30.52, 15.79 and 141.67 % for bio-fertilizer + sulphure + 85kg N /fed; 46.19, 30.99, 15.13 and 166.67 % for soil treatment with organic matter + Bio-fertilizer + 85 kg N/fed and 50.00, 31. 77, 17.76 and 183.33% for soil treatment with Bio fertilizer + O.M + S + 85 kg N/fed as compared by initial soil respectively .

The variation in the contents of micronutrients, may be due to the fertilization with bio-fertilizer and organic matter as reported by (Abo El-Roos et al 1996) and Abd El- Naim et al 1996) .

Effect of different treatments on maize plants:

Macronutrients concentration in zea maize :

Data presented in Table (4) illustrated that the nitrogen concentration (%) in straw and grains of maize plant increased with all treatment compared to N mineral fertilizer . The highest values (N %) of straw and grains 2.83 and 1.21%

were for treatment of bio-fertilizer + sulphure + organic farm+85kg N/fed. The corresponding relative increases were 4.12, 5.62, 4.50, 3.5, 4.87 and 6.00 % for straw and 10.19 , 15.74 , 12.04 , 4.00 , 7.41 and 12.04 % for grains for soil treatment with organic farm +85 kg N/fed, Bio-fertilizer +85 kg N/fed, sulphure + 85 kg N/fed, Bio + S + 85 kg/fed and Bio +S + O.M + 85 kg N/fed, respectively, compared by treatment with 120 kg N/fed . These results agreed with those obtained by Mohamed (2004) and Soliman and Hassan (2004).

On the other hand the concentration of phosphorus in straw and grains presented in Table (4) show that the increased concentration of P in straw and grains in all treatment, specially treatments with Bio- fertilizer +85 kg N/fed only , organic + bio-fertilizer +85kgN/fed and Bio+ S + O.M + 85 kg N/fed combination respectively. The results were agreement with Koreish et al (1998) Massoud (1999) who found that P concentration increased with inoculation with (*Azotobacter+ VAM*) compared with control .

Regarding to the concentration of potassium in grain and straw of maize crop, data in Table(4) show that K concentration tends increase with combination of Bio- +S + O.M +85 kg N/fed and Bio-fertilizer +85 kgN/fed . The highest values of K in straw (3.39 %) and (1.49 %) for grains were found in soil treated with Bio- +S + O.M +85 kg N/fed .

Table (4) Macro nutrients concentration of grain and straw maize crop.

Experimental pilot unit	Macro nutrients (%)					
Tretments	*N*		*P*		*K*	
	Straw	*Grain*	*Straw*	*Grain*	*Straw*	*Grain*
Mineral	2.67	1.08	0.32	0.26	2.78	1.20
120 kgN/fed	a	a	a	a	a	a
Organic farm +	2.78	1.19	0.40	0.33	3.05	1.29
85 kgN/fed	a	ab	ab	a	b	b
Bio- fertilizer +	2.82	1.25	0.43	0.36	3.19	1.35
85 kgN/fed	a	ab	bc	ab	c	b
Sulpher +	2.79	1.21	0.38	0.34	3.17	1.39
85 kgN/fed	a	b	cd	b	d	c
Bio +sulpher	2.77	1.12	0.44	0.36	3.25	1.42
85 kgN/fed	a	bc	d	b	de	cd
Organic + bio- +	2.80	1.16	0.46	0.40	2.30	1.45
85 kgN/fed	a	cd	e	b	e	d
Bio+ sulpher+ organic +85 kgN/fed	2.83	1.21	0.52	0.45	3.39	1.49
	b	d	f	b	f	e
L.S.D % 5	0.087	0.054	0.051	5.330	0.320	0.670

Also, the relative increases in N , P and K concentration of both straw and grains yields of maize as related to used amendments had no specific trends.

These results agreed with data obtained by Bishr, et al (2006) who found that the highest potassium percentage in seed plant were produced from plants treated with 10 m^3/fed chicken manure. El-Sawah (2000) found that significant increase in N, P and K content of maize plant when seeds were inoculated with *Azospirillum brasilens and Bacillus megatherium* as well as low dose of mineral nitrogen fertilizers was applied .

Micronutrients concentration in straw and grains of maize crop:

Effect of amendments as a single application and combination on the concentration of some micronutrients (Fe , Mn, Zn and Cu) in straw and grains of maize crop are presented in Table (5) Data showed that applying the amendments caused an increases in the concentrations of Fe , Mn, Zn and Cu for straw and grains , with a more pronounced increase with amendments combination , specially soil treated with Bio-fertilizer + O.M + S +85 kg N/fed and organic nanure + Bio-fertilizer +85 kg N/fed. According to the obtained data concentration of Fe, Mn, Zn and Cu in both straw and grains of maize crop could be ordered as follows : Bio-fertilizer + O.M + S + 85kg N/fed > organic matter + Bio-fertilizer +85 kgN/fed > Bio-fertilizer +85 kg/fed> Sulpure fertilizer + 85kgN/fed > Organic matter +85kgN/fed > Mineral N 120kgN /fed. These results agreed with those obtained by Bishr, et al (2006) and Shaban and Helmy (2006).

Table (5) Micronutrients in straw and grains of maize crop.

Tretments	Fe (ppm)		Mn (ppm)		Zn (ppm)		Cu (ppm)	
	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain
Mineral 120 kg N/fed	83.10 a	34.30 a	33.62 a	16.82 a	13.31 a	6.61 a	3.04 a	1.31 a
Organic farm +85 Kg N/fed	85.89 b	37.90 ab	35.69 b	17.28 b	14.09 b	7.18 ab	3.21 ab	1.68 b
Bio- fertilizer +85kgN/fed	88.26 c	38.28 bc	35.89 c	18.10 c	16.32 c	7.53 b	4.23 bc	1.89 c
Sulpher + 85kgN/fed	84.62 d	38.01 cd	35.10 d	17.91 d	17.59 d	6.85 b	3.19 bc	1.80 cd
Bio +sulpher +85 kg N/fed	85.40 e	38.61 d	36.56 e	18.57 e	18.38 e	8.29 b	5.29 bc	2.18 d
Organic bio-fertilizer+ 85 kg N/fed	92.01 f	39.50 e	37.16 f	18.88 e	19.10 f	8.89 bc	5.77 c	2.59 e
Bio+sulpher+ organic +85 Kg N/fed	92.30 g	40.26 e	37.95 g	19.24 e	20.36 g	9.28 c	6.10 d	3.10 f
L . S. D.%5	0.09	1.36	0.10	0.16	0.08	0.07	0.06	0.05

Plant growth and dry matter yield :

The beneficial effects of amendments addition on maize yield (straw and grains) in the studied soil are presented in Table (6). Results showed that straw and grains yield of maize tended to increase with treated combination of treatments (Bio-fertilizer + O.M + S +85kgN/fed) , where the yield of straw and grains were the increased to (2.99 and 1.77 ton /fed) compared with other treatments. As expected responses of 100 grains weight seemed similar trend to that yield weight with inoculation and mixture treatment combined with organic manure and sulphure treatments. These results agreed with those obtained by Mohamed (2004).

Therefore, it could be categorized the beneficial effect of used amendments on the straw and grains yield of maize into different orders according to the increases in straw and grains yield as follows: Bio + O.M + S + 85kgN/fed > O.M + Bio+85kg/fed > Bio + S + 85 kgN/fed > Bio + 85kgN/fed > Organic +85kgN/fed > sulphure +85kgN/fed > Mineral 120kgN/fed. Mohamed et al (2001) revealed that using *Azospirillum brasilense* or *commerical biofertilizer* Cerealin with half N rate (144 kg N/ha) resulted in a significant increase in maize yield.

Table (6) Maize yield , its components and protein percentage (2006/ 2007).

Experimental pilot unit	Yield component production of maize crops					
Tretments	Weight dry (gm)/plant		Weight 100 Grains (gm)	Straw Ton/fed	Grains Ton/fed	Protein (%)
	Straw	grains				
Mineral 120 kgN/fed	100 a	61 a	33.10 a	2.55 a	1.22 a	6.75
Organic + 85 kgN/fed	127 a	78 ab	35.91 ab	2.74 b	1.49 b	7.43
Bio-fertilizer + 85 kgN/fed	135 a	82 ab	40.73 abc	2.79 bc	1.61 b	7.81
Sulpher +85 kgN/fed	121 ab	88 abc	36.67 bc	2.66 cd	1.46 b	7.56
Bio-fertilizer +sulpher + 85 kgN/fed	139 bc	94 bc	38bc	2.82 d	1.62 c	7.00
organic + bio- +85 kgN/fed	140 c	103 c	39.25 bc	2.88 e	1.66 c	7.25
Bio+ sulpher+ O.M + 85 kgN/fed	143 d	105 d	44.81 c	2.99 f	1.77 d	7.56
L.S.D % 5	10.73	8.50	5.84	0.07	0.05	---

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Also , the protein percentage (%) in grains of maize obtained in Table (6) show that the protein (%) content in grains increase in the treatment of Bio-fertilizer + 85 kg N/fed only. The lowest protein values were obtained with in

treated mineral 120 kg N/fed compared with bio-fertilizer, sulphure and organic manure + 85 kg N /fed alone or in combination.

In conclusion, inoculation of maize plant seedling with *Azospirillum brasilense NO40* tolerant alone or mixed with sulphure and organic manure +85 kg N/fed with applied different levels of mineral N-fertilizers increased plant dry weight, nitrogen, phosphorus potassium and Fe, Mn ,Zn and Cu contents in maize plants and increased biomass yield and protein percentage in grains of maize plants . This data agreement with El- Bakry, et al (2001) and Salama (2006).

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تأثير التسميد بالنتروجين المعدني و الكبريت والمخصب العضوي والحيوي على إنتاجية الذرة الشامية في ارض ملحية بسهل الطينة

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الملخص العربى

أجريت تجربتان حقليتان في موسمي الصيف ٢٠٠٧ و٢٠٠٦ في قرية ٧ بمنطقة سهل الطينة وكانت الأرض وقوامها رملية طنية ذات ملوحة ١٠.٧٥ ميللموز /سم وذلك لدراسة مدى إمكانية زراعة الذرة الشامية هجين ثلاثي تحت ظروف الملوحة وتقليل التسميد النتروجينى المعدني واستخدام الكبريت والتسميد العضوي والحيوي والتداخل بينهم. وهذه المنطقة تروى بمياه ترعة السلام (المخلوطة بنسبة ١ :١ مياه نيل + مياه صرف زراعي).

وتتلخص النتائج المتحصل عليها :

١- نقص قيم pH التربة من ٨.٤١ إلى ٨.٠٣ بالمقارنة بالكنترول قبل الزراعة .

٢- نقص قيم EC ملوحة التربة من ١٠.٧٥ إلى ٤.٥٥ ملليموز / سم بالمقارنة بالكنترول قبل الزراعة وهذه النتيجة كانت واضحة في المعاملة بالحيوي + الكبريت + العضوي و التربة المعاملة بواسطة التسميد الحيوي + الكبريت+٨٥ كجم نتروجين /فدان.

٣- أدى استخدام التسميد الحيوي والمعدني والكبريت والعضوي والتداخل بينهم إلى زيادة معنوية في العناصر الميسرة من النتروجين والفوسفور والبوتاسيوم.

٤- زاد محتوى العناصر الصغرى (الحديد والمنجنيز والزنك والنحاس) الميسرة في كل المعاملات

٥- زاد المحتوى العنصري للعناصر الكبرى النتروجين والفوسفور والبوتاسيوم في القش والحبوب لنبات الذرة في المعاملات الملقحة والمعاملات التي بها تداخل بين المعاملات.

٦- أدى استخدام التسميد المعدني والكبريت والحيوي والعضوي والتداخل بينهم إلى زيادة العناصر الصغرى الحديد و المنجنيز و الزنك و النحاس وخاصة المعاملة بالتسميد الحيوي والعضوي والكبريت +٨٥ كجم نتروجين /فدان .

٧- زاد محصول من الحبوب إلى ١.٧٧ والقش إلى ٢.٩٩ في المعاملة الحيوي والعضوي والكبريت +٨٥ كجم نتروجين /فدان مقارنة بالمعاملات الأخرى .