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IMPROVING WHEAT PRODUCTION AND GRAIN QUALITY BY INORGANIC, ORGANIC AND SOME MICRONUTRIENTS FERTILIZERS UNDER SALINE CONDITIONS

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ABSTRACT: *Two field experiments were conducted during two successive seasons in 2007/2008 and 2008/2009 at Gelbana district Sahl – el Tina plane (North Sinai) to study the response of two Egyptian wheat varieties namely Sakha 93 and Sids 1 to inorganic, organic and foliar spray with micronutrients either singly or in combination. Split plot design was used. wheat plants were sprayed two times with mixture of Zn +Mn +Fe at a rate of 0.3g Zn EDTA +0.3g Mn EDTA +0.3g Fe EDTA, first sprayed at tillering stage (30 dys from sowing) and secondly at the head development stage (70 days from sowing). It was found that NPK fertilizer was more effective than compost or micronutrients mixture (Fe +Zn +Mn) in increasing wheat yield and yield components of both studied varieties. Sakha 93 was more affected by this treatment and surpassed Sids 1 for all growth characters except plant height. Corresponding increases in macronutrients (NPK) and micronutrients (Fe+ Zn+ Mn) in wheat grains. NPK treatment produced high significant effect in crude protein % and total carbohydrates in grains, shoot length, radical length, EC and seedling dry weight for both studied varieties while germination percent, was increased but non significant for both varieties. The obtained data declared that the combination treatment NPK+ compost + Fe+ Zn+ Mn produced highest significant increases for all studied characters except germination percent for Sakh93 and Side 1 wheat*

Results revealed that applied fertilization treatments led to increase pH and Ec in soil and increased available macro- and micronutrients soil content compared with initial soil .In conclusion the present study is going to say that the use of following order NPK + compost +EDTA> NPK + compost > NPK + EDTA> NPK .

Key Words: *wheat plant, NPK fertilizer, compost and EDTA (Zn+ Mn+ Fe).*

INTRODUTION

Wheat is staple food in Egypt. Raising wheat production through increasing and increasing its cultivated area. Increasing wheat yield per unit area can be achieved by breeding high yielding varieties. Salinity is considered of the major obstruct in North Sinai to increase wheat production.

However, there are ways to control salinity, in the other word we cannot erase salinity but we can live with it i.e. cultural practices. land leveling, grading seed bed improvements, irrigation intervals, sowing methods and limited quantity and quality of organic fertilizer, inorganic and micronutrients cultivation selection.

Macronutrients (NPK) are key elements in the nutrition of most crops, especially cereals. Morsy *et al* (1999) found that application 180 kg N fed. +200 kg/fed. single super phosphate.(15% P 2O5) + 50kg K2O/ fed. increased significantly yield and yield components, total nitrogen uptake and protein content in wheat grains. EL-Afandy (2006) reported that addition of NPK at a rate of 100 kg N/ fed.+ 150 kg /fed. single super phosphate (15%P2O5) +24 kg K2O /fed. as potassium sulphate increased significantly yield and yield components of wheat. researches have provided the importance of micronutrients. Mengel and Kirkaby (1978) reported that micronutrients are essential elements for plant life particularly under limited condition. In brief they act as plant growth hormones and play a role in the production or function of several enzymes systems in plants. Ghaly *et al* (1992) indicated that favourable micronutrients balance was found to be 2:1:2 for Fe, Mn, Zn, respectively where it produced high grain yield associated with high 1000-grain weight and protein content. Salib (2002) found that use some micronutrients lead to increase wheat productivity, especially in the newly reclaimed soils. Abd EL- Magid (2001) and Zeidan and Nofal (2002) found that the mixture of Zn +Fe+ Mn gave highest protein content in leaves and kernels as well as increased yield of wheat and barley. Abu EL –Fotoh *et al* (2006) reported that application of 75 kg N/ fed.,+ 100 kg/ kg single super phosphate (15%P2O%) + 50 kg K2O / fed. in combination with 0.2g/L of each Zn, Fe and Mn caused significant increment in wheat grain yield. organic manure play an adaptive role in the tolerance of plant cell to salinity by increasing soil organic matter and hence improve their physical properties which intern improve plant roots growth also the chemical properties, the status of essential nutrients and soil microbial activity EL-Emam(1999). Abdel- Aziz *et al* (2000) found that application of 90kg N /fed.+200 kg / fed. single super phosphate (15% P2O5) + 48 kg K2O/ fed. in association with clayey Tafla or FYM resulted in significant increases in grain yield and NPK concentration in wheat grains over NPK alone.

Gurbaksh *et al* (1985) established a trial to study the effect of salinity on germination and early seedling growth of wheat .There was no significant difference in the germination percentage at low salinity levels (0,4 and 8 mmhos / cm) but higher salinity levels (12, and 16 mmhos / cm) decreased germination.Chauban and Singh (1993) stated that seed germination percentage at 6000 ppm for wheat cv Sakha 92. Meanwhile salinity at 7000 ppm decreased the germination percentage and increased the number of days required for germination , but salinity at concentration more than 7000 ppm (8000, 9000, 10000 ppm) completely inhibited seed germination in Sakha

92 Abdel –Halim *et al* (1976) found that carbohydrate content of the grain increases up salinity level 6000-8000 ppm. While Wanas (1996) found that salinity decreased total carbohydrate, non reducing sugars, however, reducing sugar were increased by salinity in wheat G 163, (the less- salt tolerant cultivar than in wheat Sakha 92 (the more- salt tolerant cultivars.

The objectives of this work were to study the effect of organic and inorganic fertilizers as well as micronutrients on wheat productivity under saline conditions.

MATERIALS AND METHODS

Two field experiments were conducted in two successive seasons 2007/2008 and 2008/2009 at Gelbana Sahl- el teina (_North Sinai) on saline soil to study the effect of NPK, organic manure (compost) and some micronutrients (Zn+ Fe+ Mn) either singly or in combination on two Egyptian wheat (Triticum aestivum L .) varieties c.v. Sides 1 and Sakha 93 The experiment unit area 40m2 (10x4m). Soil sample was taken before cultivation and prepared for physical and chemical analysis according to Black (1965) as shown in Table (1).

Table (1): Physical and chemical properties of soil before planting

Particulars Size distribution (%)				Texture Classes	O.M (%)	CaCO3 (%)	pH (1:.2.5)	EC (ds/m)
C. sand	F.sand	Silt	Clay					
19.86	55.37	8.65	16.12	Sandy soil	0.68	12.3	8.14	10.92
cation (meg/L) Soluble				anion (meg/L) Soluble				
Ca+2	Mg+2	Na+	K+	CO-3	HCO-3	CL-	SO-4	
13.72	19.30	59.60	0.58	nil	5.33	65.13	30.61	
Soluble macroelements (mg/L)				microelements (mg/L) Soluble				
N	P	K		Fe	Mn	Zn		
45	6.21	189		4.72	3.27	1.20		

The wheat grains were planted on November 18 and 19 in the first and second seasons, respectively at the rate of 60 kg / fed. using the experimental design of split – plot with four replications. Varieties were developed to main plots, while the treatments were allocated at random in sub plots. The experiments included seven treatments. The treatments were as follows.

1-NPK(control)
2-Compost
3-EDTA (Fe+ Zn+ Mn)
4-NPK+compost
5- NPK+ EDTA
6-Compost + EDTA
7-NPK+compost+EDTA

Compost treatment at a rate of 10m3/ fed. was mixed with the upper layer (30cm depth) of the soil before cultivation . Table (2) show its analysis.

Table (2) Analysis of compost

Manure compost	pH (1:2.5)	EC (ds/m)	C/N ratio	N	P	K	Fe	Mn	Zn	Cu
				Total %			DTPA extractable mg/kg)(			
	7.25	5.76	22.5	1.83	0.88	2.23	25.9	40.9	28.6	4.5

NPK treatment was added as follow, nitrogen fertilization as ammonium nitrate (33.5%N) was applied at the rate of 100 kg N/fed. In four equal doses (at sowing, 20, 45, 60 days after sowing date) .Phosphorus as calcium super phosphate (15 % P2O5) was added at the rate of 100kg/fed. while potassium as potassium sulphate (48%) was applied at the rate of 50 kg /fed. before sowing. The micronutrients treatment such as Zn, Fe & Mn was applied as foliar spray. Plants were sprayed at 30 and 70 days after sowing at the rate of 0.3 g/L Zn, 0.3g/L Fe , 0.3g/L Mn with rate of 400 liter/ fed. in the form of EDTA compound. EDTA contain (12% Zn, 6%Fe and 12%Mn).The other different field practices was followed in the usual manner for wheat cultivation. Plants were harvested on 13 and 10 May for both growing seasons. Random samples,of ten guarded plants from each plot were taken to estimate the following characters.

1-Plant height(cm).
2-Spike length(cm).
3-Number of spikelets/ spike.
4-Number of spike / m2.
5-Weight of kernels per spike (g)
6-1000- kernel weights(g).
7-Grain yield (kg/ fed.)

Laboratory test.

Also laboratory test were carried out at Seed Technology Research Dept ARC for Vigor testing:

(a) Percent of germination: Grains were incubated in moist filter paper at 25C for 8 days. Normal seedlings were count according to international rules I.S.T.A. (1993) and expressed as germination percentage. Seedling vigor was assessed by measuring radical, shoot length and its dry matter.

(b) Electrical conductivity: The electrical conductivity of leachiest was determined according to procedure described by A.O.A.C. (1990).

For chemical determination, wheat grains were fine powdered, wet digestion of dry material was carried out according to Chapman and Pratt (1978).Total carbohydrate and crude protein were determined according to A.O.A.C.(2000). P and K concentrations were determined according to the

method described by A.O.A.C.(1990).The atomic absorption spectrophotometer was used to determine Zn, Fe ,&Mn. least significant differences test was used for comparing treatments means as described by Sendecor and Cochran (1982).

RESULTS AND DISCUSSION

Growth characters.

Results in Table (3) showed that the plant height, spike length , number of spike/m2 were significantly affected by treatments, however interaction between treatment x varieties were significantly at 5% level and non significant effect at 1% level except for spike length.

Pooled data in that Table, declared that NPK fertilizer had stimulation effect on the studied parameters against compost or foliar spray with Zn+ Fe+ Mn alone or in combination for both Sids 1 and Sakha 93. The obtained results were in agreement with those obtained by Darwish *et al* (2002) who found that NPK soil application increased significantly plant height, spike length, number of spike/ m2 and spikelets number/ spike as compared with organic waste of jojoba or castor bean on wheat plant. EL-Meneasy *et al* (2005) reported that NPK fertilizer surpassed chicken manure at 10 m3/ fed. improving plant height, spike length and number of grains/ spike in wheat plants.

Results also indicated that when compost combined with mineral fertilizer (NPK), high significant increment in plant height and spike length reached 102.33(cm) and 8.33(cm) , respectively for Sids 1 variety. Corresponding data for Sakha 93 were recorded 83.33 (cm) and 12.00(cm), respectively. This response could be attributed to the nutrients available in the mineral fertilizaters immediately after application, while organic types taken sometime to reliable nutrients available form Abd-EL-Latif *et al* (2005).

Combination of micronutrients with inorganic fertilizer (NPK) caused, highly significant increase in spike number/ m2 and number of spikelets/ spike reached to 327. 27 and 11.02 respectively for Sids 1variety, while in case of Sakha93 results were 267.0 and 15.67 respectively as compared with control. These reveal that fertilization with NPK combined with foliar application mixture Fe+ Zn+ Mn treatment may be help the plant to develop giving more growth and more yield and were encourage micronutrients up taking directly through foliage due to difficult of uptake from soil Nasef *et al* (2003).This finding is consistent with Sharshar *et al* (2000).

Table (3): Effect of NPK, compost and micronutrient on growth characters of Sids 1 and Sakha 93(combined analysis) (2007/ 2008 and 2008/ 2009 seasons).

Treatments	Varieties	Plant Height (cm)	Relative Increase %	Spike Length (cm)	Relative Increase %	No.of Spike /m2	Relative Increase %	No.of Spikelts /spike	Relative Increase %
Control	Sids 1	91.0	100.0	6.67	100.0	292.33	100.0	10.33	100.0
NPK	Sakha93	73.67	100.0	9.43	100.0	392.0	100.0	14.27	100.0
Compost	Sids 1	81.67	-10.25	5.72	-14.24	250.06	-14.46	8.95	-13.36
	Sakha93	69.00	-6.34	8.9	-5.62	381.08	-2.79	13.27	-7.01
EDTA	Sids 1	81.00	-10.99	5.49	-17.69	236.01	-19.27	8.39	-18.78
mix.	Sakha93	64.67	-12.22	8.33	-11.66	367.07	-6.36	12.37	-13.31
NPK	Sids 1	102.33	+12.45	8.33	+24.89	338.89	+15.93	11.39	+10.26
+	Sakha93	83.33	+13.11	12.00	+27.25	470.67	+20.06	16.67	+16.82
compost									
NPK	Sids 1	101.33	+11.35	7.82	+17.24	327.27	+11.95	11.02	+6.68
+	Sahga93	82.00	+11.31	11.20	+18.77	467.0	+19.13	15.67	+9.81
EDTA									
Compost	Sids 1	87.67	-3.66	6.02	-9.75	260.5	-10.89	9.21	-10.84
+	Sakha93	72.00	-2.27	8.94	-5.20	391.48	-0.13	13.78	-3.43
EDTA									
Compost	Sids 1	108.0	+18.68	7.99	+19.79	334.33	+14.37	12.25	+18.59
+EDTA	Sakha93	91.67	+24.43	11.67	+23.75	499.67	+27.46	17.33	+21.44
+NPK									
L.S.D(V)		2.71		0.59		21.77		0.68	
5%		6.25		1.36		50.20		1.56	
1%									
(T) 5%		2.1		0.55		18.03		0.74	
1%		2.85		0.75		24.43		1.01	
(TxV) 5%		4.7		1.20		39.81		1.58	
1%		N.S		2.40		N.S.		N.S	
C.V		11.38		12.91		12.63		12.28	

EDTA (Fe, Zn, Mn).

Moreover, application NPK with compost and micronutrients, show highest significant increment in growth characters and achieved the highest values of spike number / m2and number of spikelts / spike 334.33 and 12.25, respectively for Sids 1and 499.67 and 17.33 respectively for Sakha 93 . Where NPK alone recorded 292.33 and 10 33 respectively for Sids 1cultivar and 392.0 and 14 27 respectively for Sakha 93 cultivar. These results indicated that addition of this treatment to wheat plant its tolerance to salinity and sodcity hazard.

Results in Table (3) showed significant difference in studied parameters among the tested wheat varieties Sakha 93 cultivar recorded the highest value in these parameters and lowest value was found in Sids 1cultivar except for plant height.

Yield and yield components.

Data in Table (4) show that yield and yield components were significantly influenced by treatments and interaction between treatments and varieties.

Table (4): Effect of NPK, compost and micronutrients on yield and yield components of Sids 1and Sakha 93 (combined analysis) (2007/2008 and 2008/2009 seasons).

Treatment	Varieties	Weight Of grains / spike (g)	Relative Increase %	1000-grains weight	Relative Increase %	Grain Yield Kg/fed.	Relative Increase %
Control NPK	Sids 1	0.96	100.0	30.48	100.0	821.33	100.0
	Sakha 93	1.72	100.0	37.57	100.0	1312.47	100.0
Compost	Sids 1	0.7	-27.0	26.19	-14.07	703.41	-14.36
	Sakha 93	1.59	-7.6	36.49	-2.87	1209.33	-7.86
EDTA (mix)	Sids 1	0.63	-34.38	24.37	-20.05	656.24	-20.10
	Sakha 93	1.46.	-15.12	35.04	-6.73	1145.67	-12.71
NPK + compost	Sids 1	1.08	+12.5	35.12	+15.22	1190.67	+44.97
	Sakha 93	2.18	+26.74	44.39	+18.15	2179.67	+66.07
NPK + EDTA	Sids 1	1.05	+9.36	31.90	+4.66	1021.67	+24.39
	Sakha 93	2.17	+26.16	40.06	+6.63	1774.67	+35.22
Compost + EDTA	Sids 1	0.83	-13.54	28.27	-7.25	760.06	-7.46
	Sakha 93	1.64	-4.65	37.50	-0.19	1234.21	-5.96
Compost +EDTA + NPK	Sids 1	1.12	+16.67	37.22	+22.11	1207.67	+47.04
	Sakha 93	2.57	+49.42	51.59	+37.32	2279.67	+73.69
L.S.D.(V) 5%		0.09		0.38		8.09	
1%		0.21		0.89		18.66	
(T) 5%		0.08		0.67		4.53	
1%		0.11		0.91		6.14	
(TxV) 5%		0.18		1.39		10.94	
1%		0.36		2.77		21.85	
C.V		12.5		10.46		11.48	

EDTA (Fe, Zn, Mn).

From Table (4), addition of compost or foliar Fe+ Zn+ Mn mixture either singly or in combination could not bring any improvement in grains weight / spike, 1000 grains weight and grain yield for both studied cultivars as compared with inorganic fertilizer, (NPK). The superiority of mineral fertilizer is logically predict, since the readily available N or the water soluble N occurs in a relative high amount in soil treated with inorganic fertilizer. The N organic from which are mineralized slowly in soil, therefore the nitrogen should be less available to plants (Abdel-Gani and Bakry, 2005). These results are in accordance with those obtained by Mahdy *et al* (2000) and Mostafa *et al* (2004).

Data indicated that compost action was greatly effective when combined with mineral fertilizer they recorded high significant improvement in grain weight / spike (g), 1000 – grain weight (g) and grain yield kg/ fed. reached to 1.08, 35.12 , and 1190.67 respectively for Sids 1 variety and 2.18 , 44.39 and 2179.67 respectively for Sakha 93 variety. The obtained results are in agreements with those obtained by Mohamed(2002 a) who reported that amending the soil with matured town refuse (MTR or sewage sludge compost manure (SSC) with mineral fertilizer increased grain yield of wheat plants

Azer and Sadek (2007)revealed that FYM highly increased grain and straw yield in wheat plant when combined with NPK fertilizer.

Table(4) revealed that foliar application of micronutrients in combination with NPK gave high significant response against NPK alone, where grain weight/ spike (g) , 1000- grain weight (g) and grain yield kg / fed. achieved of 1.05, 31.9 and 1021 respectively for Sids 1, also 2.17, 40.06 and 1774.67 respectively for Sakha 93 .EL-Fouly(1983) reported that micronutrients can only give good yield increase when crop needs of the major nutrients are satisfied. Similar results were obtained by Monged *et al* (2004) and Abu- El-Fotoh *et al* (2006) they found that the CO-fertilization of micronutrients and NPK led to highest value of straw and grain yield in wheat plants.

Furthermore, highest significant increment with full integrated balanced fertilization (NPK+ compost+ EDTA), where grain yield kg./fed. raised from 821.33 up to 1207.67 kg for Sids 1variety and from 1312.47 up to 2279.67 kg. for Sakha 93 variety at NPK and NPK+ compost+ EDTA, respectively. It is worth to mention that this treatment encourage the tolerance of wheat plant to salinity and sodic hazard. This study is in line with those obtained by EL-Akabawy *et al* (2001) on maize. Concerning the effect of mineral fertilizer on wheat growth and yield (Tables 3&4) may be due to that nitrogen being an important constituent of amino acids, protein and protoplasts directly influence plant growth and development (Fayed *et al*, 1981; EL-Akabawy *et al*, 2001 and Zhanghu *et al*, 2004). Russel(1973) stated that application of P and K fertilizers increased yield of cereals. This could be attributed to the function of these elements in photosynthesis and metabolism, where P has an important role in energy transfer process through ADP and ATP compound while K is essential for carbohydrates and nitrogen metabolism and activation of various enzymes which intern influence on grain yield.

Results in Table (4) show that both varieties different significantly concerning these parameters, where Sakha 93 variety surpassed Sids 1for all tested parameters. The present finding may be due to the genetic diversity between both studied cultivars and their response to environmental conditions during growing seasons. Also these results illustrated in Tables (3&4) indicated that Sakha 93 was more salt tolerant than Sids 1. This results are in full agreement with EL-Afandy (2006) who working on two wheat varieties Sakha 93 and Sakha 69 and reported that Sakha 93 was more salt tolerant than Sakha 69 as indicated from their vegetative growth characters and yield and yield attributed.

Minerals concentrations:

Tables (5&6) show that macro- and micronutrients were significantly different due to treatments and their interaction with varieties.

Table (5): Effect of NPK, compost and micronutrients on N, P and K concentrations in grains of Sids 1and Sakha 93 (combined analysis) (2007/2008 and2008/2009 seasons).

Treatments	Varieties	N%	Relative Increase %	P%	Relative Increase %	K%	Relative Increase %
Control	Sids 1	1.65	100.0	0.120	100.0	0.36	100.0
NPK	Sakha 93	1.93	100.0	0.200	100.0	0.52	100.0
Compost	Sids 1	1.38	-16.36	0.090	-25.0	0.28	-22.22
	Sakha 93	1.81	-6.22	0.176	-12.0	0.44	-15.38
EDTA	Sids 1	1.36	-17.58	0.085	-29.17	0.25	-30.56
mix	Sakha 93	1.70	-11.92	0.169	-15.5	0.41	-21.15
NPK	Sids 1	2.01	+21.82	0.139	+15.83	0.39	+8.33
+	Sakha 93	2.53	+31.09	0.285	42.5+	0.59	+13.46
compost							
NPK	Sids 1	1.86	+12.73	0.134	11.67+	0.38	+5.56
+	Sakha 93	2.38	+23.32	0.269	+34.5	0.57	+9.62
EDTA							
Compost	Sids 1	1.48	-10.30	0.101	-15.83	0.30	-16.67
+	Sakha 93	1.90	-1.55	0.188	-6.00	0.49	-5.77
NPK							
Compost	Sids 1	2.10	+27.27	0.164	+36.67	0.42	+16.67
+EDTA	Sakha 93	2.71	+40.41	0.311	55.50+	0.67	+28.85
+NPK							
L.S.D.(v)		0.04		0.01		0.01	
5%		0.10		0.04		0.03	
1%							
(T)5%		0.06		0.01		0.01	
1%		0.08		0.02		0.02	
(TxV)5%		0.13		0.02		0.02	
1%		0.26		0.05		0.05	
C.V		7.05		7.49		8.42	

EDTA (Fe, Zn, Mn).

From Tables (5&6) it could be cleared the superiority of NPK fertilizers in Improving macro- and micronutrients contents in grains of the two wheat varieties as compared with compost or micronutrients alone or in associations. This may be due to the conversion of N-organic to available form through microbial activity take more time and cause reducing N content (Abdel-Gani and Bakry, 2005).Similar finding were obtained by Shaban and Attial (2009).

Results showed that compost was enriched by adding mineral fertilizer, causes significant increases in macro- and micronutrients, where nitrogen, phosphorus and potassium reached 2.01, 0.139 and 0.39 respectively for Sids 1 and 2.53, 0.285 and 0.59 respectively for Sakha 93. These results obtained by Abdel- Aziz *et al* (2000), El- Zaher *et al* (2001) and El-Shafie and EL- Shikha (2003).Application of micronutrients when combined with NPK, resulted in significant increases in nutrients concentrations in grain, where Fe, Zn and Mn (ppm) amounted to 161.79, 59.5 and 62 69 respectively for ids 1cultivar .

Table (6): Effect of NPK , compost and micronutrients on Fe, Zn, and Mn in grains of Sids 1 and Sakha93 (combined analysis) (2007/2008 and 2008/2009 seasons).

Treatments	Varieties	Fe (ppm)	Relative Increase %	Zn (ppm)	Relative Increase %	Mn (ppm)	Relative Increase %
Control	Sids 1	142.46	10.0	45.00	100.0	53.33	100.0
NPK	Sakha 93	172.67	100.0	54..00	100.0	62.33	100.0
Compost	Sids 1	129.05	-9.41	39.33	-12.6	47.33	-11.25
	Sakha 93	167.00	-3.28	47.33	-12.35	56.31	-9.66
EDTA	Sids 1	120.70	-15.27	35.33	--21.49	44.00	--17.49
(mix)	Sakha 93	157.33	-8.88	43.00	-20.37	54.92	-11.69
NPK	Sids 1	174.05	+22.17	66.75	+48.33	70.27	+31.76
+	Sakha 93	238.40	+38.07	95.54	+76.92	100.75	+61.64
compost							
NPK	Sids 1	161.78	+13.56	59.50	+32.22	62.69	+17.55
+	Sakha 93	212.76	+23.22	80.52	+49.11	78.67	+26.22
EDTA							
Compost	Sids 1	135.11	-5.16	42.33	-5.93	50.33	-5.63
+	Sakha 93	172.10	-0.33	52.33	-3.09	60.67	-2.66
EDTA							
Compost+	Sids 1	201.90	+41.72	68.95	+53.22	82.75	+55.17
EDTA	Sakha 93	273.96	+58.66	102.60	+90.00	115.58	+85.43
+NPK							
L.S.D.(V)		2.21		0.40		1.93	
5%		5.09		0.92		4.45	
1%							
(T) 5%		1.56		1.08		1.16	
1%		2.12		1.47		1.57	
(TXV) 5%		3.55		2.20		2.73	
1%		7.10		4.40		5.47	
C.N		8.54		7.28		7.21	

EDTA (Fe, Zn, Mn)

Corresponding data were 212.76, 80.52 and 78.67 respectively for Sakha 93 cultivar. These results confirm that the balance between these elements may affect the uptake of other mineral and also can change the physiological effect of the plant nutrients concerning uptake. These results are in accordance with those obtained by Monged *et al* (2004) on wheat. Moreover, highest significant increases in the Fe, Zn, and Mn, in wheat grains was found in plants treated with balanced fertilization (NPK+ compost + micronutrients) for both studied varieties. Such trend might emphasize the increase in growth and yield occurred under the above mentioned treatments Tables (3&4). It is worth mentioning that the marked increase in wheat growth and yield with maintenance of nutrients percentage indicate the true need for the integrated and balanced fertilization to obtain high wheat grain yield with good quality at the same time. In this connection, similar finding results were reported by El-Akabwy *et al* (2001) on wheat and Monged *et al* (2004) on maize.

Data presented in Tables (5&6) show that there were significant difference in these nutrients between the two wheat cultivars, Sakha 93 recorded highest values , while Sids 1recorded lowest values

Crude protein:

It is quit clear from the data reported in Table (7) that crude protein % in wheat grains was significantly influenced by varieties, treatments as well as interaction between treatments and varieties.

Table (7): Effect of NPK or compost or EDTA either singly or in combinations on crude protein % and total carbohydrates in grains of Sids 1 and Sakha 93 for combined analysis (2007/2008 and 2008/2009 seasons).

Traetments	Varieties	Crude Protein %	Relative Increase %	Total Carbohydrates %	Relative Increase %
Control	Sids 1	9.50	100.0	70.60	100.0
NPK	Sakha 93	11.08	100.0	72.60	100.0
Compost	Sids 1	7.95	-16.32	61.91	-12.31
	Sakha 93	10.38	-6.32	69.03	-4.92
EDTA	Sids 1	7.80	-17.89	59.10	-16.29
(mix)	Sakha 93	9.78	-11.73	64.78	-10.77
NPK	Sids 1	11.54	+21.47	72.30	+2.41
+	Sakha 93	14.55	+31.32	73.40	+1.10
compost					
NPK	Sids 1	10.70	+12.63	73.87	+4.63
+	Sakha 93	13.66	+23.29	75.30	+3.72
EDTA					
Compost	Sids 1	8.52	-10.32	68.55	-2.90
+	Sakha 93	10.92	-1.44	71.47	-1.56
EDTA					
Compost+	Sids 1	12.06	+26.95	75.60	+7.08
EDTA+	Sakha 93	15.57	+40.52	79.40	+9.37
NPK					
L.S.D. (V)		0.18		0,75	
5%		0.43		1.73	
1%					
(T) 5%		0.18		0.39	
1%		0.24		0.53	
(TXV) 5%		0.38		0.97	
1%		0.76		1.94	
C.V.		8.72		7.46	

EDTA (Fe, Zn, Mn).

From Table (7), percentage of crude protein was significantly increased with inorganic fertilizer more than organic fertilizer or micronutrients mixture. The favorable effect of NPK fertilizer might be explained by assuming an influence of N availability on critical stage of spike initiation and development of plant metabolism in way leading to the increase in the synthesis of amino-acid and their incorporation into grain protein (Koth,1998). While positive effect of phosphorus may be due to increasing photosynthesis activity and subsequently chemical content such as protein and phosphorus (El-Ashmony, 1991).

Data in Table (7) illustrate that motivation of compost was highly pronounced when associated with NPK for both studied varieties, where crude protein % increased from 9.5 up to 11.54 for Sids 1 and from 11.08 up

to 14.55 for Sakha 93 at NPK alone and NPK+ compost respectively. Zein *et al* (2000) and Mohamed (2002a) have been obtained similar results.

Significant increase was achieved in this parameter with application NPK in combination with foliar mixture Fe +Zn+ Mn amounted to 10.7 and 13.66 for Sids 1and Sakha 93 respectively. Salem and Mohamed (2000) found that highest yield was obtained from addition NPK with foliar application of Zn +Fe +Cu combination on wheat plants. Further more, application of balanced fertilization including macro- and micronutrients in association with compost led to highest significant increment in studied parameters where maximum values geing 12.06 and 15.57 for Sids 1 and Sakha 93 respectively. The same treatment with growth characters as well as yield and yield components (Tables 3&4). Thus it could be noted that balanced fertilization improved wheat production quantitatively and qualitatively. Grain protein is important in human and animal nutrition and also in relation to various culinary uses of flour.

Concerning the varieties effect, data illustrated in Table (7) revealed that crude protein percentage was varied significantly between the studied varieties. This difference may be attributed to the variation in growth habit and genetically performance which directly affected on the chemical contents (Zaied 1990).

Total carbohydrates:

Data in Table (7) show that total carbohydrates were significantly affected by varieties, treatments and treatments x varieties interaction. Data showed that this parameter markedly increased by NPK addition over compost or micronutrients, that was true in grains of both Sids 1and Sakha 93 cultivars.

Data in Table (7) indicated that inorganic fertilizer together with organic fertilizer (compost). resulted in significant increase in total carbohydrates which achieved to 72.30 and 73.40 over NPK alone (70.60 and 72.60) for Sids 1 and Sakha 93 respectively .Corresponding significant increment 73.87 and 75.30 for Sids 1 and Sakha 93respectiyely for plants treated with NPK+ micronutrients foliar sprayed . Moreover, full treatment (NPK+ compost+ micronutrients) induced highest values of total carbohydrates reached to 75.60 and 79.40 for Sids 1 and Sakha 93 respectively. Also data showed significant difference in this parameter between the two varieties under study, and Sakha 93 was the best.

Seedling vigor test:

Data in Table (8) show that shoot length, radical length, seedling dry weight and electrical conductivity (EC) were significantly affected by varieties, treatments, and treatments x varieties interaction, while results indicated that germination % were not significantly affected Highest germination % obtained from Sids 1 and Sakha 93 (93.33% and 98.67 %) when compost+ NPK + EDTA application compared with control (79.67 and 92.33), respectively.

Table (8): Effect of NPK, compost and micronutrients on seed vigor test of Sids 1 and Sakha 93 (combined analysis) (2007/2008 and 2008/2009 seasons).

Treatmant	Varieties	Germin-tion %	Relative Increase %	Shoot Length (cm)	Relative Increase %	Radical Length (cm)	Relative Increase %	EC scmg-1	Relative Increase %	Seedin dry weight (g)	Realtive Increase %
Contro	Sids 1	79.67	100.0	8.92	100.0	9.47	100.0	20.8	100.0	0.02	100.0
NPK	Sakha93	92.33	100.0	10..15	100.0	11.72	100.0	23.4	100.0	0.08	100.0
Compost	Sids 1	75.33	--5.45	8.17	--8.41	7.79	--17.74	15.6	-25.0	0.01	-50.0
	Sakha93	91.59	-0.80	9.16	-9.75	9.72	-17.06	17.0	-27.35	0.07	-12.5
EDTA	Sids 1	63.00	-20.92	6.81	-23.65	7.20	-23.97	14.6	-29.81	0.01	-50.00
(mix)	Sakha93	90.02	-2.50	8.70	-14.29	8.94	-23.72	15.6	-33.33	0.05	-37.50
NPK	Sids 1	91.67	+15.06	10.70	+19..96	12.98	+37.06	21.5	+3.37	0.10	+400.00
+	Sakha93	97.33	+5.42	12.20	+20..20	14.30	+22.01	19.5	-16.67	0.13	+62.50
Compost											
NPK	Sids 1	91.00	+14..22	9.8	+9.87	11.10	+17.21	16.8	-19.23	0.10	+400.00
+EDTA	Sakha93	93.00	+0.73	11.47	+13.00	13.47	+14.93	14.1	-39.74	0.11	+37.50
Compost	Sids 1	71.00	-10.88	8.48	--4.93	8.05	-14.99	16.3	-21.63	0.01	-50.0
+	Sakha93	92.10	-0.25	9.63	-5.12	10.59	-9.64	13.2	-43.59	0.08	0.00
EDTA											
Compost+	Sids 1	93.33	+17.15	10.43	+16.93	12.37	+30.62	14.1	-32.21	0.11	+450.00
EDTA+	Sakha93	98.67	+6.87	13.10	+29.10	14.57	+24.32	12.1	-48.29	0.14	+75.00
NPK											
L.S.D.(Y)		N.S.		0.19		N.S.		o.49		0.002	
5%		N.S.		0.44		N.S.		1.15		0.005	
1%											
(T) 5%		N.S.		o.16		1.80		0.31		0.002	
1%		N.S.		0.22		2.44		0.42		0.003	
(TXV) 5%		N.S.		0.36		N.S.		-.73		0.005	
1%		N.S.		0.72		N,S,		1.46		0010	
C.V.		10.31		9.83		9.01		11.3		11.41	

EDTA (Fe, Zn , Mn).

However, combination compost with NPK induced significant response, over NPK, where shoot and radical length (cm) reached to 10.4 and 12.8, respectively for Sids 1and 12.2 and 14.3 respectively for Sakha 93. Also combination of Fe+ Zn + Mn with mineral fertilizer significantly increased seedling dry weight (g) raised from 0.02 up to 0.1 for Sids 1 and from 0.08up to0.11 for Sakha 93 variety compared to NPK alone. While decreased EC of leachiest for both varieties between varieties.Sakha93 had the highest value, except for EC values under study. Moreover, highest significant increased were obtained by application NPK+ compost +Fe+ Zn+ Mn in shoot and radical length reached to 10.43 and 12.37 respectively for Sids 1 and 13.10 and 14.57 respectively for Sakha 93. Corresponding seedling dry weight (g) was 0.11 and 0.14 for Sids 1 and Sakha 93 respectively. On the other hand, least values in EC of leachiest were induced by this treatment, were14.08 and 12.07 for Sids 1 and Sakha 93 respectively. Results in that Table (8) raveled that these parameters were significantly difference

Effect of organic compost, EDTA and NPK fertilization on soil properties:

Table (9) show the effect of compost, EDTA micronutrients and mineral fertilizers on changes in pH, electrical conductivity (EC) and nutrient contents in the soil after wheat harvesting in two seasons. Continuous application of compost alone or in conjunction with NPK fertilizer for two years decreased the soil pH. However, a reverse trend was observed in case of EC. The EC and pH of the soil decreased from its

initial value, when only NPK fertilizer were applied and increased significantly with the application of compost applied alone or with NPK and EDTA fertilizers. The application of compost with or without NPK or EDTA fertilizers could not sustain the original level of N. However, their application increased the available P, K and DTPA extractable Zn, Fe, Mn and Cu content of soil. Application of N, P, K and micronutrients can be avoided with the application of compost or EDTA. The build-up of organic C and nutrient content a higher in surface soil as compare soil initial. These results agreement by Khdshgoftarmanesh and Kalbasi (2002) found that the organic matter applied led to increased the amounts of available macro-(N, P,K) and micronutrients [iron (Fe), manganese (Mn), Zn, and copper (Cu)] in soil, which in turn enhanced soil productivity and crop yield. The effect of all treatments fertilizer on soil characters was significant except available P content in soil.

It is worth mention that the superiority of compost + EDTA +NPK as compared to the other all treatments is more related to the occurrence of active organic acids that released from the compost. These organic acids provided a substantial modification of soil physical properties, especially soil structure as well as soil aggregation and drainable pores. Consequently, these favorable conditions are positively affected soil permeability and

encourage the downward movement of leaching water that enhance progressive removal Na-salt and decrease the pH, EC and available nutrients values El-Bording and El-Dewiny (2008) showed that the chemically available micronutrients show positive correlation with pH, OM, clay content, CEC and ESP. Calcium carbonate content and gypsum content showed negative correlation with different micronutrients. Soil pH is powerful regular of nutrient availability. Manganese, zinc and iron are most available in low soil pH values. As the pH of an alkaline soil, Fe, Mn and Zn availability decreases and deficiencies can become a serious problem, especially on those soils that do not contain appreciable amounts of these elements.

Table (9): Available macro- and micronutrients in soil after wheat harvest.

treatments	pH (1:2.5)	EC dSm-1	Macronutrients (mgkg-1)			Micronutrients (mgkg-1)		
			N	P	K	Fe	Mn	Zn
2007/2008								
NPK	8.12	10.34	61	6.79	189	4.97	3.14	1.35
Compost	8.01	7.64	67	7.35	196	6.35	4.25	1.66
EDTA	8.06	9.17	64	6.84	192	8.25	4.89	2.06
NPK + compost	8.01	4.39	74	7.48	197	6.89	3.69	1.85
NPK +EDTA	8.04	7.53	69	7.22	201	8.32	4.89	2.14
Compost +EDTA	7.98	6.25	78	7.51	214	8.56	5.02	2.16
Compost+ EDTA+NPK	7.93	4.12	82	7.74	216	8.66	5.25	2.22
2008/2009								
NPK	8.06	8.26	66	6.92	196	5.12	4.03	1.41
Compost	7.98	6.47	71	7.58	199	6.72	4.58	1.69
EDTA	8.00	8.10	70	6.96	198	8.36	5.10	1.70
NPK+ + compost	7.96	4.11	77	7.74	203	7.12	4.98	2.05
NPK +EDTA	7.99	6.18	73	8.01	205	8.58	5.43	1.86
Compost + EDTA	7.92	4.54	81	8.12	200	8.66	5.61	2.18
Compost + EDTA+NPK	7.84	4.01	86	8.29	214	8.91	5.73	2.25
L.S.D 5% Fertilizer	0.016	1.28	1.83	Ns	18.39	0.86	0.68	0.32
L.S.D 5 % seasons	0.008	1.18	0.97	ns	ns	ns	0.36	ns

EDTA (Fe, Zn, Mn)

Finely, it can be concluded that the increasing the productivity of wheat crop with good grain quality under saline soil condition of Egypt was occupied using high rates of inorganic fertilizer. Compost or micronutrient (as source of plant nutrition) can not be used as an immediate substitute for

chemical fertilizer, While combination of chemical fertilizer with foliar mixture micronutrients along with manuring the soil with maturated organic such as compost can improve the bio- chemicals media soil and at the same time increasing wheat yield more than the additional mineral fertilization alone.

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تحسين إنتاجية وجودة حبوب القمح بإضافة التسميد المعدني والعضوي مع الرش بالعناصر الصغري تحت ظروف الأراضي الملحية

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الملخص العربي

اجريت تجربة لموسمين زراعيين ٢٠٠٧/٢٠٠٨و٢٠٠٨/٢٠٠٩ ني قرية جلبانة بمنطقة سهل الطينة- شمال سيناء بهدف دراسة مدي استجابة صنفي القمح سدس ١و سخا ٩٣ للتسميد المعدني والعضوي مع إضافة بعض العناصر الصغري (حديد+ زنك+ منجنيز) في صورة مخلبية وتم إستخدام هذة العناصر في محاليل الرش بتركيز٠,٣ حديد +٠,٣ منجنيز +٠,٣ جرام زنك /لتر ماء وتم رش النباتات مرتين الرشة الاولي بعد ٣٠ يوم من الزراعة (طور التفريع) والرشة الثانية بعد ٧٠ يوم من الزراعة (مرحلة طرد السنابل) واستخدم التصميم الإحصائي القطع المنشقة. أظهرت النتائج المتحصل عليها فاعلية التسميد المعدني وتفوقه علي التسميد العضوي والرش بالعناصر الصغري في إحداث آستجابة معنوية لمحصول القمح ومفرداته وبمقارنة صنفي القمح تحت الدراسة وجد أن سخا ٩٣ كان الاكثر إستجابة للمعاملة وتفوق علي صنف سدس ١ في كل الصفات المورفولوجية ماعدا طول النبات حيث وصلت الزيادة النسبية ٧٣,٦٩ & ٤,٤٧ علي التوالي. زيادة معنوية لمحتوي الحبوب من العناصرالكبري (النيتروجين والفوسفور والبوتاسيوم) والعناصر الصغري (حديد - زنك - منجنيز) . كما إرتفعت نسبة البروتين والكربوهيدرات في الحبوب وكما إرتفعت نسبة الإنبات للحبوب بمعدلات مختلفة تبعا للمعاملات . كما إختلفت أطوال الريشة والجذير والوزن الجاف

للبادرة والتوصيل الكهربي للحبوب تبعا للاصناف والمعاملات. كما اوضحت النتائج زيادة EC و pH للتربة وزيادة المتاح من العناصر الكبري والصغري بالمقارنة بالتربة الغير معاملة بالتسميد.

وسجلت النتائج المتحصل عليها ان إضافة العناصر الكبري مع الكمبوست والرش بالعناصر الصغري كان الاكثر تأثيرا في إظهار النتائج المرجوة علي كل التقديرات السابقة التي اجريت في هذة الدراسة لصنفي القمح تحت الدراسة.