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EFFECT OF ADDING DIFFERENT LEVELS OF ORGANIC MANURE AND POTASSIUM FERTILIZER IN THE YIELD GROWTH OF WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract

An experiment was carried out at Babylon Governorate in the area of Almad-hatiya during the season 2017-2018 to study the effect of organic waste and Potassium fertilizer in some yield properties of wheat *Triticum aestivum* L. Pots were used to bring the soil from the field. The experiment was applied with the design of the complete random sectors with three replicates and two factors. The first factor is organic waste represented by poultry waste with three levels (0, 15, 30) tons.ha^{-1}. The second factor is potassium fertilizer, which is represented by potassium sulfate fertilizer with three levels (150, 75, 0) kg.ha^{-1}.The results showed that there was a significant increase in the values of plant properties when increasing the addition of organic waste and potassium fertilizer. The plant height increased and exceeded the treatment of 30 tons. ha^{-1} organic matter with 120 kg. ha^{-1} potassium fertilizer to reach 80.1 cm while it was 72.5 cm in comparison treatment. As for the biological yield, it reached 52.6 g.pot^{-1} in the treatment of 30 tons. Hector-1 organic matter with 120 kg. ha^{-1} potassium fertilizer after it was 38.5 g.pot^{-1} for the comparison treatment. Other properties of the plant, such as the weight of 1000 grains, grain yield and protein ratio, improved as a result of the overlap between organic manure and potassium fertilizer.

***Key words*:** Poultry waste, Wheat, Potassium fertilizer, Plant height.

Introduction

Potassium is the third most important nutrients of the plant and absorbed by the plant in large quantities in a way it may exceed the other nutrients. It has an important role in the nutrition of the plant as it contributes to the formation of proteins, carbohydrates, and starch (Havlin *et al*., 2005). Wheat *Triticum aestivum* L. is also regarded as the first strategic food crop in the world and the most important among the grain crops. This importance lays in the good balance between proteins and carbohydrates in their grains. Despite of the outstanding location of this crop, its productivity in Iraq is still low. The total production of the plant in Iraq per hectare was 1002.30 kg in 2005, while the world production was 2262.70 kg.ha^{-1}. It is therefore ranked the sixth among the countries that import wheat (FAO, 2014). The idea that was prevailed in the past that Iraqi soil is rich in potassium and does not need to be fertilized with this element has been reconsidered. Potassium is characterized by its slow release from the sites installed in clay minerals. So the advantage is not in its quantitative quantities that exist in the soil, but in its release extent especially in the critical stages of plant growth which may require this element relatively more than the rest of the stages and other elements (Adday, 2002). Organic fertilizers are an important source, containing all the necessary elements for the growth and development of plants, including micro elements, on broad ranges of dissolved organic compounds such as proteins, sugars and amino acids (Bandani *et al*., 2014). Organic matter, as described (Wei et al., 2012), considers as a combination of complex compounds in different cases of degradation and stability. It is composed of microbial cell residues, plant and animal residues. Furthermore, it is a source of plant-ready ammonium (Barker and Pilbeam, 2007). The added potassium improves nitrogen uptake and thus helps to increase the efficiency use of nitrogen (Brar *et al*., 2011). It was found (Bodruzzaman *et al*., 1997) that the productivity of wheat crop increased by 75% when the fertilizer of poultry residues was added compared to comparison treatments (without fertilizer). The overlap between the organic fertilization and the potassium fertilization has significantly increased plant height properties.

Materials and Methods

A field experiment was conducted to study the effect of organic manure (poultry waste) with potassium fertilizer and the effect of the interaction between them on some properties of soil and wheat plant. The experiment was carried out in pots specialized to plant the wheat crop by using the complete random sectors design. The soil was brought from the Almad-hatiya area. Table (1) shows some of its physical and chemical properties. Three treatments of the organic manure (poultry residues) were used (30, 15, 0) tons/ha. Potassium Fertilizer, represented by Potassium Sulfate Fertilizer, was used at three levels (150, 75.0 kg/ha). Taking into account the addition of the fertilizer recommendations of Nitrogen fertilizer 240 kg N / ha in the form of Urea fertilizer which contains 46% of nitrogen.

The planting and adding the water needs were carried out throughout the season, then the harvest was carried out and some soil measurements were carried out as well. The following properties were studied: plant height, protein ratio, the weight of 1000 grains, grain yield, biological yield.

Table 1 : Some soil physical and chemical properties

property	Units	Value
EC	$Ds.m^{-1}$	3.5
pH		7.7
Sand	$gm.kg^{-1}$	480
Silt	$gm.kg^{-1}$	400
Clay	$gm.kg^{-1}$	120
Bulk density	$mg.m^{-3}$	1.36
Lime	$gm.kg^{-1}$	300
Ca^{+2}	$Meq.L^{-1}$	13.2
Mg^{+2}	$Meq.L^{-1}$	9.1
Na^{+2}	$Meq.L^{-1}$	10.5
Hco_3^-	$Meq.L^{-1}$	3.00
Cl^-	$Meq.L^{-1}$	18.5
$S0_4^-$	$Meq.L^{-1}$	10.3

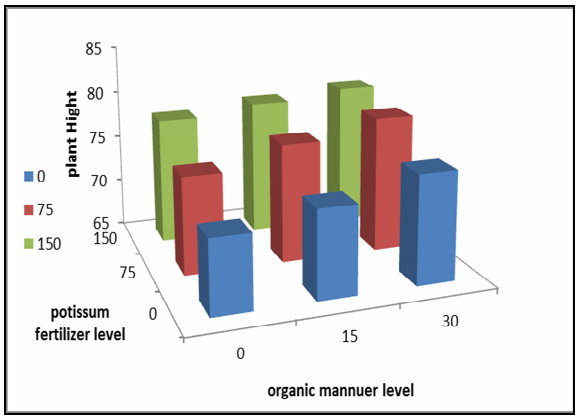
Results and Discussion

Plant Height

Figure (1) and Table (2) show a significant increase in the height values of the plant. The treatment of organic fertilizer by 15 ton. ha^{-1} gave a value of 76.8 cm. Besides, the treatment of adding 30 tons increased by ha^{-1}, with a value of 78.4 cm. Increasing the height of the plant when increasing the level of the organic fertilizer is due to the improving the physical properties of the soil and supplying the plant with the necessary nutrients which were reflected in increasing the dry matter (1, 15). In addition, there was a significant effect to the Potassium fertilizer as the plant height increased by 74.2, 77.1 and 79.1 cm when adding (0, 75, 150) kg. ha^{-1}. This increase is due to the role of potassium in most vital activities related to processes of growth and division (Abdul *et al*., 2015). In the interaction between organic manure and Potassium fertilizer, it was found that the interaction was positive and good. The lowest value of the comparison treatment was 72.5 cm, whereas the highest value was 80.1 cm at the treatment of 30 $tons.ha^{-1}$ organic fertilizer and 150 kg. ha^{-1} potassium fertilizer, with an increase rate of 10.5%.

Table 2 : Effect of organic matter levels and potash fertilization in plant height.

	0	15	30	Mean
0	72.5	74	76.2	74.23
75	75.1	77.3	79.1	77.16
150	78.2	79.2	80.1	79.16
mean	75.26	76.83	78.46	
L.S.D				



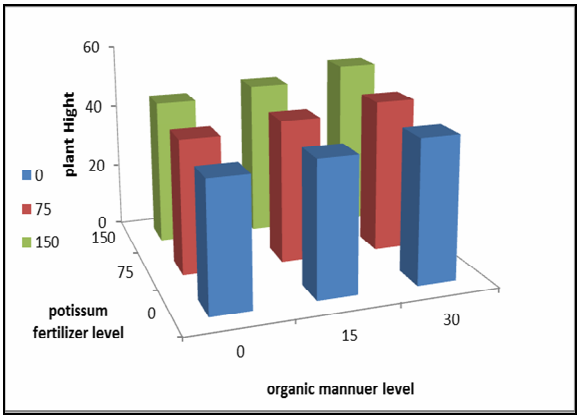
Biological Yield

Figure (2) and Table (3) show a significant increase in the values of the biological yield. The value was 44.23 at the treatment of organic manure of 15 $tons.ha^{-1}$, with an increase rate of 6.5% compared with the comparison treatment. On the other hand, the treatment of adding 30 tons. ha^{-1} was increased as well to give the value 47.80, with a rate of 15.1% compared to the comparison treatment. This is due to the role of the organic manure in increasing nutrient readiness and thus increasing NPK absorption, which is reflected in plant growth (Alsamrrai, 2004). It was also found that there was a significant effect to the Potassium fertilizer. The biological yield values reached to (41, 44, 48.5) cm when adding (0, 75, 150) kg. ha^{-1} of it, respectively. This increase is due to the role of potassium as one of the necessary elements in plant growth and the multiplicity of phylogenetic and biochemical functions.

The increase in plant tissue yields a marked increase in photosynthesis and the formation of ATP, which the plant requires to fill the sieve tubes to form compounds with large molecular weights and then increase the dry mass of the plant. In the interaction between organic manure and potassium fertilizer, it was found that the interaction was positive and good. The lowest value of the comparison treatment was 38.5 cm, but the highest value was 52.6 cm at the treatment of 30 tons.ha^{-1} organic fertilizer and 150 kg. ha^{-1} potassium fertilizer, with an increase rate of 36.6%.

Table 3: Effect of organic matter levels and Potassium fertilization in the biologic yield.

	0	**15**	**30**	**Mean**
0	38.5	40.8	43.7	41
75	41.1	43.9	47.1	44.03
150	44.9	48	52.6	48.50
mean	41.5	44.23	47.8	
L.S.D				



The weight of 1000 grains:

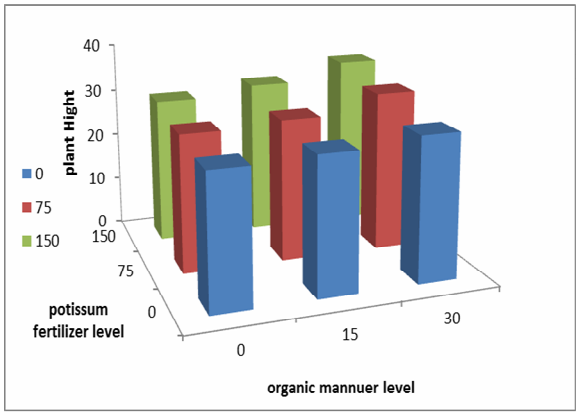
Figure (3) and Table (4) show a significant increase in the values of weight of 1000 tablets the value was 29.56 g at the treatment of organic manure of 15 tons.ha^{-1}, with an increase rate of 4.2 % compared with the comparison treatment. On the other hand, the treatment of adding 30 tons. ha^{-1} was increased as well to give the value 32.58 g, with an increase rate of 14.8% compared with the comparison treatment. This is due to the increase in the efficiency of photosynthesis and transferring the products of this process from their manufacturing sites to the storage sites in the grain (Pholsen *et al*., 2001).

It was also found that there was a significant effect to the Potassium fertilizer. As the plant height increased when increasing the potassium fertilizer, the values of the weight of 1000 grains reached to (27.9, 30, 32.4) cm when adding (0, 75, 150) kg. ha^{-1} of it, respectively. This increase is due to the transfer of potassium from the vegetative part to the grains (Al-Younis and Ahmed, 1993).

In the interaction between organic manure and potassium fertilizer, it was found that the interaction was positive and good. The lowest value of the comparison treatment was 26.9 g, but the highest value was 35.5 g at the treatment of 30 tons.ha^{-1} organic fertilizer and 150 kg. ha^{-1} potassium fertilizer. This shows the importance of the interaction between organic fertilizer and potassium fertilizer.

Table 4 :Effect of organic matter levels and Potassium fertilization in the weight of 1000 tablets.

	0	**15**	**30**	**Mean**
0	26.9	27.7	29.3	20.97
75	28.1	29.1	32.8	41.25
150	30	31.9	35.5	61.85
mean	21.25	25.92	31.9	
L.S.D				



Grains Yield

Figure (4) and Table (5) show a significant increase in the values of grains yield. The value was 21.2 g at the treatment of organic manure of 15 tons. ha^{-1}, with an increase rate of 12.1% compared with the comparison treatment. On the other hand, the treatment of adding 30 tons. ha^{-1} was increased as well to give the value 24.9 g, an increase rate of 31.7% compared with the comparison treatment. This is due to the effect of organic matter in increasing nutrient readiness and thus increasing the absorption of NPK which is reflected on plant growth (Al-Younis and Ahmed, 1993).

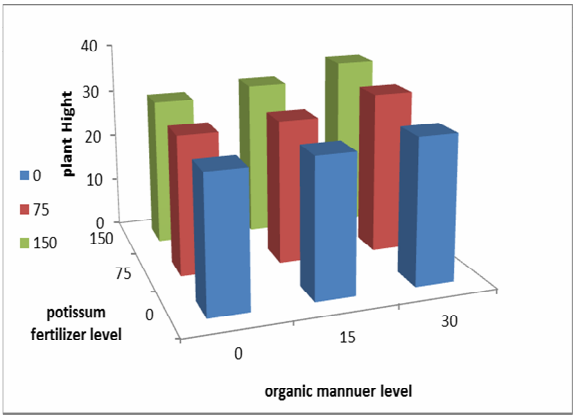
It was also found that there was a significant effect to the potassium fertilizer. As the plant height increased when increasing the potassium fertilizer, the grains yield values reached to (18.9, 21.2, 24.8) g when adding

(0, 75, 150) kg. ha^{-1} of it, respectively. The reason for the increase in grain yield with the addition of potassium is due to the high efficiency in the process of transport and storage of carbohydrates and protein (El-Ghany; *et al.*, (2010).

In the interaction between organic manure and potassium fertilizer, it was found that the interaction was positive and good. The lowest value of the comparison treatment was 16.5g, but the highest value was 28.6 g at the treatment of 30 tons.ha^{-1} organic fertilizer and 150 kg.ha^{-1} potassium fertilizer. This shows the importance of the interaction between organic fertilizer and potassium fertilizer.

Table 5 : Effect of organic matter levels and Potassium fertilization in grain yield.

	0	15	30	Mean
0	26.9	27.7	29.3	18.96
75	28.1	29.1	32.8	21.23
150	30	31.9	35.5	24.86
mean	21.25	25.92	31.9	
L.S.D				

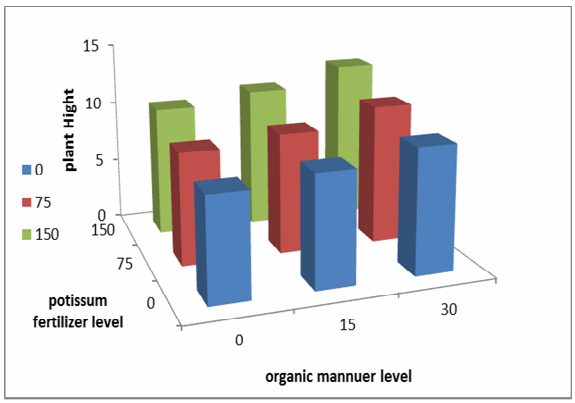


Protein Ratio

Figure (5) and Table (6) show a significant increase in the values of grains yield. The value was 9.9% at the treatment of organic manure of 15 tons.ha^{-1}, with an increase rate of 8.7% compared with the comparison treatment. On the other hand, the treatment of adding 30 tons. ha^{-1} was increased as well to give the value 11.3 %, with an increase rate of 24.1% compared with the comparison treatment. This increase was achieved because of increasing the organic matter additions. This is due to the effective role of potassium in transferring the photosynthesis products to the new emergence sites in the plant, especially in the productive stage of the plant, as well as the activation of many enzymes and their reflection on the yield (Pholsen *et al.*, 2001).

Table 6 : Effect of organic matter levels and potash fertilization in protein ratio.

	0	15	30	Mean
0	8.1	8.8	9.9	8.93
75	8.9	9.6	11.1	9.86
150	10.4	11.3	12.9	11.53
mean	9.13	9.9	11.3	
L.S.D				



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