

RESEARCH PAPER

Effect of sheep and chicken manure on wheat growth and productivity

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ABSTRACT:

The experiment was conducted during December 2021 to April 2022 at glasshouse of the Department of Biology, College of Education, Salahaddin University-Erbil. The factorial experiment included studying the influence of two types of manure (Poultry and sheep manure) each of them with six levels (0,20,30,40, 50 and 60)ton ha⁻¹, on vegetative characteristics, number of grain.plant⁻¹, the weight of 100 seeds, leaf chlorophyll contents, protein and nitrogen contents of seeds of wheat cultivar (Seminto) using Randomized complete Design(CRD) using three replicates. The main results were statically analyzed by using Factorial (C.R.D.); each treatment consisted of three replications. Means were compared using the L.S.D. test at a p-value of 0.05 for plant features in the side glasshouse and 0.01 for chemical characteristics. poultry manure and sheep manure by soil application significantly increased plant height.plant⁻¹, number of leaves.plant⁻¹, number of tillers.plant⁻¹, flag leaf area, shoot system dry weight (g), chlorophyll contents of leaves, grain number.plant⁻¹ and weight of 100 grain.

KEY WORDS: *Triticum durum*, poultry manure, Sheep manure.

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1.INTRODUCTION :

The primary source of carbohydrates and proteins in the human diet is wheat, it is one of the most important cereal crops in the world. In addition to ensuring social stability and food security, an adequate supply of wheat and its processed products (such as pasta, flour, bread, and biscuits) can also improve dietary diversity and prevent malnutrition. The projected 9.6 billion world population in 2050 will necessitate a 60% increase in wheat output over the next 30 years. (Yang et al., 2021). In 2013, the International Food Policy Research Institute estimated that there was a 553 million ton global demand for wheat. It will increase by 40% in 2020. (Qadir, 2021). In Iraq and around the world, the gramineae family's wheat was at the vanguard of strategic grain crops, and experts worked together to increase its productivity and enhance the grain's quality, which is positively reflected in the ultimate crops produced from it (Al-Jayashi et al., 2021).

In most countries, wheat can be effectively cultivated and can be adapted to various agro-climatic conditions. (Subhan et al., 2017).

It appears that using chemical fertilizers is a very rapid and effective way. (Al-Shamma and Al-Shahwany, 2014). Farmers often utilize mineral fertilization, including the application of inorganic fertilizers in the forms of urea, KCL, and super phosphate.(Sofyan et al., 2019). Fertilization is frequently used extensively by farmers. It causes soil and water pollution and conversion large amount of applied chemical fertilizers to non-available form for example chemical fixation of 70-90 % of applied phosphorus fertilizers in calcareous soils and volatilization of 50% of nitrogen in warm seasons. There are ways to lessen the negative effects of chemical fertilizers that can enhance soil quality and soil nutrient concentrations. (Ghanbari et al., 2012). Organic sources of nutrients are the best option to maintain the health of the soil, plants, and animals and give all living things an equal chance to live and use their beneficial functions, such as phosphorus solubilization, nitrogen fixation, and recycling of animal waste, among

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others. This will help to solve the problem of nutrient deficiency and will benefit nature rather than harm it. (Fazily and Hunshal, 2019). To improve sustainable agriculture, using organic fertilizer to meet crop nutrient needs will be unavoidable in the future. This is because adding organic manure generally improves the chemical, physical, and biological soil properties, which in turn increases crop productivity and preserves the quality of crop production. (Adekiya et al., 2020). The quality of organic fertilizers given material influenced by the environmental conditions under which the plants grew and enhance the availability of N, P, K and other essential nutrients which play an important role in growth and development of plant (Mohammad and Kanimarani, 2021). Abdulkadir Rashid and Esmail (2022) demonstrated that the poultry manure has a great effect on sweet corn compared to biochar due to high content of phosphorus and nitrogen in poultry manure. This study aims to highlight on the role of organic fertilizers in increasing yield and quality of plants.

2. MATERIALS AND METHODS

2.1. Treatments and design of experiment:

The research was conducted at the greenhouse of the Department of Biology, College of Education, Salahaddin University-Erbil, from 20, 12, 2021. Agricultural Research Center-Erbil provided the Seminto cultivar of wheat (*Triticum durum* L.), which was used in this experiment. A plastic pot was used in the study. Each pot contains seven kilograms of sandy loam soil. In each pot, 7 grains were sown then thinned to 4 plants later. Sheep manure and chicken manure were applied to the soil at the sowing and tillering stages at different rates (0, 20, 30, 40, 50, and 60 tons/ha.). The experiment was laid out in Factorial C.R.D. with 3 replications.

2.2. Studied parameters:

The studied plant characters included plant height (cm), number of tillers.plant⁻¹, leaf numbers.plant⁻¹, flag leaf area (cm²), shoot dry weight (g), flag leaf chlorophyll contents, and total nitrogen. The flag leaf area was calculated using the Hunts formula (LA=LD * 0.905) (Woodward, 1983).

Where, LA= Leaf area, L= Length of leaf, W=Width of leaf

By using the oven, plant shoots were dried at 75 °C for seventy-two hours until fixation of

weight. According to Ryan et al. (2001) the Kjeldahl technique was used to determine total N. At harvest, 100 grains weight (g) and grain number.plant⁻¹ were calculated.

The chlorophyll *a* and *b* in flag leaf were measured according to the methods applied by (Lichtenthaler, 1987); by using a spectrophotometer, chlorophyll *a*, and chlorophyll *b* were estimated on two wavelengths 664.2 nm and 648.6 nm as follows:

$$\text{Chlorophyll a} = (13.36 \times A_{664.2}) - (5.19 \times A_{648.6})$$

$$\text{Chlorophyll b} = (27.43 \times A_{648.6}) - (8.12 \times A_{664.2})$$

Where A= Absorbance

2.3. Statistical Analysis

The Least Significant Difference test (L.S.D.) was used to compare between means at 5% p-value for glasshouse parameters and 1% for chemical characteristics.

3. RESULTS AND DISCUSSION

3.1. Vegetative characteristics

Application of two types of manure (Poultry and sheep manure) each of them at levels (0,20,30,40, 50 and 60)ton ha⁻¹ significantly affect vegetative characters of durum wheat. Data presented in Table 1 shows that Poultry manure and sheep manure application significantly increased plant height, tiller numbers, leaf number, flag leaf area, and dry weight of shoot system in comparing with control. The 50 tons,ha.⁻¹ of poultry manure gave the maximum plant height and leaf numbers (58.44cm and 14.89), respectively. On the other hand, 40 ton.ha.⁻¹ of chicken manure gave the highest tiller numbers (5.67). However, the highest value for leaf area and shoot dry weight were (53.03cm², 9.26g) respectively, obtained for chicken manure at 60 t.ha.⁻¹.

These results partially agreed with those obtained by (Mohammed et al., 2012) concerning the *Triticum* plant, while, Farhad et al. (2009) described that poultry manure application as organic fertilizers to maize plants causes significant increases in the plant height. While Ibrahim et al. (2008) reported that organic fertilizer application to the wheat plant significantly increased shoot dry weight. Results indicate that applied manure concentrations significantly affected most vegetative characteristics because organic manure improves

soil physical, chemical and biological properties (Reimer et al., 2023).

Table 1: Effects of soil application of poultry manure and sheep manure on some vegetative growth characteristics:

Organic Manure	Concentration (ton, ha ⁻¹)	Plant height (cm)	Tiller number.plant ⁻¹	leaf number.plant ⁻¹	flag leaf (cm ²)	Shoot dry weight(g)
Chicken manure	Control	47.66	1.00	2.78	37.38	3.47
	20.00	51.94	3.56	5.33	38.00	7.89
	30.00	56.44	3.44	7.33	37.33	6.46
	40.00	52.89	5.67	11.89	39.00	7.72
	50.00	58.44	5.44	14.89	37.4	8.38
	60.00	56.44	4.33	11.33	53.03	9.26
Sheep manure	Control	39.70	2.00	4.11	15.17	1.63
	20.00	40.97	1.67	4.39	26.17	3.47
	30.00	45.63	1.67	5.27	27.43	2.40
	40.00	40.97	3.00	5.83	20.27	2.93
	50.00	44.50	4.00	5.33	28.30	2.87
	60.00	48.50	2.00	6.00	25.07	3.47
	L.S.D(0.05)	2.14	1.61	1.03	8.73	0.32

3.2. Chlorophyll contents of leaf

Chlorophyll a and total chlorophyll were significantly influenced by chicken manure and sheep manure and levels of manure application. The maximum chlorophyll a (1.21 mg/g) was recorded with chicken manure, and the highest value for total chlorophyll (1.76mg/g) was recorded with sheep manure (**Figure 1**).

These results agreed with those gained by (Jala-Abadi et al., 2012) concerning *Triticum* plants. Because nitrogen is a component of the chlorophyll molecule, organic fertilizers may have a positive impact on the amount of chlorophyll in leaves. N also serves as a structural component of the chloroplast and is the primary component of all amino acids found in proteins and lipids. (Jala-Abadi et al., 2012).

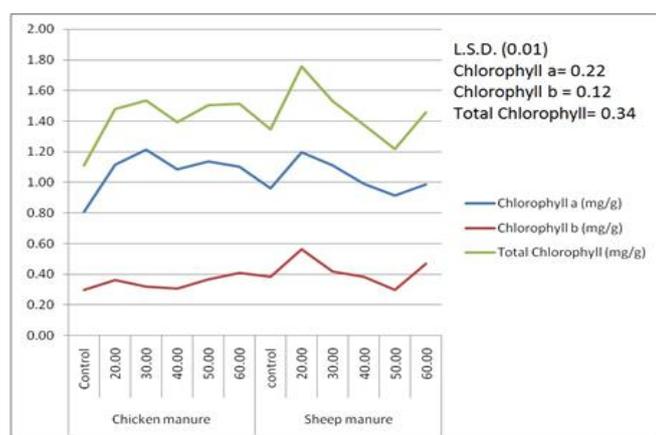


Figure 1: Effects of soil application of poultry manure and Sheep manure on the Chlorophyll contents of flag leaves.

3.3. Yield characteristics

Application of chicken manure and sheep manure results in a significant increase in seed number.plant⁻¹, and weight of 100 seeds (**Figure**

2). These results partially agree with those found by (Jala-Abadi et al., 2012) concerning wheat plants and (Farhad et al., 2009), who testified that poultry manure application to *Zea mays* plant caused significant increases in the seed number and seed weight. Increasing grain number and weight of 100 grains may be due to the fact that organic manures as Organic fertilizers, including sheep manure, farmyard manure, and, poultry manure, may be utilized for crop production as a replacement for inorganic fertilizers. Poultry manure can be utilized as an organic soil improvement to repair deteriorated soil (Sanchez-Monedero et al., 2004). Using of poultry manure as an organic fertilizer has overtaken the use of other animal manure (e.g., kraal manure, pig manure) because of its high content of N, P, and K (Boyd et al., 2004). Three elements; nitrogen, phosphorous, and potassium make up the majority of organic fertilizers. Nitrogen affects leaf growth, phosphorus affects the growth of roots, flowers, and fruit, and potassium affects robust stem growth, water transport in plants, and the encouragement of flowering and fruiting (Hamad and Mahmood, 2022).

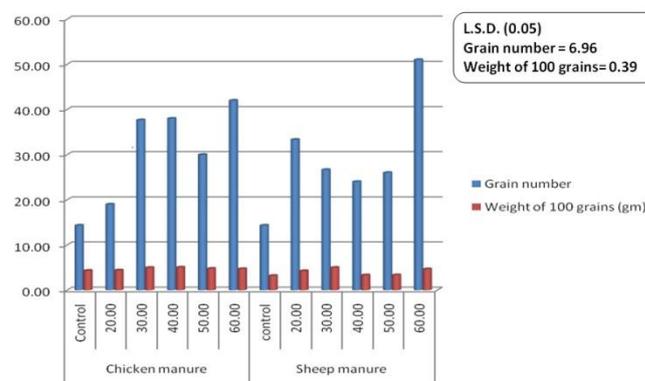


Figure 2: Effects of soil application of poultry manure and Sheep manure on some Yield characteristics.

3.4. Nitrogen and protein content of seeds

Nitrogen and protein content in wheat seed improved but not significantly with increasing manure application rates (**Figure 3**).

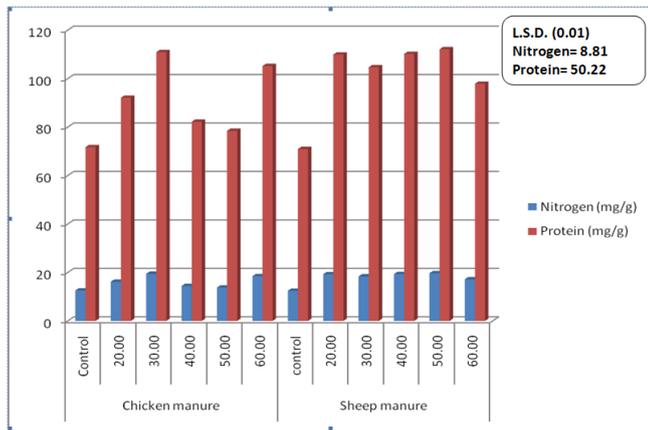


Figure 3: Effects of soil application of poultry manure and Sheep manure on some chemical contents of the seeds

1. CONCLUSIONS

From the present study, it can be concluded that the application of the application of sheep and chicken manure as organic manure enhanced wheat growth and development; the results showed that chicken manure had the greatest effect on wheat growth.

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