Improvement Of Sandy Soil Properties Under Sprinkler Irrigation Using Natural Conditioners.

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ABSTRACT

Field experiment was designed in winter season of 2002and 2003 at El-yasha village, El –Nobareya newly .The aim of this study was to evaluate the effect of some organic manure [Poultry manure (PM), Cattle manure (CM) at 0,10,and 20 m^3/fed.] and different inorganic (NPK) fertilization levels: Zero (control), 50 %NPK or 100 %, NPK on soil properties and grain productivity of a sandy soil.

Obtained results showed that the additions of the wastes and NPK had decreased soil bulk density, saturated hydraulic conductivity and wind erosion index "WEI", but increased total porosity, soil aggregation, mean weight diameter "MWD", structure coefficient "SC", water retention at different potentials as well as the organic matter contents of the soil. The best treatment was found to be {20m^3/fed "PM"+NPK100 %]

There were positive and significant correlation's between organic matter and water retained at the 0.3, 1.0, 3.0, 5.0, 10.0, and 15.0 bar potentials, total and readily –available water and macroporosity, but a negative correlation with bulk density and saturated hydraulic conductivity.

The results indicated that increasing the rates of organic manure application up to 20m^3/fed. resulted in a decrease in soil pH by7.3% and 4.2% for PM and CM, respectively and an increase in soil salinity compared with untreated soil.

The results demonstrated that the significant increase in grain yield was obtained with addition of 10 and 20 m^3/fed organic manure (PM) under mineral fertilizers rates of 50 or100 % NPK /fed. This reflected on significant increases in the uptake of macro nutrients and grain yield.

From the aforementioned discussion, it could be said that the addition of organic manure to sandy soils leads to improvement of their soil properties and consequently, crop yield. The importance of using the rate of the mineral fertilizer is not only recognized as an economical factor, but it is an important factor in reducing the nitrate pollution of the groundwater as well as the other induced N losses.

Key words: Sandy soil, inorganic, poultry manure, cattle manure, soil properties and wheat grains.

INTRODUCTION

The increase in population in Egypt requires putting new desert land, that occupies about 96% of the total area, under cultivation such as sandy and calcareous soils.

El-Nobareya newly region is classified as sandy soil which contain low total and available essential plant nutrients as well as organic matter. They have inadequate water retention. Under such severe conditions, the productivity of different crops tends to decrease markedly .The resultant widespread chemical fertilizers demand and their high prices make their use uneconomic for certain crops in sandy soils .It is widely recognized that organic substances play a direct role in sustaining soil fertility, as they are sources of plant nutrients .The addition of organic manure, particularly to newly reclaimed sandy soils, is of vital importance. Amendment of the soil with organic manure improves their physical and chemical properties which in turn influence, the growth and development of plants (Ains &Egolum, 1980 and Hussein and AbdEl-Aziz 1992).

Salter & Williams, (1963); Nuttal, (1970) and Mbagwu, (1985) evaluated the effect of organic waste composts on the hydro – physical properties of a desert sandy soil . Salter, et al. (1967) and Abdel –Aziz et al. (1996) found that the application of farmyard manure didn't show any change in soil texture, while soil bulk density was decreased as well as infiltration rate and hydraulic conductivity were increased. The combination of organic and inorganic fertilizers resulted in greater values of apparent net inorganic release than those obtained when each applied singly (Metwally and Khamis, 1998).On the other hand, using organic wastes decreased soil pH values, which lead to increasing nutrient availability and supply (Dahdoh and El –Hassanin 1994)

Application of organic manure in combined with the recommended dose of mineral fertilizers caused a substantial increase in the soil nutrients availability than those obtained when each was applied alone (El –Fayoumy and Ramadan, 2002).

The aim of this study was to evaluate the effect of organic amendments application poultry manure and cattle manure on soil properties and wheat productivity .The comparison between organic amendments and mineral fertilizers, as a source of plant nutrition was included.

MATERIALS AND METHODS

Field experiment was conducted on the farm at El- Yasha village El-Nobaria newly to evaluated the effect of organic and inorganic manures on some physical and chemical Properties of a sandy soil under sprinkler irrigation system .The main characteristics of the experimental soil and organic manures are given in Tables (1&2).

The experimental design was a randomized complete block with four replications of each treatment; the size of each plot was $15m^2$. Three levels of inorganic (NPK) fertilization (0,50%and100%). Two manures with three rates of each manure (0,10 and $20m^3$/fed). So, the experimental treatments were as follows:

1-control: no organic manure no mineral fertilizers.
2- mineral fertilizers (NPK) rates 50 %.
3-mineral fertilizers (NPK) rates100 %.
4-poultry manure (PM) rates 10 m^3/fed.
5-poultry manure (PM) rates 20 m^3/fed.
6-cattle manure (CM) rates10 m^3/fed.
7-cattle manure (CM) rates 20 m^3/fed.
8-mineral fertilizers (NPK) 50 %+poultry manure (PM) 10 m3/fed.
9- mineral fertilizers (NPK) 50%+ poultry manure (PM) 20 m3/fed.
10- Mineral fertilizers (NPK)50 % + cattle manure (CM) 10 m3/fed.
11- Mineral fertilizers (NPK)50 % + cattle manure (CM) 20 m3/fed.
12- Mineral fertilizers (NPK)100%+poultrymanure (PM) 10 m^3/fed.
13- Mineral fertilizers(NPK)100%+poultry manure (PM) 20 m^3/fed.
14- Mineral fertilizers(NPK)100 % + cattle manure (CM) 10 m^3/fed
15- Mineral fertilizers (NPK)100%+ cattle manure (CM) 20 m^3/fed.

The NPK (100%) fertilizer was prepared by mixing350kg ammonium nitrate (33.5 %)/fed. which applied at seven equal doses through season, 200 kg superphosphate (15.5 %)/fed. added before planting and 50kg potassium sulphate (48 %)/fed. after 30 days from planting.

Wheat seeds (Triticum aestivum L.) sakha 93 at the rate of 60kg/fed was the tested crop, sown on 15th November 2002. The ^{lst} irrigation was immediately took place after sowing.

Table (1) Soil chemical and physical analysis of the investigated soil at El- Nobaria newly area (El-yasha village) for the experimental year 2002.

Parameter	Value
Soil PH (1:2.5) sat.soil ext.	7.82
EC (ds/m)	0.36
OM %	0.26
Total N %	0.022
Available P (ppm)	1.44
Available K (ppm)	63.34
Sand %	88.66
Silt %	2.14
Clay %	9.20
Soil Texture Class	Sandy
Hydraulic Conductivity (cm/min)	14.24
Bulk density (g/cm3)	1.43

Table (2) Analysis of conditioners used as a soil improvement in the current study.

Variable	Poultry manure	Cattle manure
PH (1:2.5)	7.58	8.9
EC (ds/m)	8.32	2.9
OM %	24.41	5.57
Total N %	1.13	0.23
Available P (ppm)	55.15	11.57
Total K%	0.23	0.05
CEC meq/100g soil	86.95	52.17
Moisture %	1.63	3.06

The following soil properties were determined:
Bulk density (BD) ,particle density (PD),Saturated hydraulic conductivity (K_s)and organic matter by .(Black ,1982)Total porosity was calculated from the equation (TP)=1-BD/PD
Where: PD=2.68g/cm^3

That is the volume of water present in the soil (at 0.1 bar) relative to the volume of the soil pores. Soil moisture characteristic curves were determined exposing the completely saturated samples to constant suction levels of 0.3,1.0, 3.0, 5.0, 10.0 and 15.0bar using

the pressure cooker, (Black, 1982). Total available water was obtained as the difference between the 0.3 and 15 bar. Readily – available water (RAW) regarded as the 0.3 minus 5 bar water contents, while the less –readily available water (DAW) was the 5.0 minus 15.0 bar water contents.

Water stable aggregates, the wet sieving technique of Yoder (1936), and modified by Ibrahim (1964) was used to dermine the percentage of water stable aggregation in undisturbed crumble soil samples using a set of sieves having 2.00,1.00,0.5 and 0.25 mm screen openings. The parameter that he called the mean weight diameter (MWD) is equal to the sum of products of (i) the mean diameter, $\bar{x}_i$, of each size fraction and (ii) the proportion of total sample

Weight, wi, occurring in corresponding size fraction, where the summation is carried out over all n size fraction, including the one the passes through the finest sieve:

$$MWD = \sum_{i=1}^{n} \bar{X}_i \square V_i$$

and structure coefficients (SC) were estimated:

$$SC = \frac{\% \text{ Aggregate} \leq 0.25\text{mm diameter}}{\% \text{ Aggregate} > 0.25\text{mm diameter}}$$

Wind erosion Index (WEI) was calculated according to Vandeveldel et. al. (1974) as Follows:

$$EI = \frac{\text{Aggregates} < 1.0\text{mm(untreated treatment) i.e. control}}{\text{Aggregates} < 1.0\text{mm(treated treatment)}}$$

Plant samples were subjected to chemical analysis for the available macronutrients (N, P and K) according to Jackson (1973).

RESULTS AND DISCUSSION

*** Saturated hydraulic conductivity:**

Results in Table (3) indicate that the increase in organic wastes rate caused a considerable decrease in saturated hydraulic conductivity in soil. This reduction could be attributed to the migration of fine particles of organic wastes causing the clogging of macropores or a reduction in the pore size. Also, results reveal that the reduction in saturated hydraulic conductivity was highly significantly decreased with increasing organic manure. These decreases were equivalent to 68.27 and 26.96 %, respectively below

the untreated plots. These findings may de due to that organic manure, which leads to raise of soil water holding capacity and the consequently increase of soil matrix potential as a result of increasing soil surface area (Hillel, 1982).

Table (3) Hydraulic conductivity as affected by the organic manures and (NPK) fertilization of the studied soil.

Treatment NPK %	Hydraulic conductivity (cm/min)					
	Control	P M m^3/fed		CM m^3/fed		mean
		10	20	10	20	
0	15.76	5.58	5.00	11.51	9.61	9.49
50	15.40	5.56	4.99	11.00	9.35	9.26
100	11.55	5.49	4.84	10.91	5.82	7.72
Mean	14.24	5.54	4.94	11.14	8.26	8.82
Treatment NPK %	Organic matter %					
0	0.193	0.521	0.616	0.215	0.433	0.396
50	0.197	0.539	0.624	0.223	0.443	0.405
100	0.210	0.548	0.625	0.222	0.45	0.411
Mean	0.197	0.536	0.622	0.22	0.442	0.404
L.S.D 5 % (H.C)						
Rate Wastes		0.78044		0.06145		
Rate Fert.		0.60452		0.0476		
Rate Fert X rate Wastes		3.313		n.s		

These results are in agreement with those of Hamouda et al. (1999). Pore space has a direct effect on soil productivity due to its influence on water –holding capacity and upon the movement of air, water and roots through the soil. It is clear that the effect of inorganic manure levels does not exceed more than 14 and 2 % reduction, respectively. The interaction effect between (organic X inorganic manure) gave significant effect on hydraulic conductivity.

Water stable aggregates:

Table (4) shows the effect of the different applied rates of organic manure under different inorganic manure levels on the water stable aggregates. Obtained data indicated that, different fractions was slightly affected, but did not show any change in soil texture .It can be noticed that there was an increase on aggregate

size distribution by increasing organic manure and inorganic manure.

Generally, the highest values of water stable aggregates were recorded at the rate of 20m^3 (PM)/Fed.with100%NPK (52%), which may be attributed to the cemmenting effect of organic materials for the fine particles of soil and consequently improve the massive structure to a granulated state.

Results regarding aggregate parameters of SC, MWD and WEI followed a apparently pattern compatible with those of aggregate parameters and manifested to total aggregates and their size distribution.

Table (4) Comparison between organic manures and inorganic (NPK) on aggregate size distribution and aggregate parameters of the sandy soil..

Treatments		Rates	Water stable aggregates %				Aggregate Parameters			
Fret. NPK %	Soil Conditioners	m^3/fed	>2.0 mm	2.0 - 1.0	1.0 - 0.5	0.5 - 0.25	T A	MWD	WEI	SC
0	Control	0	0.61	6.01	9.34	11.00	26.96	0.222	1	0.37
	P M	10	0.74	9.19	13.15	16.95	40.03	0.325	0.66	0.67
		20	0.88	11.83	14.46	19.84	47.01	0.39	0.52	0.88
	C M	10	0.69	7.10	10.42	11.93	29.51	0.25	0.85	0.42
		20	0.71	7.10	11.01	12.79	31.61	0.261	0.85	0.46
50	Control	0	0.66	6.12	10.00	11.33	28.11	0.232	0.98	0.39
	P M	10	0.80	10.42	13.8	17.10	42.12	0.348	0.59	0.73
		20	0.95	12.25	15.62	20.17	48.99	0.409	0.5	0.96
	C M	10	0.74	7.33	11.11	13.75	32.93	0.27	0.82	0.49
		20	0.74	8.98	12.15	14.88	36.75	0.307	0.68	0.58
100	Control	0	0.63	6.89	10.45	11.63	29.6	0.247	0.88	0.42
	P M	10	0.83	11.09	14.00	17.34	43.26	0.362	0.55	0.76
		20	0.96	13.15	17.61	20.19	51.91	0.438	0.47	1.07
	C M	10	0.74	8.18	11.61	13.85	34.38	0.287	0.74	0.52
		20	0.76	9.00	13.25	17.00	40.11	0.321	0.66	0.68

T A = Total aggregates. SC = Structure Coefficient.
MWD = Mean weight diameter .W EI = Wind erosion Index.

Bulk density and porosity:

Data presented in Table (5) shows that the values of soil bulk density significantly decreased with increasing the applied rates of organic manure .It was decreased by 16%and 14% with

increasing the organic manure application up to 20m^3/fed for PM and CM treatments, respectively. This finding can be attributed to the low specific gravity of soil products in and consequently, decreases bulk density. Gouda, (1984) found a significant linear correlation between increasing the content of soil organic matter and the variations of bulk density in a sandy and a loamy soil.

Regarding the effect of inorganic manure level treatments on bulk density, they did not exceed than 2 at 3 % .The interaction effect between (organic manure X inorganic manure) gave great variations in bulk density or total porosity.

Results regarding the effect of inorganic (NPK) and the interaction were not significantly different. The consequence of the decreased of soil bulk densities was a corresponding increase in total porosity, relative improvement in total porosity over the control. The increase in total porosity was due mainly to an increase in the percentage of the macropores (Table 5).

Table(5) Bulk density and macroporosity as affected by additions of organic manures and NPK Fertilization of the studied soil.

Treatment NPK %	Bulk density g/cm^3					
	Control	PM m^3/fed		CM m^3/fed		mean
		10	20	10	20	
0	1.46	1.28	1.23	1.38	1.26	1.32
50	1.42	1.23	1.16	1.36	1.23	1.28
100	1.41	1.20	1.06	1.28	1.23	1.23
Mean	1.43	1.24	1.15	1.34	1.24	1.27
Treatment NPK %	Macroporosity%					
0	41.95	46.69	47.12	42.72	46.30	44.25
50	42.92	47.55	48.77	43.14	47.17	45.91
100	42.35	48.04	50.46	45.64	46.85	46.67
Mean	42.41	47.39	48.78	43.83	46.77	45.61

L.S.D 5 %

Rate Wastes	0.105
Rate Fert.	n.s
Rate Fert X rate Wastes	n.s

Organic matter contents

Values of organic matter contents are listed in Table (3). It is well known that organic matter plays an important role in the amelioration of sandy soils through an effective role in particle aggregation and nutritional balance.Data shows the organic matter contents in soil as affected by different types and rates of the organic wastes; also, manure combined with NPK fertilization treatments after cultivation of wheat. Data showers that addition of the organic wastes substantially increased its total content .The highest increase (68%) was observed from the manure (PM) and PM combined with NPK fertilization treatments, while the lowest increase (5%) was from the CM+NPK treatments.

Soil Water retention characteristics

Addition of the organic wastes and NPK at any rate significantly increased soil water retention at all potentials except the interaction at 1.00,3.00,5.00 and 10.00 bar (Tables 6 a and 6 b). At the 0.3 bar potential (regarded as fled capacity), improvements in water retention over the control were in this order:

PM +100 %NPK > PM +50 % NPK >CM +100 %NPK > PM >CM +50 % NPK. Cmtreated soil.

The lowest improvement in total available water capacity over the control was in the NPK at all application rates (Fig1a) while only the PM+NPK recorded up to %100increase at the $20m^3$/fed also, reported that farmyard manure was effective in increasing the water –holding capacity of some sandy soil. Significant improvements in readily –available water capacity were also noticed in all treatments (Fig1b). Generally the more the readily –available water in a soil is the less the likelihood of moisture stress in crops occurring soon after rains or irrigation

Table(6-a): Low-Energy Moisture Retention (g/g) of El-Nobaria as influenced by organic manures and inorganic (NPK).

Treat. NPK %	Matric Potential	Type Wastes					
		Control	PM m^3/fed		CM m^3/fed		mean
			10	20	10	20	
0	0.3	0.079	0.106	0.129	0.119	0.126	0.111
	1	0.073	0.092	0.125	0.092	0.108	0.098
	3	0.050	0.076	0.089	0.061	0.070	0.069
50	0.3	0.087	0.121	0.140	0.124	0.128	0.12
	1	0.075	0.104	0.128	0.094	0.109	0.102
	3	0.060	0.076	0.095	0.068	0.074	0.075
100	0.3	0.106	0.130	0.165	0.126	0.134	0.132
	1	0.076	0.110	0.147	0.101	0.112	0.109
	3	0.066	0.085	0.096	0.069	0.084	0.08
L.S.D 5 %		**0.3(M.P.)**			**1 (M.P.)**		**3(M.P.)**
Rate Wastes		**0.0053**			**0.0058**		**0.0066**
Rate Fert.		**0.0041**			**0.0045**		**0.0051**
Rate Fert X Rate Wastes		**1.74**			**n.s**		**n.s**

Table (6-b) High-Energy Moisture Retention (g/g) of El-Nobaria as influenced by organic manures and inorganic (NPK).

Treat. NPK %	Matric Potential	Type Wastes					
		Control	P M m^3/fed		CM m^3/fed		mean
			10	20	10	20	
0	5	0.024	0.042	0.059	0.044	0.048	0.043
	10	0.01	0.02	0.031	0.022	0.025	0.022
	15	0.006	0.012	0.016	0.012	0.015	0.012
50	5	0.027	0.043	0.066	0.046	0.049	0.046
	10	0.018	0.023	0.032	0.023	0.031	0.025
	15	0.009	0.012	0.019	0.014	0.015	0.014
100	5	0.034	0.056	0.072	0.048	0.051	0.052
	10	0.018	0.031	0.036	0.023	0.033	0.028
	15	0.01	0.014	0.021	0.015	0.016	0.015
L.S.D 5 %		**5 (M.P.)**			**10 (M.P.)**		**15 (M.P.)**
Rate Waste		**0.0047**			**0.0033**		**0.0018**
Rate Fert		**0.0037**			**0.0025**		**0.0014**
Rate Fert X Rate Wastes		**n.s**			**n.s**		**1.623**

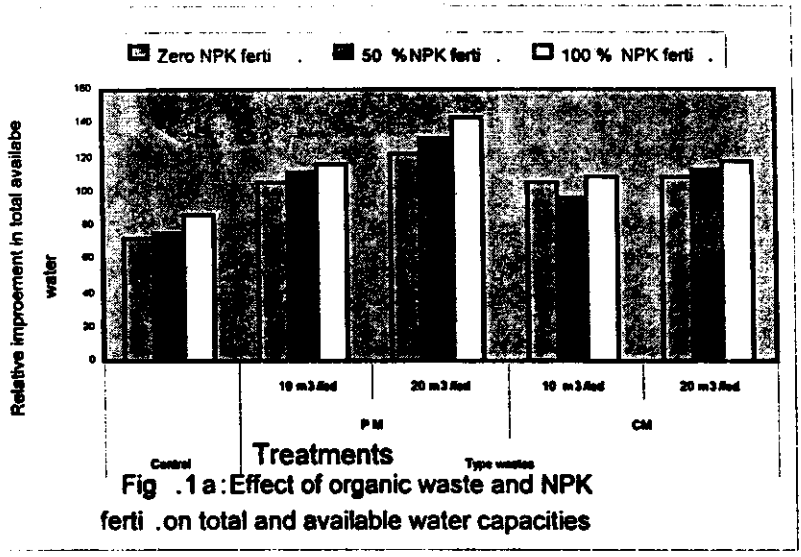

Fig .1 a : Effect of organic waste and NPK ferti .on total and available water capacities

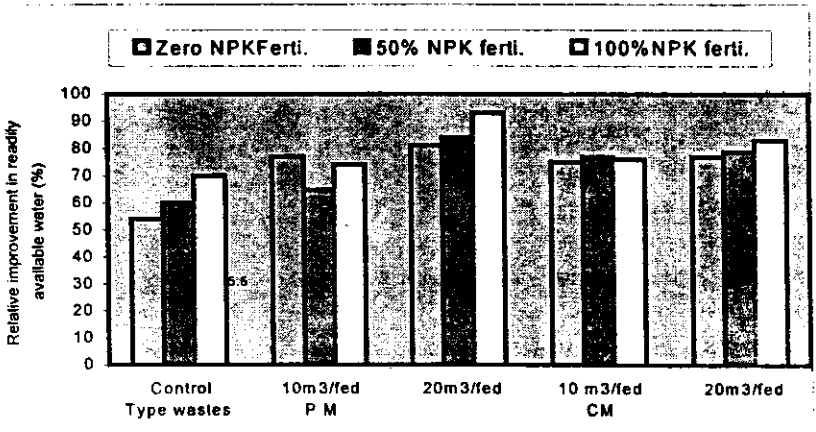

Fig.1b:Effect of organic waste and NPK ferti.on readily and water capcities

Correlation analyses:

The correlation coefficient (r) between percentage of organic matter in soil and its effect on physical properties are shown in Table (7). Even though the r-values are rather low, they show a significant positive correlation between organic matter and water contents at 0.3,1.0,3.0,5.0,10.0 and15.0 bar as Well as total and readily –available water. Also organic matter correlated positively and significantly with saturated hydraulic conductivity. Mbagwu et al. (1983) and Mbagwu (1989) also reported similar result

Table (7) correlation between organic matter contents % and selected soil physical properties.

Dependent Variable	Unit	r [a]
* Water retained at 0.3 bar	(%) [b]	0.6680**
*Water retained at 1.0 bar	(%)	0.8318**
* Water retained at 3.0 bar	(%)	0.5654*
* Water retained at 5.0 bar	(%)	0.7766*
* Water retained at 10.0 bar	(%)	0.7539**
* Water retained at 15.0 bar	(%)	0.6941**
* Total available water	(%)	0.7151**
*Readily available water	(%)	0.5939*
*Less- Readily available water	(%)	0.3986N.S
*Bulk density	gm/cm^3	- 0.9302**
*Saturated hydraulic conductivity	cm/mime	- 0.9222**

a *significant at 0.05; * * significant at 0.01; n s, not significant

b water retention is expressed as gravimetric percentage; total available water = 0.3 minus 15.0 bar water content; readily available water =0.3 minus 5.0 bar water content; less-readily –available water =5.0 bar minus 15.0 bar water content

Soil reaction (pH)

Data present in table (8) revealed that soil pH values were gradually decreased in sand soil as a result of the different

types and rates of organic wastes with and without NPK application. This decrement is more pronounced under the highest rate ($20m^3$/fed) mixing with (PM). This finding is expected to be due to the organic acids that produced during organic matter decomposition. Mohamed et al. (1998) obtained similar results.

Table (8). Soil pH and EC of the studied soil as affected by organic manure and (NPK) fertilization.

Treatment NPK %	PH					EC (dS/m)				
	Control	PM m^3/fed		CM m^3/fed		Control	PM m^3/fed		CM m^3/fed	
		10	20	10	20		10	20	10	20
0	7.88	7.49	7.34	7.57	7.56	0.37	0.58	0.63	0.40	0.44
50	7.80	7.64	7.61	7.71	7.69	0.40	0.55	0.67	0.41	0.46
100	7.81	7.68	7.66	7.76	7.75	0.47	0.55	0.73	0.46	0.50

Electrical conductivity (EC):

Data presented in Table (8) show that values of soil salinity increased by increasing organic manure up to $20m^3$ PM/fed. Concerning the effect of mineral NPK fertilizer levels on salinity, the obtained data indicate that the values of soil salinity were slightly affected .It was increased by 8and 27% with increasing NPK fertilizer level up 100% NPK. Also, it was increased by about 13% with (PM$20m^3$/fed+100% NPK). These results are in full agreement with those reported by El-Fayoumy and Ramadan (2002).

Grain yield:

Statistical analysis (Table 9) showed that there was a highly significant effect of organic manure under level NPK fertilizer on total grain yield. Data showed also that total grain yield increased from 17,25,6 and 8% as organic manure levels over that of the control .In addition, 50%NPK was increased from 40,52,8 and 11% while the respective increase at 100% NPK reached 42,58,4 and 7% as organic manure levels over that of the control.

This may be due to the differences in the amounts of nutrients supplied by the amendments. As shown in Table (2), the order in which the amendments supplied nutrients is poultry manure >cattle manure.

Effect on Nutrients uptake:

Data show that nitrogen uptake by wheat grains increased by all organic wastes. There was an increase with increasing manure rate and fertilization (Table 9). The control treatment showed an uptake of 33.6mg N/plot .The organic wastes and NPK treatments showed uptake of 40 to as high as149.4 mg N/plot.

Phosphorus uptake also increased by about 1-3.5 times than that of the control which correspond 7.77 mg P/plot of untreated control and 8.6 to27.72 mg P/plot for treated plots.

Potassium uptake showed the same trend .The 8.16 mg K /plot of the control is contrasted by the much higher uptake of the organic wastes and NPK treatments which ranged between 11.98 to as high as 70.55 mg K /plot.

The organic wastes and NPK could be arranged with respect to their effect on uptake of N, P and K by wheat grain in the sandy clay loam calcareous soil as follows:

Manure>Fertilization >Untreated, because manure generally improves such soil properties as organic matter content, aggregation and aggregate stability (Mazurak et al.1965), which are inherently low in sandy clay loam calcareous soils. Manure combined with NPK fertilization may be satisfactory for reclamation such soils. In contrast, manure applied alone at the rate of 10 or20m^3 /fed, which produced large results as fertilization, may be desirable for sustained soil productivity of fallow soil when brought into arable cultivation.

Generally, the increase in nutrients (N, Pand K) uptake is an outcome of the increase in plant growth caused by the beneficial effects of conditioners. Besides, improved retention of moisture caused by the treatment with conditioners could have enhanced transport process of nutrients.

Table (9) Wheat grain yield and total uptake of NPK as affected by organic manure and NPK fertilization

reatmen	Wheat grain kg /plot					Total uptake of N,P andK in wheat grain mg/experimental unit														
NPK %	control					N					P					K				
	Contral	PM m3 /fed.		CM m3/fed.		Contral	PM m3 /fed.		CM m3/fed.		Contral	PM m3 /fed.		CM m3/fed.		Contral	PM m3 /fed.		CM m3/fed.	
		10	20	10	20		10	20	10	20		10	20	10	20		10	20	10	20
0	4.8	5.63	6	5.1	5.23	33.6	67.6	84	40.8	41.8	7.77	14.6	16.1	9.13	10.6	8.16	32.7	49.6	12	13.1
50	5	7	7.6	5.45	5.58	40	98	114	60	67	8.6	19.6	21.9	10	10.5	14.6	40.2	58.5	27.9	29
100	5.25	7.5	8.3	5.49	5.62	47.25	120	149	65.9	67.4	9.87	23.6	27.7	13.3	14.6	14.75	59.4	70.6	32.9	36.5

L.S.D 5%

Rate wastes = 0.381695

Rate Fert. = 0.29565

Rate Fert. X Rate wastes =1.24808

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الملخص العربي

تحسين خواص الأراضي الرملية تحت نظام الري بالرش باستخدام المحسنات الطبيعية

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أجريت هذه الدراسة بمناطق الاستصلاح الجديدة في قرية المشع بمنطقة النوبارية الجديدة خلال الموسم الشتوى 2002/2003بغرض دراسة التأثير المتداخل لإضافة معدلات من المادة العضوية والأسمدة المعدنية على الخواص الطبيعية والكيماتية للتربة وإنتاجية القمح بها تحت نظام الري بالرش وقد تم اختيار ثلاث مستويات من المادة العضوية صفر، 20,10متر مكعب للفدان من سماد الماشية وسماد الدواجن مع ثلاث معدلات من الأسمدة المعدنية (صفر، ٥٠، ١٠٠ % من الاحتياجات السمادية الموصى بها لهذه الأراضي)
و قد أوضحت النتائج ما يلي:
-انخفض كل من الكثافة الظاهرية والتوصيل الهيدروليكي و كذلك تأثير الانجراف بالرياح (WEI).
-حدوث تحسن في معامل البناء (SC) والقطر المتوسط للتجمعات الأرضية الثابتة (MED)
-وجدت علاقة موجبة معنوية بين محتوى المادة العضوية وقوة حفظ التربة للماء وكذلك كمية الماء الميسر ، من ناحية أخرى وجدت علاقة سالبة بين المادة العضوية وكل من الكثافة الظاهرية والتوصيل الهيدروليكي.

- أدت زيادة معدلات إضافة المادة العضوية حتى 20متر مكعب للفدان إلى انخفاض pH التربة بمقدار 7.4% في حالة سماد الماشية و 4.2% في حالة سماد الدواجن، بينما زادت ملوحة التربة مقارنة بالكنترول (بدون معاملات).
- تحققت أعلى زيادة معنوية لمحصول الحبوب من إضافة 20متر مكعب للفدان من سماد الماشية مع إضافة 100، 50% من الأسمدة المعدنية، هذا وقد انعكس التأثير المعنوي على زيادة تركيز محتوى الحبوب من NPK، وقد تم استنتاج أن خلط الأسمدة العضوية حتى 20متر مكعب للفدان مع التسميد المعدني في الأراضي الرملية يؤدى إلى زيادة إنتاجية المحاصيل النامية في هذه الأراضي تحت نظام الري بالرش.

مما سبق يتبين أن إضافة المادة العضوية كمحسنات تربة طبيعية إلى الأراضي حديثة الاستصلاح بصفة عامة يؤدى ألي رفع خصوبتها وتحسين السلوك المائي بها مما يكون له كما أوضحت النتائج أن استخدام التسميد بمردود جيد على إنتاجية مثل هذه النوعية من التربة المعدني الملائم في وجود المادة العضوية يعتبر من العوامل المهمة التي تؤدى ألي خفض معدلات السماد المعدني المستخدم والذي بدوره يؤدى إلى خفض تلوث التربة والماء الأرض بالنترات و كذلك خفض تكلفة التسميد المعدني مما يؤدى ألي زيادة العائد الاقتصادي