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The effect of poultry manure on some vegetative growth characteristics and yield of two cultivars of radish plants *Raphanus sativas* L

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Abstract

The experiment was carried out in the fields affiliated with the College of Agriculture / Tikrit University, under latitude 34.6 and longitude 43.6833, for the 2022 agricultural season, to study the effect of natural organic fertilizer and poultry manure on the growth and yield of two cultivars of radish plants, as two levels of poultry manure 20 and 30 gm plant^{-1} were used in addition to treatment for comparison, the other factor, cultivars , used two cultivars , one of which was local and the other was foreign . The field land was divided into terraces; the treatments were distributed randomly according to a completely randomized block design with three replicates. The results were as follows: Fertilization with poultry manure was superior in all studied characteristics plant height, percentage of dry matter in roots, root diameter, root length, plant yield from roots except for the number of leaves, and the results reached 18.13 cm, 8.29 %, 18.32 cm, 12.39 cm and 101.57 g respectively. As for the local Syrian and foreign cultivars, the local cultivar outperformed the foreign cultivar in most of the characteristics and gave the following results 21.48 cm, 8.19%, 17.05 cm, 11.64 cm, and 123.36 g, respectively. The interaction also had a significant effect, as the interaction treatment between fertilization at a level of 20 gm plant^{-1} excelled with the local cultivar in the following characteristics plant height, percentage of dry matter in the roots, root diameter, and their values reached 25.10 cm, 8.80%, and 20.23 cm. Respectively, as for the two traits, root diameter and plant yield from roots, the intervention treatment was superior to fertilizing the local cultivar at a level of 30 gm plant^{-1} of natural poultry manure, and their values were as follows: 12.91 cm and 143.95 gm.

Keywords: radish, organic fertilizer, poultry manure, cultivars.
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Introduction

The Radish *Raphanus sativus* L., is one of the crops of the Brassicaceae family, and it is one of the important annual winter vegetable crops grown in Iraq, as the part used in food is the leaves and roots that are eaten fresh [1]. As for the nutritional value and importance of radish, it contains proteins. Carbohydrates, fats, water, and fiber, in addition to some minerals, including calcium, iron, and ascorbic acid. It is also rich in some vitamins, including vitamins A and B. Therefore, it is used in treating some medical conditions, including constipation and diarrhea, as well as reducing the production of thyroid hormone. It is also used as a good antibiotic [2]. Since the consumption of the crop depends on eating the leaves and roots, it is one of the crops that needs the addition of chemical fertilizers as a source of nitrogen and potassium, and the use of these fertilizers leads to harm to human health and the environment in addition to the high cost, so it is necessary to replace these fertilizers with natural organic fertilizers, including poultry manure, as it is rich. It contains nutrients, increases soil fertility, and improves its physical and chemical properties [3]. [4] found in his study on onion plants that adding manufactured poultry manure had a significant effect on some of the studied characteristics, including the number of leaves, the fresh and dry weight of the leaves, and the total yield at the level of 40 kg 100 m^{-1} compared to chemical fertilization. [5] showed that adding poultry manure to onion plants at a rate of 12 tons h^{-1} led to a significant increase in the percentage of dry matter of the shoot and an increase in the amount of yield. In a study [6] on onion plants, it was found that fertilization with poultry waste was significantly superior in all characteristics of vegetative growth at all levels of fertilization to the comparison treatment, and among these characteristics were the percentage of dry matter in the leaves, plant height, leaf area, and number of leaves. As for the characteristics of yield, it was superior to the level 1500 g m^2 of poultry waste according to the control treatment in terms of percentage of dry matter in bulbs and total yield. It was also found [7] that fertilizing the lettuce crop with poultry waste at several levels of 10, 20, and 40 gm per plant, along with fertilizer combinations by spraying with humic acid, led to significant increases in all the traits studied: number of leaves, leaf area, leaf content of chlorophyll and nitrates, head curl ratio, and average weight. Head and total yield compared to the comparison treatment. As for the impact of cultivars, it is necessary to use new cultivars to increase production, compare these cultivars with local cultivars, and suit each cultivar to the environmental conditions specific to each region, in addition to the genetic factors specific to each cultivar. It was found [8] that the use of two cultivars of radishes, a local cultivar and a foreign cultivar, outperformed the local cultivar in all the characteristics studied, the percentage of chlorophyll, plant height, number of leaves, percentage of dry matter in leaves and roots, root diameter, and yield per plant, over the foreign cultivar. [9] showed that the use of four cultivars of radishes, local red, local black, Turkish, and Syrian, led to the Syrian cultivar being superior to other cultivars in root weight, root to stem weight ratio, root diameter, and plant yield from the root. [10] confirmed that the use of two cultivars of radish, the black Rudi cultivar and the red Celesta cultivar, led to the black cultivar being superior to the red cultivar in terms of root dry weight, while the red cultivar was superior to the black cultivar in terms of overall condition and root length.

Based on the above, this study was conducted to test the best levels of poultry manure, and which of the two cultivars gives the best characteristic.

Materials and methods

This experiment was conducted in the fields belonging to the College of Agriculture / Tikrit University, for the 2022 agricultural season. The field soil was prepared, which is a transported mixture soil, and Table No. (1) Shows the chemical and physical components of the soil. The field land was divided into terraces. The length of the terrace was 1 m, the distance between one terrace and another was 50 cm, and the distance between the experimental units was 30 cm. The irrigation method used was drip irrigation, as the system was prepared before the planting process. The field land was fertilized before planting with chemical fertilizer NPK according to the fertilizer recommendation (25 kg dunum^{-1} N, 30 kg dunum^{-1} P_2O_5, and 15 kg dunum^{-1} K_2O) [11] and radish seeds were planted at 24/11/2022 in two lines in each terrace, the distance between one line and another is 25 cm, and 10 cm between one seed and another. Thus, each experimental unit contained 20 seeds, with 10 seeds in each line. The experiment included 6 treatments resulting from the interaction between two factors: fertilization with poultry manure, which includes three levels (0, 20, 30) gm plant^{-1}, and the other factor is the cultivars , and it was used Two cultivars , one a local Syrian non-hybrid red radish , germination 75% and purity 98% (V1) and the other a foreign cultivar was white Spanish Super long, germination 95% and purity 99% (V2). Each experimental unit was fertilized with poultry manure according to the previously mentioned levels and according to the distribution of treatments. The treatments were distributed randomly among the experimental units and in three replicates according to the randomized complete block design (RCBD), and they were compared. The averages were calculated according to Duncan's multinomial test, and the experiment was analyzed statistically using the SAS program (2001) [12]. The service operations of thinning, hoeing, and weeding were carried out as is the practice of farmers in Salah al-Din Governorate. At the end of the experiment, measurements were taken for the following characteristics:

1. **Plant length (cm)** Plant length was measured from where the plant was in contact with the soil to the top of the plant for three plants, then the average was taken.
2. **Number of leaves (leaf^{-1})** The number of leaves for three plants was calculated, then the average was taken.
3. **Percentage of dry matter in roots (%):**The root weight of three plants was taken randomly, then the samples were dried in an electric oven at 65-75 degrees C° Until the weight was stable, it was then calculated on the basis of ratio and proportion
4. **Root diameter (cm plant^{-1}):** The root diameter was calculated using the root of three plants, then the average was taken.
5. **Root length (cm plant^{-1}):** The length of the root was calculated from its connection to the stem to the end of the root for three plants at random.
6. **Plant yield (g):** It was calculated by taking the weight of roots from three plants at random and then calculating the average.

Table (1) Some physical and chemical characteristics of field soil before planting

Units	the value	Adjective
$g.kg^{-1}$	13.8	Gypsum
$g.kg^{-1}$	21.2	Lime
$Ds.m^{-1}$	2.21	Ec
-	8.1	pH
$g.kg^{-1}$	540	Sand
$g.kg^{-1}$	339	Green
$g.kg^{-1}$	121	Clay
-	sandy loam	Histology
%	0.84	Organic matter

*The field soil was analyzed in the laboratory of the Department of Soil Sciences and Water Resources / College of Agriculture / Tikrit University

Results and discussion

1. Plant length (cm):

Table No. (2) Shows that fertilization at levels of 20 and 30 gm $plant^{-1}$, natural poultry fertilizer, produced significant differences in plant height and was superior to the comparison treatment, which reached a value of 14.00 cm. Likewise, the level of 20 gm $plant^{-1}$ was superior to the level of 30 gm $plants^{-1}$. The highest reached 18.13 and the lowest 15.58 cm, respectively. As for the effect of the cultivars, the first cultivar outperformed the second cultivar in plant height, which gave 21.48 cm, while the other cultivar gave 10.29 cm.

As for the interaction between fertilization and cultivars, the interaction treatment between the first type and fertilization with poultry manure at the level of 20 gm $plant^{-1}$ superior all other interaction treatments, as it gave a value of 25.10 cm. The lowest values were in the interaction between the second type and the same level of fertilization with poultry manure, which It reached 9.83 cm.

Table (2) Effect of fertilization with poultry manure and cultivars and the (interaction between them on plant height (cm)

Poultry manure / Cultivars	0	20	30	the average
V1	18.00 c	25.10 a	21.33 b	21.48 a
V2	10.00 d	11.17 d	9.83 d	10.29 b
the average	14.00 c	18.13 a	15.58 b	

*Different letters within column indicating of significant differences ($p<0.05$)

2. Number of leaves ($leaf^{-1}$):

Table (3) shows that there is no significant differences between cultivars and poultry manure if they are individual or when they are interacted

Table (3) Effect of Fertilization With fertilizer Poultry and the cultivars (And interference Between them in characteristic Number of leaves (leaf-1)

Poultry manure Cultivars	0	20	30	the average
V1	6.20 a	7.33 a	6.90 a	6.81 a
V2	6.00 a	5.84 a	6.25 a	6.02 a
the average	6.10 a	6.56 a	6.58 a	

*Different letters within column indicating of significant differences (p<0.05(

3. Percentage of root dry matter (%):

We note from Table No. (4) That the cultivar and fertilization with poultry manure had a significant effect on the percentage of root dry matter, as the local cultivar was significantly superior to the foreign cultivar and gave the highest percentage of dry matter in the roots, which amounted to 8.19%, while the other cultivar gave the lowest percentage, amounting to 7.38%. . As for fertilization with poultry manure, the level of 30 and 20 gm plant^{-1} was superior to the comparison treatment, which gave the lowest values of 7.07%, and the level of 30 gm plant^{-1} was superior to the level of 20 gm plant^{-1}, and the percentage of dry matter in the roots reached 8.29% and 8.02%, respectively .

Regarding the interaction between the treatments, the differences were significant when fertilizing the local cultivar at the level of 20 gm plant^{-1}, which outperformed most of the other treatments. The dry matter percentage of the roots reached 8.80% in this treatment, and the lowest value was when the foreign cultivar was not treated with poultry manure, and the percentage 6.89%.

Table (4) Effect of Fertilization With fertilizer Poultry and the cultivars And interference Between them in characteristic Percentage of root dry (%) matter

Poultry manure Cultivars	0	20	30	the average
V1	7.25 b	8.80 a	8.54 ab	8.19 a
V2	6.89 c	7.23 b	8.04 b	7.38 b
the average	7.07 c	8.02 b	8.29 a	

*Different letters within column indicating of significant differences (p<0.05)

4. Root diameter (cm):

Table (5) shows that fertilization with a weight of 20 gm plant^{-1} led to significant differences in root diameter, as it was superior to the other two treatments. The root diameter reached 18.32 cm, and the smallest diameter in the comparison treatment was 13.26 cm. The cultivars also produced significant differences, as the first cultivar outperformed the second cultivar, and the values were as follows (17.05 and 13.19) cm.

It is also clear from the same table that the interaction between the two factors led to the

superiority of the interaction treatment between (V1) and the level of 20 gm plant^{-1} over the two interference treatments of (V2) with the comparison and the level of 30 gm plant^{-1}, and the values reached 20.23, 11.17, and 12.00 cm, respectively. There were no significant differences with other intervention parameters.

Table (5) Effect of Fertilization With fertilizer Poultry and the cultivars (And interference Between them in characteristic Root diameter(cm

Poultry manure Cultivars	0	20	30	the average
V1	15.34 ab	20.23 a	15.57 ab	17.05 a
V2	11.17 b	16.42 ab	12.00 b	13.19 b
the average	13.26 b	18.32 a	13.78 b	

*Different letters within column indicating of significant differences ($p<0.05$)

5. Root length (cm):

We note from Table (6) that the local cultivar superior the foreign cultivar in root length, and the values reached 11.64 cm and 10.87 cm, respectively. As for the effect of fertilization with poultry manure, fertilization at the 30 g plant^{-1} level was superior to the root length characteristic at the other two levels, and the values reached 12.39 cm, 10.95 cm, and 10.43 cm, respectively.

In the same table, we see the effect of the interaction between the two factors, as the interaction treatment between fertilizing the local cultivar at the level of 30 gm plant^{-1} outperformed most of the other interaction treatments and gave the highest root length of 12.91 cm, while the lowest values were in the comparison treatment for the foreign cultivar, 10.15 cm.

Table (6) Effect of Fertilization With fertilizer Poultry and the cultivars And interference Between them in Characteristic of root length(cm)

Poultry manure Cultivars	0	20	30	the average
V1	10.71b	11.29 ab	12.91 a	11.64 a
V2	10.15 b	10.60 b	11.87 ab	10.87 b
the average	10.43 b	10.95 b	12.39 a	

*Different letters within column indicating of significant differences ($p<0.05$)

6. Plant yield from roots (g):

The following table shows that there are significant differences between fertilization treatments with poultry manure, as the levels of 30 and 20 gm plant^{-1} exceed the comparison treatment in terms of plant yield from roots, giving 101.57 and 92.40 gm, respectively, while the comparison treatment gave a value for the yield amounting to 69.56 gm. As for the cultivars, there were also significant differences between the two cultivars, as the local cultivar was superior to the foreign cultivar in terms of plant yield of roots, and the local cultivar gave a yield of 123.30 grams, while the foreign cultivar gave 52.50 grams.

We also note from the table that there is a significant increase when interacting between the two factors, as the interaction treatment of fertilizing the local cultivar at the level of 30 gm plant^{-1} superior most of the other interaction treatments and the value of the result reached 143.95 g. The lowest result was when the interaction treatment between the foreign cultivar and no fertilization reached 40.01 gm.

Table (7) effect of Fertilization With fertilizer Poultry and the cultivars And interference Between them in characteristic Plant yield from roots (g)

Poultry manure	0	20	30	the average
Cultivars				
V1	99.11 b	126.84 ab	143.95 a	123.30 a
V2	40.01 c	57.96 c	59.55 c	52.50 b
the average	69.56 b	92.40 a	101.57 a	

*Different letters within column indicating of significant differences ($p<0.05$)

The increase in vegetative growth characteristics and yield may be attributed to the role of organic fertilizer and natural poultry manure in improving the soil's organic matter content [13].These results are consistent with [14], which stated that organic fertilizers work to improve the soil's characteristics and its content of nutrient elements, as it increases Its readiness for absorption by modifying the acidity of the soil, thus increasing the quantitative and qualitative characteristics of the yield. The reason for the superiority of the local cultivar over the foreign cultivar may be due to its suitability to the surrounding environmental conditions as well as the genetic differences for each cultivar. These results are consistent with [15] [16]. The increase resulting from the interaction between the two factors may be attributed to the cumulative effect of both.

Conclusions:

We conclude from the experiment that fertilization with natural poultry manure led to improving the growth and productivity characteristics of radish plants. We also conclude that the local cultivar was better than the foreign cultivar in all growth characteristics and yield.

References

[1] Hassan, A. A. 1991. " *Vegetable crops Production*." Dar Al Arabiyya for Publishing and Distribution. Cairo, Arab Republic of Egypt. P 381-389.

[2] Matlob, A. N., Sultan, E., Abdul, K. S. 1989. *Vegetable Production*, p. 680. Part 1 (Iraq: Dar AL-Kutub Publication. Mosul University

[3] Al-Nuaimi, Saadullah Najm Abdullah. 1999. "Fertilizers and Soil Fertility." Dar Al-Kitab Printing and Publishing Foundation. University of Mosul.

[4] Khalil, Abdul Moneim Saadullah. 2013. "Effect of Organic Fertilization on Growth and Yield of Local

White Green Onion *Allium cepa* L." Diyala Journal of Agricultural Sciences. 5 (2): pp. 185 - 193.
[5] Salman, Adnan Hameed. 2000. "Effect of Irrigation Interference, Water Salinity, and Organic Fertilizer on Some Soil Properties and Yield in Onion." Master's Thesis. College of Agriculture. University of Baghdad. Republic of Iraq.
[6] Al-Hamdani, Sabih Abdul Wahhab and Ali Hussein Hassan and Raad Waheeb Mahmoud Al-Zuhairi. 2018. "Effect of Fertilizing with Poultry Manure and Agricultural Sulfur on the Growth and Yield of Onion *Allium cepa* L." Tikrit University Journal of Agricultural Sciences. 18(1): pp. 81 – 88.
[7] Al-Ali, Hameed Hamdan and Samia Hisham Abdul Hamid. 2017. "Effect of Adding Manufactured Poultry Manure and Spraying with Humic Acid on the Growth and Yield of Two Lettuce Varieties." Anbar Journal of Agricultural Sciences. 15 (1): pp. 202 – 213.
[8] Abdul Rahman, Harith Barhan Al-Din. 2014. "Effect of Spraying with Seaweed Extract Alga 600 on Growth and Yield of Two Radish cultivars *Raphanus sativus* L." Diyala Journal of Agricultural Sciences. 6 (1): pp. 172 – 178.
[9]Amur A.H Al-juboori Shamil.YH Al-hamdani Merwa. M. Hamdon. 2019. Effect of sowing date on growth and yield of four Radish (*Raphanus sativus* L.) cultivars. Mesopotamia J. of Agric. 47(2): pp 96 – 103.
[10] Abdullah MS AL-Dabbagh. 2019. Effect of planting method and spraying with the organic nutrition solution on growth and yield of two Radish cultivars (*Raphanus sativus* L.). Mesopotamia J. of Agric. 47(2): pp 14 – 27.
[11] Al-Bahash, Najm Abdullah and Salam Abdul Ghafur Dawood and Iman Abdul Ghani Hussein. 1985. "Effect of Planting Distance and Nitrogen Fertilization on Lettuce Yield." Journal of Agricultural Research and Water Resources. 4(2): pp. 37 – 45.
[12] Al-Mohammadi, S M, Al-Muuhammadi,F M. (2012) Statistics and experimental design . dar Osama for publication and distribution. Amman Jordan.
[13] Saber, Saad Farhood and Ihsan Jalel Azbeeb and Ahmed Dinar Khalef. 2019. "Study on the Effect of Humic Acid on Growth and Yield of Two Radish Varieties *Raphanus sativus* L." College of Agriculture and Marshlands. University of Thiqar.
[14] Chen, J.H. 2006. The combined use of chemical and organic fertilizer and/or bio fertilizer for crop growth and soil fertility. Department of soil and environmental sciences, National Chung Hsing University, 250 Kuo-Kuang Road, Taichung. Taiwan ROC. Internet.
[15] Kobierski, M., Bartkowiak, A., Lemanowicz, J., & Piekarczyk, M. (2018). Impact of poultry manure fertilization on chemical and biochemical properties of soils.
[16] Kyakuwaire, M., Olupot, G., Amoding, A., Nkedi-Kizza, P., & Ateenyi Basamba, T. (2019). How safe is chicken litter for land application as an organic fertilizer? A review. International journal of environmental research and public health, 16(19), 3521.

تأثير سماد الدواجن في بعض صفات النمو الخضري والحاصل لصنفين من نبات الفجل *Raphanus sativas* L.

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الخلاصة

نفذت التجربة في الحقول التابعة لكلية الزراعة / جامعة تكريت ، للموسم الزراعي 2022 ، لدراسة تأثير السماد العضوي الطبيعي سماد الدواجن في نمو وحاصل صنفين من نبات الفجل ، اذ تم استخدام مستويين من سماد الدواجن الطبيعي 20 و 30 غم نبات$^{-1}$ بالاضافة الى معاملة المقارنة ، اما العامل الاخر الاصناف فقد استخدم صنفين احدهما محلي والاخر اجنبي وتم توزيع المعاملات بصورة عشوائية حسب تصميم القطاعات العشوائية الكاملة وبثلاث مكررات . اما النتائج فكانت كالاتي : تفوق التسميد بسماد الدواجن الطبيعي في جميع الصفات المدروسة طول النبات ، النسبة المئوية للمادة الجافة في الجذور ، قطر الجذر ، طول الجذر ، حاصل النبات من الجذور عدا صفة عدد الاوراق ، وكانت النتائج قد بلغت 18.13سم ، 8.29% ، 18.32سم و 12.39سم و 101.57غم على التوالي . اما الاصناف فقد تفوق الصنف المحلي على الصنف الاجنبي في اغلب الصفات واعطى النتائج التالية 21.48سم و 8.19% و 17.05سم و 11.64سم و 123.36غم وعلى التوالي . كذلك التداخل كان له الاثر المعنوي اذ تفوقت معاملة التداخل بين التسميد بمستوى 20 غم نبات$^{-1}$ مع الصنف المحلي في الصفات التالية طول النبات ، النسبة المئوية للمادة الجافة في الجذور ، قطر الجذر وبلغت قيمها 25.10سم و 8.80% و 20.23سم على التوالي ، اما الصفتين قطر الجذر وحاصل النبات من الجذور فقد تفوقت معاملة التداخل تسميد الصنف المحلي بمستوى 30 غم نبات$^{-1}$ من سماد الدواجن الطبيعي وكانت قيمها كالتالي : 12.91سم و 143.95غم

الكلمات المفتاحية : الفجل ، السماد العضوي ، سماد الدواجن ، الاصناف.