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EFFECT OF ORGANIC FERTILIZER SOURCRS AND CHEMICL FERTILIZATION ON SOME SOIL PHYSICL TRAITS AND YIELD OF SUMMER SQUASH (*Cucurbta Pepo* L.)

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ABSTRACT

The results showed that the organic fertilizer mixture (1:1) 30 tons/ha with chemical fertilization recorded the lowest level of bulk density of 1.2 g/cm^3, the organic fertilizer mixture (1:1) 30 tons/ha with chemical fertilization recorded the highest percentage of aggregation stability amounting to 16.17%, the organic fertilizer palm fronds recorded the highest level of ready water with an average of 5.50 cm^3/cm^3 and the organic fertilizer mixture (1:1) 30 tons/ha without chemical fertilization recorded the highest level of ready water as it reached 6.93%, the organic fertilizer mixture (1:1) 30 tons/ha with chemical fertilization gave the largest production amount, which amounted to 26.67 tons/ha

Keywords: Organic fertilizer, physical properties of the soil, squash.

تاثير مصادر السماد العضوي والتسميد الكيميائي على بعض الصفات التربة الفيزيائية وحاصل قرع الكوسة (*Cucurbta Pepo L*)

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الخلاصة

اظهرت النتائج ان السماد العضوي الخليط (1:1) 30 طن/هكتار مع التسميد الكيميائي سجل ادنى مستوى من الكثافة الظاهرية بلغت 1.2 غم/سم^3، وان السماد العضوي الخليط (1:1) 30 طن/هكتار مع التسميد الكيميائي سجل اعلى نسبة مئوية من ثباتيه للتجمعات بلغت 16.17%، وان السماد العضوي سعف النخيل سجل اعلى مستوى من الماء الجاهز بمتوسط بلغ مقداره 5.50 سم^3/سم^3، وان السماد العضوي الخليط (1:1) 30 طن/هكتار بدون التسميد الكيميائي سجل اعلى مستوى من الماء الجاهز اذ بلغ 6.93%، وان السماد العضوي الخليط (1:1) 30 طن/هكتار مع التسميد الكيميائي اعطى اكبر كمية انتاج اذ بلغت 26.67 طن/هكتار.

الكلمات المفتاحية: السماد العضوي، الصفات الفيزيائية للتربة، قرع الكوسة.

IINRODUCTION

The Iraqi soils are described as (calcareous) with a high content of lime and this characteristic has given the Iraqi soil many qualities, including the good ones, the negative ones, the low content of organic matter **(Al-Azzawi, 2016)**. Organic matter is the oldest natural fertilizer and conditioner used in the soil and was the first companion to the agricultural process and in line with the sound agricultural and economic policy that takes into account the preservation of the safety of the environment and the health of the community. Organic matter contributes to improving the physical properties of soil, which is one of the important matters that attract the attention of international organizations such as FAO **(Al-Kazemi, 2017)**. Soil is the main medium for plant growth, and attention must be paid to it, taking care of it and maintaining its health, and then attention should be paid to encouraging agricultural producers to follow sound methods of fertilization that guarantee the production of healthy food of good quality. And the preservation of the biodiversity of the soil and as a result of the growing concern about the continuity of the environmental effects of the use of mineral fertilizers in agriculture, as well as the high costs of it, so the world returned to the use of organic fertilizers from its various animal and plant sources and by using modern scientific technologies for its role in reducing the use or dependence on mineral fertilizers and in line with the revolution Green technology that contributes to the dissemination of environmentally sound technologies among the masses of farmers in the world **(FAO, 2011)**. The summer squash plant (*Cucurbta pepo* L.) was selected as a field biological indicator and it is one of the most important vegetable crops belonging to the cucurbit family, and this importance comes from its use as food for humans as well as for its multiple medical purposes **(Al-Abbasi & Kamal, 2011)**. Therefore, the use of organic fertilizers to produce crops for soil with good physical traits, so this research aim to knowing the effect of organic fertilizer sources and chemical fertilization on some physical properties of the soil and yield of summer squash

MATEIRALS AND METHODS

A study was conducted to find out the effect of organic matter sources on the chemical properties of the soil and the yield of summer squash in one of the fields of the Faculty of Agricultural Engineering Sciences for the autumn season 2021-2022. The experiment was designed according to the completely randomized sectors method (RCBD), with three factors and three replications. The first factor included three types of locally manufactured organic fertilizers, namely, the organic fertilizer manufactured from the remnants of palm fronds, the organic fertilizer vermicompost and the mixed fertilizer in a ratio of 1:1 from the two mentioned fertilizers. The second factor included two quantities of organic fertilizer 20 tons/ha and 30 tons/ha, and the third factor included giving one fertilizer recommendation, as urea will be added as a source of nitrogen at a level of 100 kg nitrogen per hectare and triple superphosphate as a source of phosphorous at a level of 70 kg/P and potassium sulfate as a source of potassium, level 58 kg/ha and another treatment without the addition of chemical fertilizers. The samples were withdrawn in three stages of the plant's life to conduct chemical analyzes on them. The experiment began on 5TH August, when the land was divided and tillage, and on August 24, the seeds of a beautiful variety were planted. The data were collected and analyzed to find out the value of the standard error L.S.D at a significant level of 0.05. The bulk density of the soil was estimated using the paraffin wax method and according to what was stated in **Al-Tamimi & Mahdi (2017)** the stability of the clusters was estimated for soil samples taken from the dried and sieved field ,It is passed on a sieve with a diameter of 2 mm, and then passed on a 0.25 mm sieve and passed in a vertical movement in distilled water, then dried and weighed, and then passed over a chalcone solution with the same vertical movement,

then dried, weighed and calculated the stability of the aggregates according to what was stated in the **NRCS - USDA (2001)** The water was measured The available-to-plant plant with a pressure tablet device, and according to what was stated in **Al-Tamimi & Mahdi (2017)** and proceeded to reap the yield thirty days after planting, the plant began to give the yield, as the yield was weighed for each experimental unit separately, and the weights were recorded for each treatment. Soil and organic fertilizers were analyzed in the central laboratory of the department of soil at the college of agriculture as shown in (Table 1 and 2)

Table (1): Some chemical and physical properties of the study soil before planting.

Traits		values	units
EC 1:1 . Electrical Conductivity		4.51	(ds/m)
PH 1:1		7.43	-----
available Nitrogen (N)		49	(mg/kg)
available phosphorous (P)		3.65	
available potassium (K)		362.21	
Organic matter		7.3	(g/kg)
Calcium Carbonate (CaCO3)		294.2	
Soluble calcium (Ca^{+2})		19.21	(mol/L)
Soluble Magnesium (Mg^{+2})		8.65	
dissolved sodium (Na^{+})		5.24	
soluble bicarbonate (HCO_3)		1.5	
dissolved chlorine (Cl)		29.68	
soluble potassium (K)		1.84	
Soil Separators	Sand	504	(mg/kg) Sandy clay loam
	Clay	208	
	silt	288	

Table (2): Some chemical properties of the organic fertilizers used in the study.

Traits	units	organic fertilizers	
		vermicompost	palm leaves compost
Electrical Conductivity	(ds/m)	3.37	2.3
pH	—	7.30	7.00
C/N	—	7.5	10.9
Total Nitrogen (N)	(%)	2.01	1.31
Total phosphorous (P)	(%)	0.81	0.71
Total ;potassium (K)	(%)	1.88	1.81
organic carbon	(%)	15.26	14.31

RESULTS AND DISCUSSION

Effect of organic matter sources, quantity and chemical fertilization on bulk density of soil

The results in (Table 3) showed that the lowest level of bulk density was 1.2 g/cm^3 due to treatment T6F, and the highest level of bulk density was 1.8 g/cm^3 due to treatment T1. The results of the statistical analysis showed that there were significant differences at the level of significance 0.05 for the first factor, which is the type of organic fertilizer, as it was noted that the organic fertilizer palm fronds were excelled on the organic fertilizer vermicompost and the organic fertilizer mixture, where the organic fertilizer recorded palm fronds in treatments (T1, T1F, T2 and T2F). the highest average as it reached 1.6 g/cm^3, The results of the statistical analysis showed that there were significant differences when the two factors interacted with the type of organic fertilizer and chemical fertilizer, as it was noted that the highest reading recorded for the T2F treatment was 1.8 g/cm^3, which is the result of the interaction between the

organic fertilizer from palm fronds and the chemical fertilization.It is scientifically recognized that organic fertilizers contribute to reducing the bulk density of the soil, making it healthy and good soil for germination and plant growth. It was noted that the organic fertilizer vermicompost recorded a lower average bulk density than the organic fertilizer palm fronds, as the average was 1.5 g. Its average bulk density of it was 1.4 g/cm^3, and the T6F treatment recorded the lowest level of bulk density at 1.2 g/cm^3 .The reason for the low bulk density of the soil is due to the fact that the organic matter contributes to the increase in the interfacial pores of the soil and the low density of the organic matter compared to the mineral part of the soil **(Adugna, 2018; Mahmood *et al*., 2017; Ati, 2002)**.

Table (3): The effect of organic fertilizer sources and quantity and chemical fertilization on the bulk density of soil.

treatments	symbol	Bulk density (g/cm^3)	average	L.S.D 0.05
control treatment	T0	1.7	-	Organic fertilizer type
control treatment + chemical fertilizer	T0F	1.6	-	0.1506
Palm leaves compost 20 tons/ha	T1	1.8	1.6	Amount of organic fertilizer
Palm leaves compost 20 tons.ha^{-1}+ chemical fertilizer	T1F	1.5		NS
Palm leaves compost 30 tons/ha	T2	1.6		chemical fertilizer
Palm leaves compost 30 tons/ha+ chemical fertilizer	T2F	1.7		NS
Vermicompost 20 tons/ha	T3	1.5	1.5	Type of organic fertilizer * amount of organic fertilizer
Vermicompost 20 tons/ha+ chemical fertilizer	T3F	1.6		NS
Vermicompost 30 tons/ha	T4	1.3		Organic Fertilizer Type * Chemical Fertilization
Vermicompost 30 tons/ha+ chemical fertilizer	T4F	1.6		0.2130
mixture 1:1 20 tons/ha	T5	1.6	1.4	Amount of organic fertilizer * chemical fertilization
mixture 1:1 of 20 tons/ha + chemical fertilizer	T5F	1.3		NS
mixture 1:1 30 tons/ha	T6	1.6		Triple interaction
mixture 1:1 30 tons/ha+ chemical fertilizer	T6F	1.2		NS

Effect of organic matter sources, quantity and chemical fertilization on the stability of soil aggregation

The results in (Table 4) showed that the lowest percentage of aggregate stability was 1.75%. It is due to treatment T5 and the highest aggregation stability percentage was 16.17% and it is due to treatment T6F. The results of the analysis of variance at the level of significance 0.05 showed that there were non-significant differences in all experiment factors and their interactions except for the second factor (the amount of organic fertilizer).The results for the type of organic fertilizer showed that the mixed fertilizer with a ratio of 1:1 recorded the highest average, reaching 7.91% compared to the other two organic fertilizers. The results for the second factor (the amount of organic fertilizer) showed that the amount of fertilizer was 30 tons/ha. It showed a significantly excelled on the quantity 20 tons/ha, where the results of the treatments 30 tons/ha (T6F, T6, T4F, T4, T2F and T2) respectively (16.17, 8.11, 4.54, 10.25, 7.68 and 11.70) showed a significantly excelled on the treatments 20 tons/ha (T5F, T5, T3F, T3, T1F and T1) respectively (5.59, 1.75, 5.74, 3.53, 2.51 and 2.53) That is, the greater the

organic matter, the greater the aggregation stability. The organic matter improves the construction of the soil and increases its cohesion by linking the primary soil particles to form more stable micro aggregates. These aggregates are linked to each other by the remnants of fungi and bacteria that increase with the increase in organic matter. These residues are characterized by being hydrophobic compounds, meaning that their hydration is slow and the process of group bonding increases with it, which results in an increase in the stability of the aggregates **(Jabbar & Al Sheikhly, 2013; Annabi *et al*., 2011; Tayel *et al*., 2010)**.

Table (4): The effect of organic fertilizer sources and quantity and chemical fertilization on the aggregates stability of soil.

treatments	symbol	aggregates stability (%)	average	L.S.D 0.05
control treatment	T0	2.81	-	Organic fertilizer type
control treatment + chemical fertilizer	T0F	2.37	-	NS
Palm leaves compost 20 tons/ha	T1	2.53	6.11	Amount of organic fertilizer
Palm leaves compost 20 tons/ha+ chemical fertilizer	T1F	2.51		0.024
Palm leaves compost 30 tons/ha	T2	11.70		chemical fertilizer
Palm leaves compost 30 tons/ha+ chemical fertilizer	T2F	7.68		NS
Vermicompost 20 tons/ha	T3	3.53	6.01	Type of organic fertilizer * amount of organic fertilizer
Vermicompost 20 tons/ha+ chemical fertilizer	T3F	5.74		NS
Vermicompost 30 tons/ha	T4	10.25		Organic Fertilizer Type * Chemical Fertilization
Vermicompost 30 tons/ha+ chemical fertilizer	T4F	4.54		NS
mixture 1:1 20 tons/ha	T5	1.75	7.91	Amount of organic fertilizer * chemical fertilization
mixture 1:1 of 20 tons/ha+ chemical fertilizer	T5F	5.59		NS
mixture 1:1 30 tons/ha	T6	8.11		Triple interaction
mixture 1:1 30 tons/ha+ chemical fertilizer	T6F	16.17		NS

The effect of organic matter sources and quantity and chemical fertilization on the amount of available water for plants

The results in (Table, 5) showed that the lowest level of available water for the plant was 3.52 cm^3/cm^3. It returns to treatment T6F and the highest level of available water for the plant 6.93 cm3/cm3 and returns to treatment T6. The results of the analysis of variance at the level of significance 0.05 showed that there were non-significant differences between the experiment treatments, where it was noted from the results that the treatments of organic fertilizer from palm fronds were excelled on the other two types, as it was recorded an average of 5.50 cm^3/cm^3. It was noted that the organic fertilization with chemical fertilization contributed to raising the amount of available water compared to the non-fertilized treatments with chemical fertilizers, were in the organic fertilizer palm fronds and the mixture compost 1:1 20 tons/ha and other treatments fertilized with organic fertilizers with chemical fertilizers contributed to reducing the amount of available water compost as in vermicompost and compost mixture 1:1 30 tons/ha. It was noted that the amount of organic fertilizer 30 tons/ha contributed to an increase in the ready water more than the amount of organic fertilizer 20 tons/ha, which

indicates that the amount of prepared water is directly proportional to the amount of organic fertilizer added to the soil. The greater the organic matter, the greater the soil's ability to hold water due to the colloidal properties of the organic matter and it has the ability to absorb water from 10-100 times the water absorbed by the soil minerals **(Kanani, 2021; Abbas, 2018; Ramadan, 2017)**.

Table (5): Effect of organic fertilizer sources and quantity and chemical fertilization on the amount of available water for plants.

treatments	symbol	Available water depth (cm^3/cm^3)	average	L.S.D 0.05
control treatment	T0	4.71	-	Organic fertilizer type
control treatment + chemical fertilizer	T0F	5.71	-	NS
Palm leaves compost 20 tons/ha	T1	6.55	5.50	Amount of organic fertilizer
Palm leaves compost 20 tons/ha+ chemical fertilizer	T1F	4.20		NS
Palm leaves compost 30 tons/ha	T2	6.36		chemical fertilizer
Palm leaves compost 30 tons/ha+ chemical fertilizer	T2F	4.92		NS
Vermicompost 20 tons/ha	T3	4.10	4.97	Type of organic fertilizer * amount of organic fertilizer
Vermicompost 20 tons/ha+ chemical fertilizer	T3F	4.79		NS
Vermicompost 30 tons/ha	T4	4.33		Organic Fertilizer Type * Chemical Fertilization
Vermicompost 30 tons/ha+ chemical fertilizer	T4F	6.65		NS
mixture 1:1 20 tons/ha	T5	4.76	5.17	Amount of organic fertilizer * chemical fertilization
mixture 1:1 of 20 tons/ha + chemical fertilizer	T5F	5.45		NS
mixture 1:1 30 tons/ha	T6	6.93		Triple interaction
mixture 1:1 30 tons/ha+ chemical fertilizer	T6F	3.52		NS

The effect of organic matter sources and quantity and chemical fertilization on the production quantity of summer squash plants

The results in (Table 6) shown that the lowest level of production was 16.97 tons/ha. It goes back to the control treatment T0, and the highest level of production was 26.67 tons/h, and it goes back to the treatment T6F. The results of the statistical analysis showed that there were insignificant differences at the level of significance 0.05. It is noted that all the experimental treatments were superior to the control treatments T0 and T0F. This is due to the organic and mineral fertilizers added to the field, which contributed to enhancing the production of the plant by supplying it with nutrients to the plant and building a strong root system capable of supporting the plant. The results showed that the mixed fertilizer was excelled on the other two organic fertilizers, as the average production of this fertilizer was 22.02 tons/ha, which is the highest compared to the other two organic fertilizers, which confirms that adding different types of organic fertilizers contribute to improving the fertile soil properties.

Table (6): The effect of organic fertilizer sources and quantity and chemical fertilization on the production quantity of summer squash plants.

treatments	symbol	Productivity (ton/h)	average	L.S.D 0.05
control treatment	T0	16.97	-	Organic fertilizer type
control treatment + chemical fertilizer	T0F	17.26	-	NS
Palm leaves compost 20 tons/ha	T1	21.50	20.83	Amount of organic fertilizer
Palm leaves compost 20 tons/ha+ chemical fertilizer	T1F	20.52		NS
Palm leaves compost 30 tons/ha	T2	21.66		chemical fertilizer
Palm leaves compost 30 tons/ha+ chemical fertilizer	T2F	19.65		NS
Vermicompost 20 tons/ha	T3	17.97	21.90	Type of organic fertilizer * amount of organic fertilizer
Vermicompost 20 tons/ha+ chemical fertilizer	T3F	21.62		NS
Vermicompost 30 tons/ha	T4	21.94		Organic Fertilizer Type * Chemical Fertilization
Vermicompost 30 tons/ha+ chemical fertilizer	T4F	26.09		NS
mixture 1:1 20 tons/ha	T5	19.54	22.02	Amount of organic fertilizer * chemical fertilization
mixture 1:1 of 20 tons/ha+ chemical fertilizer	T5F	21.03		NS
mixture 1:1 30 tons/ha	T6	20.85		Triple interaction
mixture 1:1 30 tons/ha+ chemical fertilizer	T6F	26.67		NS

CONCLUSIONS

The organic fertilizer mixture gave the best improvement in the physical properties of the soil, followed by the organic fertilizer palm fronds, and then the organic fertilizer vermicompost.

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