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Effect of levels of organic fertilizer (compost) prepared from the Conocarpus plant on the vegetative characteristics of two radish varieties (*Raphanus sativus* L.) grown in sandy loam soil.

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I. Abstract:

The study showed that adding different levels (0, 2.5, 5, 7.5) tons/dunum of local compost prepared from the *Canocarpes Lan cifolius* plant led to a significant increase when added to two varieties of local and Indian radish plants. An increase was observed in the morphological characteristics of both varieties, with a significant increase at the significance level of (0.05) in height, number of leaves, leaf surface area, dry vegetative mass, and root weight. Both varieties were grown in sandy loam soil. A significant difference was found in the response of the two radish varieties to increasing levels of organic fertilizer, with a difference of (0.05 p) between them, according to the studied growth criteria and characteristics shown in Table No. (3). Significant interactions were recorded between the varieties and levels of organic fertilizer, and significantly in the growth characteristics of the two radish varieties grown, and the extent of the response of some radish varieties to these levels of organic fertilizers in sandy loam.

Keywords: organic matters, compost, radish, varieties, sandy loam

II. Introduction:

Vegetable cultivation is considered one of the most economically valuable agricultural activities. At the same time, vegetable farming has become increasingly expensive due to the growing use of chemical fertilizers to achieve high productivity (Salim, 1999). Radish (*Raphanus sativus* L.) is a well-known vegetable crop in most countries worldwide, and its cultivation is widespread in the Arab world. It is grown for its leaves or roots, which are eaten fresh, or the roots of some varieties are cooked (Hassan, 2003). Organic fertilization is considered a cornerstone for increasing the productivity of agricultural lands and reducing environmental pollution resulting from the excessive use of mineral fertilizers. Organic fertilizers can act as slow-release fertilizers, providing a continuous and gradual supply of nutrients available to plants and readily absorbable by them. Organic fertilization has a significant effect on increasing the availability and release of nutrients in the soil, in addition to improving the physical, chemical, and biological properties of the soil. This, in turn, positively impacts the growth and productivity of cultivated crops (Neghamish, 2020; Abu Rayyan, 2010). The use of organic fertilizers helps reduce the amount of chemical fertilizers added to the soil and improves radish production in sandy soil conditions (Brady and Weil, 2004). The use of organic fertilizers has led to improved growth and productivity in various vegetable crops, such as radishes. (Khatri *et al*., 2001) and (Van *et al.,* 2014) noted that increasing the addition of organic fertilizers led to an increase in the productivity of the radish crop compared to not adding them. The positive effects of organic fertilizers on plant growth and productivity can be attributed to the effect of different organic fertilizers that increase the levels of available

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nitrogen, phosphorus, potassium, iron, zinc and manganese. This was mentioned (EL-Karamany, *et al*., 2000). This effect may reduce the quantities of chemical fertilizers and improve application efficiency, thus avoiding environmental pollution. Organic fertilizer plays an important role in the growth and chemical composition of many medicinal and aromatic plants. Due to the importance of adding organic fertilizers to the soil and enhancing its properties, their addition to most of the world's organically deficient soils has been studied and tested on all crops, various vegetables, and fruit trees. This led to increased nutrient absorption by different plants and improved their morphological and chemical growth characteristics in response to these fertilizer additions. This is because they support the soil with essential mineral elements for plants and improve the soil's physical and biological properties. Consequently, this response is reflected in increased growth and development of plants fertilized with these compounds (Ati & Al-Sahaf, 2007). Additionally, it reduces nitrogen loss from the soil and improves radish productivity (Lanna *et al*., 2018). This research aims to determine the effect of cow manure levels on improving the growth and productivity of plant varieties in Red radish.

III. Materials and Methods:

The chemical, physical, and biological properties of the cultivated soil were measured, and the local properties were analyzed according to the methods described (Page *et al*., 1982).

Components for Preparing Conocarpus Compost

•Components of the compost mix

1000 •kg plant residues

50 •kg soil

300 •kg animal manure

5 •kg urea

5 •kg DAP

As per the instructions of the National Center for Organic Agriculture at the Ministry of Agriculture (2011), a field experiment was conducted to study the effect of locally produced Conocarpus compost at different levels on two radish varieties grown in sandy loam soils in the Al-Mustafawiya area, located in the north .West of Nasiriyah city, approximately 4 km from the city center, located within the University of Dhi Qar, specifically the field of the College of Agriculture and the marshes, at longitude 1335.46 and latitude 31.0308. After composting, the chemical and physical properties of the soil were analyzed as shown in Table 1. Wooden boxes measuring 150 cm in length, 100 cm in width, and 70 cm in depth were prepared and filled with sandy loam soil for radish cultivation, with the properties detailed in Table 1. Each plot was divided into five rows, 25 cm apart, to prepare for radish planting. Two radish varieties (local and Indian) were used at levels of 0, 2.5, 5.0, and 7.5 tons/dunum with four levels of organic fertilizer, using an R.C.B.D. design with 16 experimental units (two varieties of local and Indian radish plants at four levels). Compost and blockwork were used in five rows, and the plants were fertilized with 150 kg of nitrogen per dunam, 50 kg of potassium (K_2O), and 80 kg of phosphorus (P_2O_5). Phosphorus was added at planting, nitrogen was applied in two doses after germination and before flowering, and potassium was applied in one dose before the end of the growing season for radish plants. This was done to determine the response of these plants to locally produced organic fertilizer, and the following measurements were taken: The experiment was designed as a factorial experiment (2, 4, 2) for two radish varieties (local and Indian) and compost concentrations of 0, 2.5, 5, and 7.5 kg/ton-1. The samples were collected in sections and analyzed according to statistical analysis (Al-Rawi and Khalaf Allah, 2000).

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1. Plant height

2.Radish leaf area

3.Leaf length

4. Number of leaves per plant

5. Vegetative weight

6. Dry weight

7. Root weight

8. Dry root weight

Table No. (1) Physical and Chemical Properties of Cultivated Soil

Unity	**Value**	**Standard**
	7.14	PH
$ds.m^{-1}$	1.5	EC
%	0.45	Organic Matter
ppm	23	Total Nitrogen
ppm	6.4	Available Phosphorus
ppm	75.0	Available Potassium
%	78.00	Sand
%	15.00	silt
%	7.00	Clay
Sandy loam		Texture
%	2.2	Gypsum
%	5	Lime

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Table No. (2) shows the physical and chemical properties of locally prepared compost

Unity	Value	Standard
	7.18	PH
$ds.m^{-1}$	1.37	EC
%	20	M.O
%	1.78	TotalN
%	0.48	TotalP
ppm	98.8	TotalMg
ppm	122	Ca
ppm	278	Cl
ppm	2.68	pd
ppm	0.00078	Hg
ppm	0.21	Cr
ppm	0.37	Ni
%	Less than 4	Impurities
%	67.5	Moisture content
$grams/cm^3$	0.90	Apparent density
kg /ton	780	Ton of prepared material
	Blackish-yellow	Compost color

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Table No. (2)(b) shows the physical and chemical properties of the (international) standard compost.

Unity	Value	Standard
	6.5-8.5	PH
$ds.m^{-1}$	Less than 5.5	EC
0٪0	More than 20	M.O
0٪0	0.7	TotalN
0٪0	0.5	TotalP
0٪0	0.35	TotalMg
0٪0	0.2	Ca
0٪0	Less than 0.5	Cl
ppm	120	pd
ppm	1.0	Hg
ppm	70	Cr
ppm	20	Ni
%0organic matter	Less than 5%	Impurities
	More than 60	Moisture content
kg/m3	600	Apparent density
Kg /ton	750	Weight per ton of prepared compost
	Dark black with a yellowish tint	Compost color

IV. Results and Discussion

Table (2) shows the properties and characteristics of the locally produced compost from Al-Gharraf City, Nasiriyah, and compares these properties with international standards for compost production. All analyses of this compost confirmed that it met international standards for plant growth, whether in terms of chemical, physical, or biological properties. Experiments were conducted to determine plant response to the compost, and its suitability was tested in nutrient-poor sandy loam soil to achieve reasonable yields. The compost analysis table was compared with internationally prepared compost. The results in Table (3),

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Table (3) shows the effect of different levels of locally grown green compost on the characteristics of radish plants of the local and Indian varieties (dry weight of the vegetative parts) /g

Average impact of the variety	Compost levels (ton dunam^{-1}(				Category
	7.5	5	2.5	0	
17.565	17.37	2.37	19.5	13.3	Local
16.33	20.77	15.57	15	14	Indian
	19.08	17.91	17.25	13.65	Average Compost Impact
LSD (0.05) for the class	LSD (0.05) for compost			LSD (0.05) for interference	
0.760	1.74			1.519	

show significant differences in the dry weight of vegetative growth (α content 0.05) between radish varieties. The local variety significantly outperformed the Indian variety in the dry weight of the vegetative parts. This may be due to differences in the genetic characteristics of the varieties in the soil and their tolerance to nutrient absorption. These results are consistent with AL (Hajami, 2021) and (Aktas *et al*, 2021) When increasing the levels of locally prepared compost, it led to an increase in the dry matter weight of the vegetable group. This may be due to the fact that increasing organic matter led to an increase in the chemical properties of the soil and improved it, and provided all the nutrients for the plant. It also improved the physical, chemical and biological properties of the soil (Naghimish, 2020 .(This clarifies the role of organic materials in improving the chemical, physical, and biological properties when added to the soil. These results are consistent with (Khatri *et al*., 2019), who found that adding different sources of organic fertilizers affected the growth and yield of radish plants and their components affected the chemical, physical, and biological properties of the soil. We note from the table that the addition of compost at levels of (0, 2.5, 5, 7.5) tons/dunum significantly outperformed the control treatment at a level of α 0.05, the dry weight of the vegetative mass of radish plants, and the other studied traits. The treatment with added compost at a rate of 7.5 tons was superior. The ratio of dry matter weight to dry matter weight of the vegetative parts was significantly higher at a level of α 0.05. Table (3) shows a significant interaction between the Indian variety and the fertilizer level of 7.5 tons/dunum, with the dry matter weight reaching 20.77 grams, surpassing most of the treatments it interacted with. Table (4)

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Table (4) Effect of different levels of local compost on plant height (cm) for two radish varieties

Average impact of the variety	Compost levels (ton dunam^{-1}(				Category
	7.5	5	2.5	0	
24.75	24.75	24.0	26.67	22.0	Local
26.83	26.83	30.33	26.33	20.33	Indian
	28.33	27.17	26.50	21.17	Average impact of quantum post
LSD (0.05) for the class	LSD (0.05) for compost			LSD (0.05) for interference	
0.645	0.912			1.28	

illustrates the effect of different compost levels on the height of radish plants in two different varieties. The results showed the superiority of the Indian variety, with a significant increase in plant height compared to the local variety, reaching heights of 26.83 and 24.75 meters, respectively. This may be attributed to differences in the plant's genetic traits, which influence the variety's characteristics, nutrient absorption, and tolerance to environmental or soil conditions. Increasing the amount of compost added to the radish plant significantly increased plant height compared to the control treatment and between the two treatments. The plant height for both the local and Indian varieties under treatment [missing information]. The comparison is at a rate of 22.0 and 20.33 respectively, while the height of the local variety at a concentration of (0, 2.5, 5, 7.5 tons/dunum) was 26.67, 24 and 24.75 cm respectively, and the heights of the Indian variety at the same concentrations were 26.33, 30.33 and 26.63 respectively. This is due to the fact that increasing the level of compost added increased the nutrients for the plant and improved the physical, biological and chemical properties, and a response occurred in the height of the plants at these levels. These results are consistent with what was mentioned by Nisreen *et al*., 2025 and Khatri *et al*., 2019. Those who explained that adding active biochar to radish plants accelerated soil fertility and increased radish crop productivity. These results were also recorded by Van *et al*. (2024), who observed the response of radish plants, their growth, and biomass due to increased biochar addition to the soil. A significant interaction occurred between treatments for the Indian variety at compost concentrations of (5) tons/dunum -1, with a plant height of 30.33 cm. It outperformed all other treatments in the experiment. Table (5) **Table (5) Effect of compost levels on leaf count of two radish varieties**

Average impact of the variety	Compost levels (ton dunam-1(				Category
	7.5	5	2.5	0	
7.54	8.00	8.83	6.67	5.65	Local
7.25	8.00	7.67	7.0	6.33	Indian
	8.00	8.83	6.67	5.67	Average impact of quantum post
LSD (0.05) for the class	LSD (0.05) for compost			LSD (0.05) for interference	

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0.79	**1.118**	**1.581**

shows the effect of local organic fertilizer levels on the number of radish leaves for the local and Indian varieties. The results showed no significant superiority of the local and Indian varieties in the number of leaves. However, increasing the level of compost organic fertilizer (2.5, 5, 7.5) caused a significant increase in the number of leaves for both radish varieties at these levels compared to the control treatment and the treatment of adding compost fertilizer at the ( ) treatment. 2.5) tons/dunum -1 This is due to the increase in nutrients in the soil after the decomposition of compost, the improvement of the physical and biological properties of the soil, the increase in the activity and reproduction of microorganisms in it, and the decomposition processes and release of nutrients to these plants (Al-Hajami, 2021 and Neghamish, 2020) . Table (6)

Table (6) shows the effect of compost organic fertilizer levels (tons/dunum) and leaf area (cm2) for two radish plant varieties

Average impact of the variety	**Compost levels (ton dunam-1(**				**Category**
	7.5	**5**	**2.5**	**0**	
93.2	**169**	**117.3**	**54.7**	**32**	Local
98.25	**183**	**116.7**	**51.0**	**42.3**	Indian
	172.5	**147**	**52.8**	**37.2**	Average impact of quantum post
LSD (0.05) for the class	LSD (0.05) for compost			LSD (0.05) for interference	
7.77	**10.99**			**15.54**	

shows the effect of compost levels on leaf area in two radish varieties. The results showed no significant differences between the two radish varieties in leaf area. However, significant differences were found at the α 0.05 level between increasing compost levels and the control treatment without addition. The results also showed that when the compost level was increased to 7.5 tons/dunum -1, significant differences were found between the treatments for both radish varieties in leaf area. The 5% and 7.5% treatments were superior to the control treatments. The 7.5 tons/dunum -1 treatment differed significantly from the 5 tons/dunum treatment in increasing leaf area. This indicates the extent to which plant leaves respond to increased composting to increase the release of plant nutrients. There is a significant interaction between the varieties and the levels of organic fertilizer added to the soil, with the greatest significant interaction occurring in the Indian variety at a level of 7.5 tons/dunum-1 in the leaf area, which reached 183 cm2, and with a significant difference from all the interacting treatments in the experiment.

Table (7)

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Table (7) shows the effect of compost organic fertilizer levels (vegetative weight g) for two radish varieties

Average impact of the variety	Compost levels (ton dunam^{-1}(				Category
	7.5	5	2.5	0	
117.1	**115.8**	**135.8**	**130.1**	**88.66**	Local
109.1	**138.5**	**103.8**	**97.7**	**97.1**	Indian
	127.2	**119.4**	**113.9**	**91.8**	Average impact of quantum post
LSD (0.05) for the class	LSD (0.05) for compost			LSD (0.05) for interference	
5.07	**7.16**			**10.13**	

indicated significant differences at the α level of 0.05 between the radish varieties. The local variety significantly outperformed the Indian variety at the α level of 0.05 in the vegetative weight group, reaching 109.1 and 117.1 respectively. This is attributed to the genetic influences on plant indicators and their effect on response to soil and environmental factors. The same table also showed the reason for the significant increase in vegetative weight after raising the levels to 2.5, 5, and 7.5. The treatment fertilized with 7.5 tons/dunum of organic matter per dunum outperformed all other treatments in the experiment, even those fertilized with 2.5 tons/dunum. This may be due to the fact that increasing the level of organic matter increases the availability of nutrients, enhances soil fertility, and improves its various properties. These results are consistent with the findings of Khate *et al*., Researchers (Nisreen . 2019) observed that yield and plant growth vary depending on the type of fertilizer applied and its level in the soil. Generally, increasing the availability of sufficient organic matter improves soil fertility, nutrient availability, plant growth, yield, and biomass. This was also observed in radish plants, as studied by Nisreen *et al*., (2025), Khatri *et al*., (2019), and Waleed *et al.,* (2025). Table 7 indicates a significant interaction between varieties and levels of organic fertilizer application. A significant increase of α (0.05) was observed between radish varieties. Furthermore, the Indian radish variety showed a significant advantage in root dry matter weight compared to the two local radish varieties during the experiment, resulting in a significant increase of 0 to 2.5 tons/dunum. The weight of dried roots of radish plants indicates that increasing organic matter in the soil for different radish varieties significantly increases the weight of the Indian variety. The Indian variety showed a significant advantage at the α level of 0.05. The local radish variety, at a fertilization level of 5.75, outperformed all other varieties in the experiment. Table 8, which studies the estimated dry root weight in grams for two radish varieties, shows a significant advantage for the Indian radish variety in the weight of its dry root matter compared to the local radish variety. This is attributed to the genetic differences between the two varieties and their responsiveness to the growing conditions and environment during the experiment. Table 8

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Table (8) shows the effect of different levels of locally grown green compost on the dry root weight of two radish varieties. Dry root weight (g(

Average impact of the variety	Compost levels (ton dunam^{-1}(				Category
	7.5	5	2.5	0	
12.46	15.77	14.82	11.39	7.85	Local
16.77	21.55	20.99	15.49	9.05	Indian
	18.66	17.90	13.44	8.45	Average impact of quantum post
LSD (0.05) for the class	LSD (0.05) for compost			LSD (0.05) for interference	
1.454	2.056			2.908	

also shows that increasing the levels of organic fertilizer added to the soil from 0 to 2.5, 5, and 7.5 tons/dunum resulted in a significant increase of α (0.05) in the weight of dried roots of radish plants for both varieties. The 5 and 7.5 tons/dunum levels were the most significant. The Indian variety significantly outperformed the local variety at the 0.05 α level compared to the other levels of 0 and 2.5 tons/dunum -1 for both varieties in terms of the weight of the dried roots of the radish plant. This indicates that the increase in soil organic matter led to an increase in the vegetative and root growth of the plant due to the availability of various elements available to the plant through the decomposition of these materials and the availability of ready-made forms of nutrients absorbed by the plant (Neghamish, 2020). We note the significant superiority of the Indian variety at the 0.05 α level over the local variety in the weight of the plant roots for both mentioned fertilization levels. The best overlap in the dry weight of the roots was observed in the Indian variety at the organic fertilization level (5, 7.....% 9 tons/dunum), and it outperformed all overlap levels between the varieties.

V. Conclusion and Recommendations

1- The compost prepared from conocarpus showed a positive response and effectiveness in improving the morphological characteristics of two radish varieties, significantly enhancing their growth properties in sandy loam soil.

2- Secondly, the interaction between the variety and the compost fertilization levels played a significant role in enhancing plant growth characteristics.

3- Thirdly, the locally prepared compost from conocarpus exhibited chemical, physical, and biological properties comparable to internationally recognized compost in all the studied characteristics.

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It is recommended that conocarpus be used, given its abundance and widespread cultivation in Iraq, for compost production, provided that plants grown near vehicle exhaust and those collected from sidewalks and public streets are avoided.

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