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EFFECT OF THE QUANTITY AND QUALITY OF ORGANIC FERTILIZERS IN THE PHYSICAL PROPERTIES AND THE READINESS OF SOME NUTRIENTS TO SEDIMENTARY SOIL

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Abstract

Field experiment carried out in Mahdi area in Al- Samawah town during the agricultural season 2017-2018. The wheat *Triticum aestivum* L. response evaluation was studied for different fertilization treatments: (C) control, (F1) Buffalo manure at two levels (4% and 8%), (F2) Sheep manure at two levels (4% and 8%), (F3) poultry residues at two levels (4% and 8%), and (T) complete fertilizer recommendation. This study measured growth characteristics of the plant and some physical and chemical soil indicators, An experiment was carried out according to the design of the complete random blocks (RCBD), The treatments were assigned to experimental plots following a randomized complete block design (RCBD) and each treatment was treated in three replicates. The least significance difference (LSD) at 5% error rate was to compare significance means. The results showed a significant improvement in the treatment of fertilization with poultry residues 4% on the density of soil reached (1.0407 ig M3), soil porosity (56.07%) and soil potassium concentration after harvest (260.3 mg. kg^{-1}). (1.470 mm), absorbance (0.590 cm -1 min), potassium available in soil at 50% flowering (413 mg^{-1}.kg), While 8% buffalo manure treatment showed a significant increase in saturated water conductivity (0.855 m^{-1}.day), Available of Nitrogen & phosphorus post-harvest (47.38, 18.97 mg^{-1} kg).

Key words : quantity, quality, organic fertilizers, physical properties, soil.

Introduction

Organic matter has been used as a natural fertilizer and soil remediation since ancient times. Soil organic matter is one of the basic components. It is formed with the mineral part of the soil and called the solid phase, which consists mainly of plant, animal and living residues. The ratios of organic matter and its components vary according to the soil, common agricultural practices and environmental conditions (Al-Raawy, 2000). The drought soil, semi-drought and tropical regions has a percentage of organic matter not exceeding 2.5%. In some areas of sedimentary Iraq, such as the central and southern regions, it does not exceed 1%. This is due to high temperatures in the summer and low rainfall, which leads to rapid oxidation of organic matter and lack of vegetation cover and the change in pH, because of the containment of these soils on carbonate minerals and carbon dioxide, which leads to a lack of readiness of nutrients, especially the smaller ones and the lack of soil in Iraq of nutrients, in addition to sedimentary soils, especially in southern Iraq, because of its mud texture, soil degradation and high density due to soil weight, low porosity and low connectivity values. Due to the low percentage of organic matter in drought soils, it is important to increase organic matter content and to increase soil vitality and provide macro and micro nutrients (Al- Balkhi, 2006, Oada and Al Hassan, 2007). As a result of the adverse effects of the use of chemical additives, concerns in many countries of the world have tended to promote organic production, which is characterized as a clean food free from the residual effects of pesticides and chemical fertilizers. The percentage of nitrates and oxides decreases so that this ratio does not exceed the safe health limits, Particularly in developed countries, the continued increase in the economic value of organic products in the world may show how much these products enjoy consumer concerns (Abu Rayyan, 2010**).** The aim of this study is to evaluate the effect of different organic fertilizers in the physical and soil properties of soil.

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Materials and Methods

Field experiment was carried out in the Mahdi area in Muthanna province during the winter season 2018-2017, to determine the effect of the quantity and quality of organic manure on the physical properties of soil and the growth and yield of wheat (class Ebaa 99). A simple experiment was applied with a complete cattle design (R.C.B.D) with three replicates. The soil additions included organic manure of three species (buffalo, sheep, poultry) and quantity (4% and 8%) each of them. The area of the experimental unit was 6 m^2 (3 × 2m dimensions). The experiment was planted on 15/11/2017 at a rate (120 kg $^{-1}$. h), samples were taken from the soil of the field before planting. Several random samples were distributed to the field at a depth (0-30 cm), After the removal of the plant residues, Soil was softened using a wooden hammer and passed from a 2 mm diameter sieve. The chemical and physical analysis of the soil and its results were presented in (Table 1). Soil density, soil porosity, saturated water conductivity, and soil volume distribution, the ratio of the weighted diameter and the readiness of N,P and K were measured.

Table 1: Some of chemical and physical properties of soil before planting.

Soil characteristics studied	Value	Unit
pH	-	7.4
EC	dSc.m	2.5
Available of N	mg.kg^{-1}soil	12.5
Available of P	mg.kg^{-1}soil	8.7
Available of K	mg.kg^{-1}soil	192
Ca	mg.kg^{-1}soil	200
Mg	mg.kg^{-1}soil	121
Carbonates	mg.kg^{-1}soil	0
Bicarbonate	mg.kg^{-1}soil	67.1
Chlorides	mg.kg^{-1}soil	1785
O.M	g.kg^{-1}soil	0.95
Available of water	$cm^3.cm^{-3}$	0.16
Virtual density	Meg.m^{-3}	0.46
The real density	Meg.m^{-33}	2.60
Water conductivity	m day^{-1}	0.356
Porosity	%	46.02
Moisture at field capacity	$cm^3.cm^{-3}$	0.42
Oil moisture when saturation	$cm^3.cm^{-33}$	0.466

Tissue: clay loam

Results and Discussion

Effect of different of organic levels on the density profile

Table 2 shows significant differences on soil density in additive treatments. The treatment of poultry waste (8%) gave the lowest value of soil density, While control treatment gave highest value of the apparent density of soil.

Table 2: Effect of levels of different organic fertilizers on soil density.

Treatments	Value (Meg.m^{-3})
Control	1.3977
NPK	1.3240
Buffalo manure 4%	1.2113
Buffalo manure 8%	1.1137
Sheep manure 4%	1.1950
Sheep manure 8%	1.1153
Poultry residues 4%	1.1970
Poultry residues 8%	1.0407
L.S.D	0.05189

These results can be explained by the role of organic matter in reducing soil density due to the low density of organic matter (0.8-0.95g.cm^3), maybe to the large volume of organic matter compared with its mass (Widmer *et al.*, 2002) and this agree with (Atea *et al.*, 2019) and Al- Fadhli (2011).

Saturated water conductivity

Table 3 shows significant differences in soil water conductivity between the addition treatments. Buffalo manure treatment8% exceeded the other treatments except for the treatment of sheep manure 8% and poultry waste 8% treatments which did not differ significantly (0.855, 0.832, 0.792) respectively, While its coefficient recorded the lowest complete recommendation for water conductivity (0.363). The increase in water conductivity when adding organic waste is due to the reduction of the apparent density table 2, this agree with(Mosaddeghi *et al.,* 2000).

Table 3: Effect of Different Organic Fertilizers levels on water conductivity.

Treatments	Value (m day-1)
Control	0.391
NPK	0.363
Buffalo manure 4%	0.587
Buffalo manure 8%	0.855
Sheep manure 4%	0.588
Sheep manure 8%	0.832
Poultry residues 4%	0.507
Poultry residues 8%	0.792
L.S.D	0.128

Average Weighted Diameter

The table 4 shows significant differences in the mean soil weight ratio between the additive treatments. The

treatment of sheep manure 8% exceeded on all the treatments, including the control treatment, which recorded the lowest value of weight (1.4703, 0.6967) respectively.

Table 4: Effect of Different Organic Fertilizers levels on Average Weighted Diameter.

Treatments	Value
Control	0.6967
NPK	0.7100
Buffalo manure 4%	1.0670
Buffalo manure 8%	1.3907
Sheep manure 4%	1.2487
Sheep manure 8%	1.4703
Poultry residues 4%	1.0007
Poultry residues 8%	1.3137
L.S.D	0.06842

The above results can be explained by the role of organic matter in improving soil physical properties and composition of soil aggregates as a result of organic decomposition products and organic excretions as a result of microorganisms, root growth and root secretions, this agree with (Celik and Kilic*.,* 2004).

Porosity of soil

Table 5 shows significant differences in the soil porosity among the added treatments. The treatment of poultry waste 8% exceeded on the rest of the treatments, except for the treatment of 8% sheep manure, which did not differ significantly from them 56.07%, 53.88)%) respectively, While the control treatment recorded the lowest value of porosity (45.60%).

Table 5: Effect of Different Organic Fertilizers levels on Porosity of soil.

Treatments	Value
Control	45.60
NPK	47.73
Buffalo manure 4%	49.65
Buffalo manure 8%	52.47
Sheep manure 4%	51.51
Sheep manure 8%	53.88
Poultry residues 4%	51.50
Poultry residues 8%	56.07
L.S.D	2.367

The effect of organic addition coefficients can be attributed to the difference in porosity in soil depending on their conditions, past coefficients and agricultural management, the more compact the soil, the smaller the pores between aggregates of soil and the increased density of the virtual, which significantly affects the growth of plants, the increase in total porosity in soils that have been supplemented by organic matter increases the volume and exchange of water and air (Cooperband, 2002; Min *et al.,* 2003) and (Atea *et al.*, 2019)

Absorption of soil

Table 6 shows significant differences in the soil absorbance characteristics among the added treatments. The treatment of sheep manure 8% exceeded for the rest of the treatments except for the treatment of poultry waste 8% (0.5900, 0.5767) respectively. While the coefficient of the fertilizer recommendation was less than the absorption value reached 0.3667.

Table 6: Effect of Different Organic Fertilizers levels on Absorption of soil.

Treatments	Value
Control	0.3700
NPK	0.3667
Buffalo manure 4%	0.4700
Buffalo manure 8%	0.5400
Sheep manure 4%	0.5133
Sheep manure 8%	0.5900
Poultry residues 4%	0.5033
Poultry residues 8%	0.5767
L.S.D	0.04151

He above can be explained to the role of organic fertilizer added to improve physical properties, showing positive correlation with the soil uptake characteristic, this agree with (Ali and Abdul Razak. 2014)

NPK concentration in soil

Table 7 shows significant differences in N,P and K uptake at flowering 50% among treatments addition of soil. The treatment of the fertilizer recommendation was superior to some treatments, with the highest nitrogen value recorded 48.8 mg.kg^{-1}. Buffalo manure 8% treatment was superior on available of P compare with most treatments when post-harvest. phosphorus was estimated with the exception of the fertilizer recommendation, sheep manure 8% treatment, poultry waste 8% treatment and buffalo manure 4% (18.97, 17.80, 18.87, 18.67, 17.40 mg. kg^{-1}) respectively, but the control treatment recorded the lowest value of phosphorus-filled soil (7.40 mg. kg^{-1}). The treatment of sheep manure 8% recording the highest value of available of potassium. There were no significant differences among the treatments except the control treatment, which recorded the lowest value of available potassium (413.7, 160.7 mg) respectively.

The organic matter had a significant effect on the increase in nutrients concentrations of nitrogen,

Table 7: Effect of Different Organic Fertilizers levels on NPK concentration in soil.

Treatments	N (50% flowering)	N (After harvest)	P (50% flowering)	P (After harvest)	K (50% flowering)	K (After harvest)
Control	14.22	6.47	15.40	7.40	160.7	72.7
NPK	48.87	31.27	32.63	17.80	397.0	187.7
Buffalo manure 4%	45.86	43.63	27.63	17.40	373.3	193.3
Buffalo manure 8%	47.77	47.38	33.93	18.97	410.3	182.3
Sheep manure 4%	42.46	42.80	29.00	15.10	370.7	205.0
Sheep manure 8%	48.30	46.73	34.17	18.87	413.7	184.7
Poultry residues 4%	39.63	40.43	27.93	15.80	343.0	181.7
Poultry residues 8%	45.84	46.13	32.43	18.67	408.7	260.3
L.S.D	5.096	3.107	3.750	2.808	51.69	80.23

phosphorus and potassium in the soil. This may also be due to the fact that organic matter contains a good content of plant-absorbable nutrients and the role of organic matter on improving the physical, chemical and biological properties of soil, the role of organic acids resulting from the process of decomposition of organic matter in reducing the degree of soil interaction and dissolving hard compounds decomposition as phosphate compounds and release the element of phosphorus from its complexities, this agree with(Gomaa *et al.,* 2005) and (Verlinden *et al.,* 2009) and (Atea *et al.*, 2019).

References

Abu Rayyan, A. (2010). Organic Agriculture (Horticulture and Crops) Faculty of Agriculture Jordan University Amman Jordan.

Al- Balkhi, A. (2006). Study of the interactions of some natural and productive organic compounds, their complexities, effectiveness in soil fertilization and crop productivity. PhD thesis. Damascus University Central Organization for Statistics and Information Technology. Directorate of Agricultural Statistics, Ministry of Planning, Republic of Iraq.

Al-Fadhli, J.T.M. (2011). Effect of organic and mineral fertilization on the growth and productivity of potatoes. Soil and Water Resources Department, Baghdad University, Faculty of Agriculture.

Ali, N.S. and S.A. Abdul Razak (2014). Soil and organic fertilization and their role in sustainable agriculture. Desertification Section. faculty of Agriculture. Baghdad University. Ministry of Higher Education and Scientific Research.

Al- Raawy, A.H.M. (2000). Emissions of carbon dioxide and processing of nitrogen from different organic materials added to soil. Master Thesis-College of Agriculture-University of Baghdad.

Atea-Alaa, R. and F.H. Issa (2019). Effect of organic fertilizer and mycorrhiza fungi on some physical and chemical properties of soils. *Plant Archives*, **19(1):** 534-537.

Celik, I., I. Ortas and S. Kilic (2004). Effects of compost, mycorrhiza, manure and fertilizer on some physical properties of a Chromoxerert soil. *Soil and Tillage Research*, **78:** 59-67.

Cooperband, L. (2002). Building soil organic matter with organic amendments. Center of Integrated Agricultural Systems. 6-12.

Gomaa, A.M., S.S. Moawad, I.M.A. Ebadah and H.A. Salim (2005). Application of Bio-Organic Farming and its Influence on certain Pests Infestation, Growth and Productivity of Potato Plants. *Journal of Applied Sciences Research*, **1(2):** 205-211.

Min, D.H., K.R. Islam, L.R. Vough and R.R. Weil (2003). Dairy manure effects on soil quality properties and carbon sequestration in alfalfa orchard grass systems Commun. Soil Sci. *Plant Anal*., **34:** 781-79915.

Mosaddeghi, M.R., M.A. Hajabbasi, A. Hemmat and M. Afyuni (2000). Soil compactibility as affected by soil moisture content and farmyard manure in central Iran. *Soil & Tillage Research*, **55:** 87-97.

Oada, M. and H.A. Hassan (2007). The Effect of the Use of Different Types and Types of Organic Fertilizers in Some Productivity Indicators of Potato Crop. *Al-Baath University Journal*, **29(7):** 87-116. Syrian Arab Republic.

Valarini, P.J., G. Curaqueo, A. Seguel, K. Manzano, R. Rubio, P. Cornejo and F. Borie (2009). Effect of Compost Application On Some Properties of A Volcanic Soil From Central South Chile. *Chilean Journal of Agricultural Research*, **69(3):** 416-425.