

IMPORTANCE OF ORGANIC MANURING AND MINERAL FERTILIZATION FOR WHEAT YIELD AND ITS COMPONENTS IN EL-DAKAHLIA GOVERNORATE .

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ABSTRACT

A factorial field experiment on wheat crop was conducted during two successive growth seasons of (2009/2010) ; (2010/2011) as two different On-farm trials sited in El-Dakahlia Governorate. The factors involved organic manuring from two biological treating composts of rates (0, 10 and 20 m³.fed⁻¹) and NPKZn-mineral fertilization of the optimum recommended rates.

The two experimental sites were clayey in texture have the average values of salinity index E_{Ce} = 3.8 dS.m⁻¹ ; pH = 7.8 and the available soil forms of N , P , K and Zn nutrients were : 30 , 19 , 600 , 0.6 ; respectively.

The obtained results indicated the following points :

- 1-Such soils have to be manured with composts and fertilized with optimum recommended NPKZn-mineral fertilizers for obtaining higher wheat yields.
- 2-Grain and straw yields have been increased significantly as a result of adding organic manuring (in forms of composts). Higher wheat yields were realized by applying (10 or 20 m³.fed⁻¹) treatments.
- 3-The biological treated compost realized economically higher values of wheat yield relative to the untreated one.
- 4-The NPKZn- mineral fertilization with optimum recommended rates has increased the values of such wheat parameters.
- 5-The significant interaction effects of organic composting and NPKZn-mineral co-fertilization indicated that : the highest yield and its component were obtained by applying the treatment of (bio-treating compost of 10m³.fed⁻¹). Along with optimum recommended rates of NPKZn mineral fertilizers.

INTRODUCTION

Wheat is the most important food crop in Msrian Agriculture . More than 2.5 million feddans are cultivated annually with wheat . The average productivity is about 2.7 ton/feddans; where the recent heigh yielding wheat varieties have been cultivated .

Wheat yield is a function of some major variables; i.e Soil fertility , irrigation water, plant variety and fertilization.

Fertilization Whether from organic or mineral sources has a beneficial effects of increasing wheat production. Mineral fertilization has the wide area in the fertility map of Egypt ; but organic manuring has the narrow one.

Organic manure has better effects on soil chemical , physical , biological and subsequent nutritional characteristics for grown crops. Nitrogen, Phosphorus , potassium and Zinc mineral fertilization for wheat ; in optimum recommended rates and under optimum conditions of the other variables ; may maximize fertilizer use efficiency and subsequent higher wheat yields (Genaidy *et al.* 1987 ; Genaidy , 1994 ; Genaidy and Hegazy , 1998 ; 2001 ,

Genaidy *et al* , 2007 ; Ali *et al* , 2011; El-Sirafy *et al.* (2011a) ; El-Sirafy *et al.* (2011b) .

The objectives of this research are to achieve ; in a field experiment in two successive seasons ; the highest yield and yield components of Sakha (94) wheat variety under the different combinations optimum recommended NPKZn –mineral fertilizers rates and organic manures .

MATERIALS AND METHODS

A factorial field experiment (*Triticum aestivum*, L.) was conducted during two successive growth seasons of (2009/2010) ; (2010/2011) and was carried out at Sakha Agric Res. Station , and as On – farm trials sited in Belqass soil (El-Dakhlia Governorate) .

Two biological treating composts (treated and untreated with bacteria were prepared on the farm at Belqass district, El-Dakahlia Governorate ; Egypt, from the natural crop residues i.e. rice straw ; maize stalks; whole green plants maize and farmyard manure (FYM). First heap (compost 1) was uninoculated ; but the other heap (compost 2) was inoculated with compost starter (compost starter is a mixture of effective strains of bacteria and fungus) obtained from Soil microbiology Res. Department; Soils & Water and Environment Research Institute; ARC; Sakha Agric Res; Station. Samples of two biological treating composts were taken after composting and analyzed . Some characteristics are shown in Table 2 .

The factors involved organic manuring from two biological treating composts (treated and untreated with bacteria) of three tested rates (i.e. 0, 10, 20 m³/fed) as well as mineral fertilization of urea, calcium super phosphate, potassium sulphate and zinc sulphate (i. e. 0, N, NP, NPK, NPKZn) of optimum recommended rates (i.e. N = 75 kg N.fed⁻¹ ; P = 30 kg P₂O₅.fed⁻¹ ; K= 24 kg K₂O.fed⁻¹ ; Zn = 5 kg Zn.fed⁻¹ .) .

The statistical experimental field design of split – split plot .

Wheat crop (Sakha 94 high yielding variety was sowed on 18/11/2009 and 17/11/2010 after addition the organic manure and super phosphate fertilizer ; for the two seasons , respectively .

Organic manuring ; NPKZn mineral fertilization , irrigation water requirements and irrigation intervals as well as all the agronomic practices have been applied according to the recommended methods of wheat applied researches.

Wheat growth has been followed by plant sampling through different growth stages . Wheat harvesting began on 4/5/2010 and on 1/5/2011 for the two seasons , respectively for measuring wheat yield and yield components as well as wheat grains quality.

All the soil , organic manure and wheat characteristics determinations were done according to the standard methods mentioned by Black (1965) , Chapman and Pratt (1961) and Jackson (1972) and A. O. A.C (1990) According to Snedecor and Chochran , 1971 and using the technique by means of COSTAT- C. computer soft ware Package .

Some soil fertility characteristics could be summarized in table (1) as follows :

Table (1): Some soil fertility characteristics of the two experimental sites .

Soil fert.characteristics	Site 1 (1st season)	Site 2 (2nd season)
Soil texture class	(24.2 % Sand, 24.1% silt, 51.7 % clay) clayey	(24.2% sand, 23.8% silt, 52.0 % clay) clayey
Soil salinity index (ECe at 25 °c)	3.86 dS.m ⁻¹	3.90 dS.m ⁻¹
Soil-pH (1:2.5 susp.)	7.86	7.90
CaCO ₃ (calcimeter method)	1.89 %	2.00 %
O.M.(Walkly & Black method)	1.65 %	1.60 %
Available N(K-sulfate extract)	31 ppm	28.2 ppm
Available P (Olsen -extract. P)	21 ppm	18 ppm
AvailableK(Am-acetate extract .)	624 ppm	600 ppm
Available Zn (DTPA-extract)	0.60 ppm	0.62 ppm

Table (2): Some physicochemical and biological of the tested organic manure (bio treat. Composts).

Soil exp. Site (growth season).	Site 1 (2009/2010)		Site 2 (2010/2011)	
Organic man. (bio. Treat. Compost).	Compost 1	Compost 2	Compost 1	Compost 2
Physico.chem. and biological properties:				
Moisture content	29 %	30 %	30 %	31 %
Dry matter	71 %	70 %	70 %	69 %
Bulk density (g/cm ³)	0.423	0.418	0.420	0.416
Weight of cubic meter	423.2 kg	418.40 kg	420.50 kg	416.60 kg
Organic matter (D.M)	37.93 %	34.48 %	41.43 %	43.10 %
Organic carbon (C)	22 %	20 %	24 %	23 %
Total nitrogen (N)	1.12 %	1.01 %	1.30 %	1.35 %
C/N ratio	19.60	19.80	18.46	18.52
pH (1 : 10 extract)	7.8	7.8	7.9	7.8
EC (1: 10 extract)	3.70 ds.m ⁻¹	3.65 ds.m ⁻¹	3.4 ds.m ⁻¹	3.50 ds.m ⁻¹
Some nutrients concentrations:				
Total-P	0.475 %	0.469 %	0.688 %	0.685 %
Total-K	1.84 %	1.68 %	2.51%	2.35 %
Total-Zn	0.95 ppm	1.0 ppm	2.41 %	2.35 ppm
Total count of microbes	10⁵×70	10⁵×83	10⁵× 73	10⁵×85

RESULTS AND DISCUSSION

The data obtained from the experiment conducted at the two seasons ; were statistically analyzed and presented here under the following two titles:

- 1) General effects of the main variables i.e. organic manuring biological treating ; organic manuring rate and NPKZn-Mineral fertilization on wheat crop yield and yield components .
- 2) Interaction effects between the above mentioned variables on some plant parameters .

1-General effects of main variables :

Organic manuring biological treating effects :

As shown in table (3) , the values of grain and straw yields as well as grain/straw ratios have been differed according to the biological manure treating . For the first season the values of such parameters were higher

relative to the second seasons. For straw yields there were no significant differences ; but the values of grain yield and grain/straw ratio related to compost₂ were higher than compost₁. But for the second season ; straw yields resulted from compost₂ increased by (10% and 20%) over compost₁ respectively. But the differences due to grain yield was non significant , and the grain/straw ratio due to compost₁ was higher than compost₂

ata in Table (3) also reveals that ; increasing organic manuring rate led to increase in grain and straw yields where the parallel increments due to (org. man₁₀ ; org.man₂₀ treatments were [(0% , -1.0%) ; (31% , 32%)] for grain yield and [(5% , 6%) ; (12% ; 12%)] for straw yield and for the two seasons respectively. For grain/straw ratio , it decreased by increasing org. Man. rate (at 1st season) but the opposite direction took place (at 2nd season) , and the highest value of (0.585) resulted by applying org.man₁₀ rate .

t can be concluded that , this trend may be due to that the enriched compost has enough values of macro , micro nutrients and has high amount of need bacteria , fungi and actinomycetes .

he results were reported by Tartoura et al. (2005) , Shoman et al. (2006) and Zein et al. (2000) and who observed that yield and its components were significantly affected by adding organic fertilizer.

Table (3) : Main effects of organic manuring and mineral fertilization on wheat grain and straw yields as well as grain / straw ratio for the two seasons

Wheat characteristics.	Grain yield (kg / plot)		Straw yield (kg / plot)		Grain / Straw ratio	
	1 st	2 nd	1 st	2 nd	1 st	2 nd
Growth seasons						
Fertilization class :						
1. Organic manure:						
a-Bio.treating:						
Compost (1)	4.032	3.473	9.050	6.654	0.457	0.557
Compost (2)	4.102	3.469	8.724	7.958	0.483	0.461
LSD (0.05)	0.064	N.S	N.S	0.215	0.018	0.013
b-Rate (m³/fed) :						
0	4.186	2.872	8.582	6.393	0.491	0.456
10	4.186	3.763	8.982	7.149	0.476	0.585
20	3.939	3.778	9.099	7.927	0.442	0.485
LSD (0.05)	0.150	0.114	0.301	0.203	0.023	0.026
2.Mineral fertilizer (fert. Unit/fed.)						
0	3.494	2.811	7.730	6.440	0.473	0.446
N	4.419	3.750	10.010	8.015	0.449	0.480
NP	4.050	3.389	8.774	6.748	0.475	0.553
NPK	4.200	3.688	8.753	6.793	0.487	0.575
NPKZn	4.174	3.718	9.172	7.784	0.465	0.491
LSD (0.05)	0.173	0.118	0.458	0.229	N.S	0.029

Notes:

1-a. Each value due to org. man. bio.tr. is a mean of 60 varieties (3 org. man. rate. × 5 min. fert. rate × 4 rep.)

1-b. Each value due to Organic manure rate is a mean of 40 varieties (2 org. man. bio.tr. × 5 Min. fert. rates × 4 rep.) 2- Each value due min. fert. is a mean of 24 varieties (3 Org. man. rate × 2 org. man. bio.tr. × 4 rep.).

The same table (3) also indicated that ; wheat grain and straw yields significantly increased as NPKZn-mineral fertilization increased. For the first season ; higher values were obtained by applying (NPKZn) treatments ; with parallel increments of (19% ; 18%) for that parameters , respectively. As for the second season ; the same (NPKZn) treatments also realized the higher values with related increments of (32% ; 21%) for such parameters , respectively. The highest grains/straw ratios of (0.487 , 0.575) were realized by applying (NPKZn) treatments for the two seasons , respectively.

It can be conducted that , the increases in the yield of wheat crop due to raising the NPKZn doses can be attributed to the beneficial effects i.e. nitrogen encourage meristematic activity for producing more tissues , organs since nitrogen is a constituent of protein , nucleic acids. Phosphorus plays a vital role in crop production and is involved in energy transfer in plants . it also a constituent of cell nucleus . phosphorus has been reported to increase the strength of cereal straw , stimulate root development , fruit production . Potassium is play a role important from carbohydrate productions. Zinc is know to play a very important role in chemical process in plants .

These results were confirmed with the findings of Ali et al (2008) , Gutpa (2003) , Parihar (2004), Abd El-Hameed and Omar (2006) concluded that, increasing N levels up to 105 Kg/fed. significantly increased yield and yield components.

2- Interaction effects :

Organic manuring rate × mineral fertilization effects :

Table (4) shows that wheat grain and straw yields as well as grain/straw ratio have been affected by the organic manure rate × mineral fertilizers co-fertilization . For the first season ; the highest values were obtained by applying [(org. man_(0,0) × N) ; (org. man₁₀ × NP)] ; [org. man_(0,0) × N) ; (org. man₁₀ × N)] treatments with increments of (56 % ; 50%) ; (100 % ; 87 %) for such parameters respectively. The highest grain/straw ratios of (0.594 ; 0.721) were realized by applying (org. man_(0,0) × min.fert_(0,0)) and (org.man₁₀ × NP) treatments respectively.

With respect of the second season ; the highest values of grain and straw yields were obtained by applying the treatments of [(org.man₁₀ × N) ; (org. man₂₀ × NPKZn)] with parallel increments of (88.5 % ; 95 %) , (65 % ; 70 %) over the control (org. man_(0,0) × min. fert_(0,0)) treatment ; and for such parameters respectively. The highest grain/straw ratios of (0.812 ; 0.721) were found by applying (org. man₁₀ × NP) and (org. man₁₀ × NPK) treatments ; respectively.

Table (4): Organic manuring × mineral fertilization interaction effects on wheat grain and straw yields as well as grain / straw ratio for the two seasons .

Wheat characteristics.			Grain yield (kg / plot)		Straw yield (kg / plot)		Grain / Straw ratio	
Growth season			1 st	2 nd	1 st	2 nd	1 st	2 nd
Treatments								
No.	Org. man. (m ³ /fed.)	Min. fert. (F. unit/fed)						
1	0	0	3.110	1.973	5.257	5.360	0.594	0.370
2		N	4.855	3.143	10.815	8.018	0.451	0.393
3		NP	3.750	2.561	8.616	5.978	0.445	0.431
4		NPK	4.165	3.090	9.123	6.030	0.468	0.533
5		NPKZn	4.505	3.595	9.099	6.579	0.498	0.555
6	10	0	3.605	3.221	9.290	7.089	0.391	0.481
7		N	4.213	3.594	9.848	8.839	0.433	0.416
8		NP	4.658	4.141	8.237	5.899	0.576	0.812
9		NPK	4.381	4.139	8.010	6.258	0.550	0.721
10		NPKZn	4.071	3.720	9.524	7.664	0.431	0.498
11	20	0	3.767	3.240	8.642	6.873	0.435	0.488
12		N	4.188	4.513	9.362	7.190	0.464	0.630
13		NP	3.742	3.465	9.469	8.369	0.404	0.416
14		NPK	4.055	3.834	9.128	8.091	0.444	0.472
15		NPKZn	3.945	3.840	8.893	9.110	0.465	0.420
L.S.D. (0.05)			0.299	0.204	0.794	0.204	0.058	0.050

Notes :

Each values in the table due to interaction effect . is a mean of 8 varieties (2 org. man.bio.tr. ×4 rep.) .

Organic manure bio-treating × mineral fertilization effects:

Table (5) indicates that grain and straw yields as well as grain/straw ratios have been affected by the organic manure bio-treating × mineral fertilizers co-fertilization . With respect of the first season ; the highest values were obtained by applying the treatments [(compost₂ × N) ; (compost₂ × NPK)] ; [(compost₁ × N) ; (compost₂ × N)] with parallel increments of (30 % , 25 %) ; (30.5 % , 28 %) for the three parameters ; respectively. The highest grain/straw ratios of (0.483 , 0.534) were obtained by applying the treatments of (compost₂ × NP) ; (compost₁ × NPK) ; respectively. As for the second season , the highest values of the same yield components were obtained by applying the treatments of [(compost₁ × NPKZn) ; (compost₂ × NPK)] ; [(compost₂ × N) ; (compost₂ × NPKZn)] with parallel increments of (57 % ; 22 %) , (24 % , 21 %) over the control treatments and for such parameters ; respectively. The highest grain/straw ratios of (0.667 ; 0.641) were found by applying (compost₁ × NP) and (compost₁ × NPK) treatments ; respectively.

The Positive effects of compost on wheat yield and its components are mainly due to improving the soil physical and chemical properties . More over compost is considered as an important source of humus ; macro and microelements carrier , and in the same time , increase the activity of the useful microorganisms. Similar results were gained by Abd El-Rasoul et al. (2003), Ali et al. (2005) .

Table (5): Organic man. biological treating × mineral fertilization interaction effects on wheat grain and straw yields as well as grain / straw ratio for the two seasons.

Wheat characteristics.			Grain yield (kg / plot)		Straw yield (kg / plot)		Grain / Straw ratio	
Growth season			1 st	2 nd	1 st	2 nd	1 st	2 nd
Treatments								
No.	8.610	Min. fert. (F. unit/fed)						
1	11.460	0	3.444	2.495	7.697	6.115	0.468	0.421
2	9.634	N	4.476	3.838	10.048	7.622	0.453	0.513
3	9.661	NP	4.232	3.566	9.309	6.068	0.467	0.667
4	11.273	NPK	3.817	3.552	8.852	6.109	0.440	0.641
5	9.894	NPKZn	4.193	3.914	9.347	7.358	0.454	0.544
6	12.070	0	3.543	3.128	7.762	6.766	0.478	0.471
7	10.641	N	4.361	3.661	9.969	8.409	0.445	0.447
8	11.300	NP	3.868	3.213	8.239	7.428	0.483	0.439
9	11.741	NPK	4.584	3.823	8.655	7.477	0.534	0.509
10	0.316	NPKZn	4.154	3.523	8.997	8.211	0.475	0.438
L.S.D (0.05)			0.244	0.166	0.648	0.166	0.048	0.041

Notes :Each values in the table due to interaction effect . is a mean of 12 varieties (3 org. man.rate ×4 rep.)

Organic man. bio-treat. × org. man. rate × mineral fertilization :

Table (6) reveals that the interactions between the main variables on wheat grain and straw yields as well as grain/straw ratios were significant for the two growth seasons. With respect of the first season , the highest values were obtained by applying the treatments [(compost₁ × org. man.₁₀ × NPKZn) ; (compost₁ × org . man.₁₀ × NP) ; (compost₂ × org. man.₂₀ × NPK)] ; [(compost₁ × org. man.₂₀ × NPKZn) ; (compost₂ × org. man.₁₀ × NPKZn)] with parallel increments of (59% ; 49%) ; (100% ; 94%) over the control treatments and for the three parameters , respectively. The highest grain/straw ratios of (0.560 ; 0.593) were obtained by applying the treatments of (compost₁ × org. man.₁₀ × NP) ; (compost₂ × org.man.₁₀ × NP) ; respectively.

As for the second season ; the highest values of the same yield components were realized by applying the treatments of [(compost₁ × org. man. 20 × NPKZn) ; (Compost₂ × org. man.20 × NPK)] ; [(compost₁ × org. man₂₀ × NPKZn) ; (compost₂ × org. man.₁₀ × N)] with related increases of (145% ; 26%) ; (73% ; 90%) over the control treatments and for such yield components , respectively. The highest grain/straw ratios of (1.157 ; 0.649) were got by applying (compost₁ × org. man.₁₀ × NP) ; (compost₂ × org.man.₁₀ × min. fert. 0.0) Treatments , respectively.

This is might attributed to the integrated use of inorganic fertilizers with organic manure sustains higher crop yield, maintain soil health and gave the optimum availability of NH₄⁺, NO₃⁻, P, K availability microelements . These results are confirmed with those obtained by Hammad et al., (2006) , Hammad et al (2011) and Naeem (2006).

Table (6) : Organic manuring bio-treat. and rate × mineral fertilization interaction effect on wheat grain and straw yields as well as grain / straw ratio for the two seasons.

Wheat characteristics.			Grain yield (kg / plot)		Straw yield (kg / plot)		Grain / Straw ratio		
Growth season			1 st	2 nd	1 st	2 nd	1 st	2 nd	
Treatments No.	Org. manuring. (m ³ /fed.)		Min. fert. (F. unit/fed)						
	Bio.tr.	M ³ /fed.							
1	Compost (1)	0	0	3.083	1.905	5.132	5.455	0.598	0.351
2			N	4.990	3.150	10.140	8.270	0.490	0.381
3			NP	3.840	2.360	9.833	6.043	0.395	0.392
4			NPK	3.690	3.280	10.080	5.705	0.368	0.606
5			NPKZn	4.500	3.770	8.838	6.240	0.513	0.605
6		10	0	3.410	3.150	8.900	5.394	0.388	0.586
7			N	4.275	3.725	9.865	7.690	0.440	0.485
8			NP	4.914	4.663	8.946	4.038	0.560	1.157
9			NPK	4.320	4.315	7.740	4.765	0.558	0.929
10			NPKZn	3.920	3.513	8.808	6.393	0.448	0.555
11		20	0	3.840	2.430	9.060	7.495	0.420	0.328
12			N	4.163	4.640	10.138	6.905	0.430	0.672
13			NP	3.943	3.675	9.148	8.125	0.445	0.452
14			NPK	3.440	3.060	8.735	7.858	0.395	0.390
15			NPKZn	4.160	4.460	10.396	9.440	0.403	0.473
16	Compost (2)	0	0	3.138	2.040	5.383	5.265	0.590	0.388
17			N	4.720	3.135	11.490	7.765	0.413	0.405
18			NP	3.660	2.763	7.400	5.913	0.495	0.470
19			NPK	4.640	2.900	8.165	6.355	0.568	0.461
20			NPKZn	4.510	3.420	9.360	6.918	0.483	0.506
21		10	0	3.800	3.293	9.680	8.784	0.395	0.376
22			N	4.150	3.463	9.830	9.988	0.425	0.347
23			NP	4.403	3.620	7.527	7.760	0.593	0.467
24			NPK	4.443	3.963	8.280	7.750	0.543	0.513
25			NPKZn	4.233	3.928	10.240	8.935	0.415	0.442
26		20	0	3.694	4.050	8.224	6.250	0.450	0.649
27			N	4.214	4.385	8.586	7.475	0.498	0.588
28			NP	3.542	3.255	9.790	8.613	0.363	0.380
29			NPK	4.670	4.608	9.520	8.325	0.493	0.554
30			NPKZn	3.730	3.220	7.390	8.780	0.528	0.367
L.S.D.(0.05)				0.423	0.288	1.123	0.561	0.083	0.071

Notes :

Each value in the table due to interaction effect is a mean of 4 varieties (4 replicates) .

CONCLUSION

From the above mentioned results it could be concluded that; The wheat yield components have been increased by applying organic man. bio.treating composts along with NPKZn mineral fertilization comparable to un-biotreating treatments. Also The highest values were obtained by applying the treatment (org. man.₁₀ m³.fed⁻¹ + recommended NPKZn rates) .

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أهمية التسميد العضوي والمعدني لمحصول القمح و مكوناته بمحافظة الدقهلية
زكريا مسعد الصيرفي*، سعيد أبو زيد جنيدي** و خلود أحمد النقمة** .
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**معهد بحوث الأراضي والمياه والبيئة - مركز البحوث الزراعية - (الجيزة) .

أقيمت تجربة عاملية حقلية على محصول القمح خلال موسمين متتاليين (2010/2009) ؛ (2011/2010) كحثين مزرعيين بموقعين مختلفين بأراضي مركز بلقاس (محافظة الدقهلية) . وكانت العوامل تحت الدراسة هي : أ- نوعية السماد العضوي (سماد عضوي بلدي مصنع بالمزرعة - كمبوست - ملقح بيكتريا متخصصة وغير ملقح) ؛ ب - معدل إضافة السماد العضوي (صفر ، 10 ، 20 م³/ فدان) ؛ ج - إضافة الأسمدة المعدنية في خمس مع معاملات تشمل الإضافات بمعدلات مناسبة موصى بها هي (1- بدون إضافة أسمدة ؛ 2- سماد - ن ؛ 3- أسمدة - ن فو ؛ 4- أسمدة - ن فو بو ؛ 5- أسمدة - ن فو بو ز) .
أستخدم التصميم الاحصائي التجريبي الحقل ذي القطع المنشقة مرتين . وكانت متوسطات تتضمن صفات خصوبة التربة كالآتي :

قوام طيني ؛ دليل الأملاح 3.8 ديسيمنز/م ؛ دليل الحموضة (ريد) 7.87 ؛ المادة العضوية 1.65% ؛ كربونات الكالسيوم 1.9% ؛ والصور الصالحة لعناصر ن ، فو ، بو ، ز كانت 30 ؛ 19 ؛ 600 ، 0.6 جزء في المليون على التوالي .
ولقد أوضحت النتائج الآتي :

- 1- لمثل هذه الأراضي والتي تبين أنها تحتوى كميات قليلة من المادة العضوية والصور الصالحة من عناصر ن ، فو ، بو ، ز . والتي يتطلب زراعتها بالقمح (صنف سخا 94) ؛ يجب أن تسمد عضويا بالسماد البلدي المصنع بالمزرعة - كومبوست - فقط ؛ أو بالإضافة إلى الأسمدة المعدنية لعناصر (ن) أو (ن فو) أو (ن فو بو) أو (ن فو بو ز) وذلك للحصول على عائد محصولي عالي من القمح .
- 2- لقد أدت إضافات السماد البلدي المصنع إلى زيادة محصول القمح ومكوناته . ولقد تحققت أعلى زيادات في المحصول باستخدام المعاملات (10 أو 20 م³/ ف) ؛ حيث كان متوسط الزيادات (9% ، 16%) فوق معاملة المقارنة (بدون إضافة سماد عضوي) ؛ وذلك لمكونات محصول القمح (الحبوب والقش) ؛ على الترتيب .
- 3- ولقد حقت إضافة السماد العضوي المعامل حيويًا قيمًا عالية لمكونات محصول القمح بالمقارنة بالسماد العضوي الغير معامل .
- 4- ولقد أدت إضافات الأسمدة المعدنية لعناصر (ن ، فو ، بو ، ز) بالمعدلات المناسبة إلى زيادات في مكونات محصول القمح بنحو (20% ، 26%) فوق معاملة المقارنة ، على الترتيب .
- 5- ولقد أدى التفاعل بين هذه العوامل كتسميد مشترك بين السماد العضوي والأسمدة المعدنية إلى النتائج الآتية :

لقد تحققت أعلى زيادات في مكونات محصول القمح وذلك بتطبيق معاملة (التسميد المشترك من السماد العضوي المعامل حيويًا وبمعدل 10 م³/ ف بالإضافة إلى المعدلات المناسبة الموصى بها من الأسمدة المعدنية لعناصر (ن ، فو ، بو ، ز) .

قام بتحكيم البحث

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