Original Article

The Effect of Vermicompost and the Extract of Conocarpus Leaves on the Growth and Yield of Coriander Plants and their Essential Oils

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Abstract

Field trials were conducted at the College of Education for Pure Sciences, Ibn al-Haytham, University of Baghdad Iraq, during the 2023-2024 growing season to study the effect of vermicompost and aqueous extract of *Conocarpus erectus* leaves on the coriander plant (*Coriandrum sativum* L.). The experiment involved two factors: the first with two levels of vermicompost at 0 and 5 tons ha^{-1}, and the second by spraying the aqueous extract of conocarpus plant leaves at 0, 10, 20, and 30 g L^{-1} concentrations. The interaction treatment with vermicompost at 5 tons ha^{-1} and extract spraying at 20 g L^{-1} concentration produced the best results for number of leaves (51.33 leaves $plant^{-1}$), leaf chlorophyll content (41.77 SPAD), dry weight of the vegetative system (13.87 g $plant^{-1}$), dry weight of the root system (6.30 g $plant^{-1}$), leaf area (14.533 cm^2 $plant^{-1}$), number of inflorescences (44.37), yield per hectare (669.21 kg ha^{-1}), percentage of volatile oil in the coriander leaves (0.449%), and the specific gravity of oil (0.71 mg). The control treatment gave 30.67 leaves $plant^{-1}$, 26.57 SPAD, and 5.83 g $plant^{-1}$ 1.90 g $plant^{-1}$, 5.033 cm2$plant^{-1}$, 19.57 inflorescences 303.07 kg ha^{-1}, 0.213%, and 0.33 mg, respectively, for the same growth indicators. This study proved that coriander plants respond positively to vermicompost fertilizer and spraying with the aqueous extract of conocarpus leaves by producing the best results for vegetative growth, yield, and volatile oil percentage.

Keywords: Coriander plant, Vermicompost, Plant extract, active compounds

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Introduction

The coriander *Coriandrum sativum* L. is a herbaceous plant belonging to the Apiaceae family. It is characterized by a taproot and a hollow upright stem (6). Its height ranges between 20-140 cm, and its diameter from 2-20 mm. It branches into secondary branches that end in a pink inflorescence of compound umbellate, with two types of flowers, circumferential, pink, lush, and others discoidal, crimson in color, which do not unfold. Its fruits are spherical or smooth oval, yellowish-brown in color, 2-4 mm in diameter. Coriander is highly nutritional, containing vitamins C, A, and B2 . It is considered one of the important spices that help improve food taste.

It is medicinal as its fruits and leaves contain volatile oils which include 200 compounds with medicinal uses and has a distinctive flavor used to improve the taste and smell of medicines. The plant is considered medicinally effective as it is a gas repellent, an analgesic for colic, indigestion, and diarrhea, a hypotensive diuretic, a rheumatic pain reliever, and an anti-inflammatory. It is an antioxidant and antiseptic used in manufacturing cosmetics, perfumes, and soap (6). The optimal use of biological and organic fertilizers has proven its effectiveness in maintaining ecological balance and obtaining a safe and healthy environment, in addition to producing produce that are free from chemical residues (3).

Organic fertilizers play an important role in increasing the vital activity of soil organisms and improving the physical, chemical and biological properties of the soil . One of these organic fertilizers is vermicompost. The product results from the bio decomposition of organic materials by earthworms in the presence of oxygen, and is considered a good organic fertilizer and rich in elements that are effectively important for growth, such as nitrogen . Furthermore, organic farming practices are capable of improving bulk density, increasing the soil's ability to retain moisture content, and aerating the soil through the effectiveness of worm compost, which in turn improves the physical and chemical properties of the soil . It stimulates cell division and elongation, thus improving growth characteristics. Phosphorus is an important element in building and growing roots, and potassium activates some redox enzymes. At the same time, calcium, magnesium, iron, and other minerals are auxiliary factors in vital activities and building cells (22). Worm compost contains vast numbers of beneficial bacteria, fungi, and enzymes, as well as nutrients. It also acts as an inhibitor of soil-borne pathogens.Furthermore, the use of worm compost helps improve the physical properties of the soil, such as porosity, aeration, moisture retention, and drought resistance (18).

Plant extracts have an important role in providing mineral elements through diffusion and transporting photosynthetic materials across the phloem for the purpose of vegetative growth, supplying macro- and micronutrients to strengthen the cell wall and its components . Vermicompost also contains some enzymes that enhance the activities of microbial organisms. It enhances porosity in the soil and the penetration of roots and water, which leads to increased soil aeration (15). A study by showed that treating the cabbage plant *Brassica rapa* with vermicompost significantly enhanced leaf production and leaf area, and improved germination rates and yields by 43% and 30%, respectively compared to the control treatment. (23) proved that a 30% treatment of vermicompost increased the height of cucumber plants in greenhouses compared to other treatments.

Research has proven the efficiency of using foliar spraying of plant extracts in increasing growth indicators and yield as they contain elements and nutrients necessary for the growth and development of plants , reducing stresses from oxidative damage, and improving the quality of agricultural produce. Among these are the leaf extract of the *Conocarpus erectus* L. (4). It contains a group of nutrients and vitamins involved in the plant's vital activities, which help improve the process of photosynthesis (12), plant growth, and increasing yields (9). Using various plant extracts in scientific experiments has proven effective in increasing growth indicators and yield.

A study by showed that spraying pepper plants with green tea extract increased their heights, number of leaves and branches, and the content of pepper plants' fruits containing vitamin C. Another study (2) showed that aqueous extract of watercress and mint leaves increased vegetative growth indicators and the production of active compounds of the basil plant. In the interest of promoting a healthier ecosystem, this research examined the effect of organic vermicompost and foliar spraying with conocarpus leaf extract in enhancing the growth, productivity, and active compounds of the coriander plant.

Materials and Methods

The soil was prepared, and the field was divided into 1×2 m panels each separated by half a meter to avoid mixing. Two days before the first irrigation, decomposed vermicompost was added equally to all experimental units and mixed into the soil to the point of homogeneity. The field soil properties were analyzed in college laboratories, as shown in **Table 1**.

Table 1. Physical and chemical properties of the field soil

Analysis	pH	EC	N	P	K	Mg	Cl	Ca	O.M
Unit	Ph	ds m^{-1}	mg kg^{-1}	mg kg^{-1}	mg kg^{-1}	m mol L^{-1}	m mol L^{-1}	m mol L^{-1}	g.kg^{-1}
Measurement	7.21	2.12	14.23	3.27	22.04	0.58	3.67	1.56	1.7

The experiment was conducted at the Department of Biology, Botanical Garden, College of Education for Pure Sciences, Ibn Al-Haitham, University of Baghdad (latitude 33.37 degrees and longitude 44.36 degrees) on 10/4/2023. The coriander seeds were purchased from one of the private offices in the Al-Krayat area, and planted by scattering them in lines in panels of 1 x 2 m^2, each 15 cm apart, at a rate of six lines in each panel (6) The

number of experimental units reached 24, resulting in units of about 2×4×3 . Irrigation was carried out seasonally, according to the plant's need and the weather conditions for irrigating the field.

A factorial experiment was conducted using a randomized complete block design (RCBD) with three replications. Each replicate contained eight panels on which the experimental parameters were distributed.

Study factors

Vermicompost

The vermicompost comprising the waste of decomposing earthworms was obtained from the Agricultural Protection Department in the Ministry of Agriculture, and spread on the soil near the surface a week before sowing the seeds for planting. The addition was done at two levels: the first without adding (0) the compost, and the second, adding (5 ton. ha^{-1}). After that, the panels were watered with a light sprinkler to prepare the soil for the interactions of microorganisms before planting (1).

Spraying aqueous extract of conocarpus plant leaves

The leaves of the plant were collected from the Traffic islands in the streets of Baghdad, and their mineral elements content is shown Table 2. Quantities of plant leaves were collected, washed to remove dust, then spread and dried in an oven equipped with an air vacuum at a temperature of 65-70 °C for 72 hrs until the weight stabilized. The samples were ground and dissolved in distilled water for 24 hrs, according to the required concentrations (0, 10, 20 and 30 g L^{-1}). The mixture was filtered the day before the spraying process using filter paper (Whitman). The symbols were then placed on the pre-prepared plant extract samples to prevent mixing and prepare them for spraying in the morning . The plants were sprayed early in the morning until completely wet when they reached the stage of 4-5 true leaves, with three sprayings, on 12/12/2023, 26/12/2023, and 9/1/2024. Half the fertilizer recommendation for NPK fertilizer was added to all the research treatments.

Table 2. Elements in the leaves of the conocarpus plant (10)

element	Unit	Ratio
N	%	1.35
P	%	0.33
K	%	1.61
Ca	%	1.7
C	%	57.0
Zn	mg kg^{-1}	120
Cu	mg kg^{-1}	630
Fe	mg kg^{-1}	135.7

study traits or charactistics

- **plant height (cm)**
- **Number of leaves**
- **Chlorophyll content of leaves (SPAD)** Using a portable SPAD device, three readings were obtained from each of the sampled plants, and the average was taken.
- **plant Dry weight vegetative mass (g)**. Some plants were selected and cut from the crown area, then washed and dried in an electric oven at 65-70 °C. After the weight remained stable for 72 hrs, they were weighed with a sensitive balance to extract the average dry weight of the plant.
- **Root Dry weight (g)**
- **Leaf area (dm^2 $plant^{-1}$)**. Ten leaves were randomly selected for each plant, and the average leaf area was calculated with a scanner using the Digimizer program (20). Then, it was multiplied by the number of leaves per plant, and the result was calculated according to the equation:
- **Number of inflorescences**

- **Yield per hectare^{-1}**. One cutting was taken from a height of 15 cm from the ground's surface to allow the plant to grow again. The plants were harvested 90 days after planting. The wet weights of the plants were extracted in grams per plate, and the weights were converted to kg h^{-1}. The yield was calculated according to the following equation :
- **Volatile oil percentage**. To extract the volatile oil from the leaves, 20 g of the dry plant sample was taken and placed in a beaker, and 100 ml of distilled water was added. Then it was placed in the Clevenger machine for 3 hours, after which the resulting oil was collected, and 20 ml of hexane was added to it to separate the oil from the drops. Water was collected with the oil. The volatile oil percentage was estimated according to the equation by (14).
- **Specific gravity of oil**: The specific gravity represents the degree of saturation of the oil. A volume of 100 microliters of volatile oil was taken in a precise volumetric pipette, and its weight estimated using a sensitive balance. The specific gravity was calculated at a 20 °C by dividing the weight of that volume of oil by the weight of the same volume of distilled water at the same temperature (14).

$$\text{Total leaf area of plant}\left(\text{dm}^2\text{plant}^{-1}\right) = \frac{\text{Average area of one sheet}\left(\text{cm}^2\right)}{100}\text{the number of leaves per plant}$$

$$\text{Production}\left(\text{tons.hectare}^{-1}\right) = \frac{\text{Experimental unit production (ton)} \times \text{Hectare area (10,000)m}^2}{\text{Experimental unit area}}$$

$$\text{Percentage of volatile oil} = \frac{\text{Weight of oil produced (g)}}{\text{Weight of plant sample (g)}} \times 100$$

Statistical analysis was conducted according to the least significant difference (LSD) test at a 0.05 probability level .

Results and Discussion

Plant height (cm)

Significant superiority in plant height was achieved by the 5-ton addition of vermicompost fertilizer per hectare, at 43.08 cm plant^{-1} compared to the control treatment's 31.08 cm plant^{-1}. The interaction treatment (5 tons vermicompost fertilizer per hectare and 30 g L^{-1} conocarpus leaf extract spraying) was significantly superior recording the tallest height of 46.00 cm plant^{-1} compared to the control treatment's 27.00 cm plant^{-1} (**Table 3**).

Table 3. The effect of vermicompost and plant extract on coriander plant height (cm plant^{-1})

Average	Plant extract (g L^{-1})				Vermicompost (ton ha^{-1})
	30	20	10	0	
31.08	35.67	31.67	30.00	27.00	0
43.08	46.00	44.00	43.00	39.33	5
LSD	40.83	37.83	36.50	33.17	Average
2.625	LSD 0.05				LSD
	3.712				1.856

Number of leaves

The results in **Table 4** show the significant superiority of the 5 tons ha^{-1} vermicompost fertilizer treatment in the number of leaves, at 46.67 leaf $plant^{-1}$ compared to the control's 35.83 leaf $plant^{-1}$. The interaction treatment (5 tons ha^{-1} vermicompost fertilizer and 20 g L^{-1} conocarpus leaf extract spraying) was significantly superior, recording the highest number at 51.33 leaf plant $plant^{-1}$ compared to the control treatment's 30.67 leaf $plant^{-1}$.

Table 4. The effect of vermicompost and plant extract on the number of leaves of the coriander plant (leaf $plant^{-1}$)

Average	Plant extract (g L^{-1})				Vermicompost (ton ha^{-1})
	30	20	10	0	
35.83	41.67	36.67	34.33	30.67	0
46.67	47.67	51.33	44.33	43.33	5
LSD	44.67	44.00	39.33	37.00	Average
2.731	LSD 0.05				LSD
	3.862				1.931

Chlorophyll SPAD unite

As seen in **Table 5**, the treatment of adding 5 tons of vermicompost fertilizer per hectare was significantly superior in the amount of chlorophyll found in the coriander leaves, as it recorded 38.62 SPAD compared to the control treatment's 30.14 SPAD. In the two-way interaction, the 5 tons vermicompost fertilizer per hectare and 20 g L^{-1} conocarpus leaf extract spraying was significantly superior at 41.77 SPAD compared to the 26.57 SPAD for the control.

Table 5. The effect of vermicompost and plant extract on chlorophyll (SPAD)

Average	Plant extract (g L^{-1})				Vermicompost (ton ha^{-1})
	30	20	10	0	
30.14	33.73	32.07	28.20	26.57	0
38.62	40.33	41.77	36.67	35.73	5
LSD	37.03	36.92	32.43	31.15	Average
1.753	LSD 0.05				LSD
	2.479				1.240

Plant dry weight

The results showed significant superiority of the 5 tons ha^{-1} vermicompost fertilizer treatment on average dry weight of the vegetative group, recording 12.09 g $plant^{-1}$ compared to the 7.63 g $plant^{-1}$ for the control. The interaction treatment (5 tons/ha vermicompost fertilizer and 20 g L^{-1} conocarpus leaf extract) was significantly superior, giving the highest dry weight of 13.87 g, while the control treatment recorded the lowest value of 5.83 g $plant^{-1}$ (**Table 6**).

Table 6. The effect of vermicompost and plant extract on the dry weight of the shoot of the coriander plant (g plant^{-1})

Average	Plant extract (g L^{-1})				Vermicompost (ton ha^{-1})
	30	20	10	0	
7.63	9.17	8.43	7.10	5.83	0
12.09	13.40	13.87	11.03	10.07	5
LSD	11.28	11.15	9.07	7.95	Average
0.744	LSD 0.05				LSD
	1.052				0.526

Dry weight of the root system

As seen in **Table 7**, the 5 tons ha^{-1} vermicompost treatment produced the highest value in root dry weight at 5.43 g plant^{-1} compared to the control which recorded 3.21 g plant^{-1}. The interaction treatment between 5 tons ha^{-1} vermicompost and 20 g L^{-1} conocarpus leaf extract was significantly superior, recording 6.30 g plant^{-1}, while the control had the lowest value at 1.90 g plant^{-1}.

Table 7. The effect of vermicompost and plant extract on root dry weight (g plant^{-1})

Average	Plant extract (g L^{-1})				Vermicompost (ton ha^{-1})
	30	20	10	0	
3.21	4.50	3.66	2.80	1.90	0
5.43	5.43	6.30	5.40	4.60	5
LSD	4.96	4.98	4.10	3.25	Average
0.34	LSD 0.05				LSD
	0.48				0.24

Leaf area (dm^2 plant^{-1})

The research factors caused a significant superiority and increase in the leaf area of the coriander plant, as the 5 tons ha^{-1} vermicompost treatment recorded the highest value of 13.30 dm^2 plant^{-1} compared to the control's lowest at 8.76 dm^2 plant^{-1}. The interaction treatment (5 tons ha^{-1} vermicompost fertilizer and 20 g L^{-1} conocarpus leaf extract) was significantly superior and recorded 14.53 dm^2 plant^{-1}, while the control treatment recorded the lowest value of 5.03 dm^2 plant^{-1} (**Table 8**).

Table 8. The effect of vermicompost and plant extract on the leaf area of the coriander plant (dm^2 plant^{-1})

Average	Plant extract (g L^{-1})				Vermicompost (ton ha^{-1})
	30	20	10	0	
8.76	11.66	10.33	8.03	5.03	0
13.30	13.76	14.53	12.96	11.96	5
LSD	12.71	12.43	10.50	8.50	Average
0.47	LSD 0.05				LSD
	0.67				0.33

Number of inflorescences

The addition of vermicompost fertilizer at 5 tons ha^{-1} produced superior results in the number of inflorescences (37.28) compared to 25.38 for the control treatment. The interaction treatment (5 tons ha^{-1} vermicompost fertilizer and 20 g L^{-1} conocarpus leaf extract) was significantly superior giving the highest percentage of 44.37 inflorescences, while the control treatment recorded the lowest at 19.57 (**Table 9**).

Table 9. The effect of vermicompost and plant extract on the number of inflorescences of the coriander plant

Average	Plant extract (g L^{-1})				Vermicompost (ton ha^{-1})
	30	20	10	0	
25.38	31.70	26.33	23.93	19.57	0
37.28	37.53	44.37	34.17	33.03	5
LSD	34.62	35.35	29.05	26.30	Average
1.781	LSD 0.05				LSD
	3.562				2.518

Yield per hectare

There was significant superiority in yield per hectare of the coriander plants from the 5 tons ha-1vermicompost fertilizer treatment at 512.62 kg ha^{-1} compared to the control's lowest value of 362.31 kg ha. Meanwhile, the dual interaction treatment (5 tons ha^{-1} vermicompost fertilizer and 20 g L^{-1} conocarpus leaf extract) was significantly superior, recording the highest value (669.21 kg ha^{-1}), while the control treatment recorded the lowest at 303.07 kg ha^{-1} (**Table 10**).

Table 10. The effect of vermicompost and plant extract on total yield of the coriander plant (kg ha^{-1})

Average	Plant extract (g L^{-1})				Vermicompost (ton ha^{-1})
	30	20	10	0	
362.31	414.73	362.99	368.46	303.07	0
512.62	558.65	669.21	424.81	397.81	5
LSD	486.69	516.10	396.63	350.44	Average
4.795	LSD 0.05				LSD
	6.781				3.391

Percentage of volatile oil

The research results showed significant superiority from the 5 ton ha^{-1} addition of vermicompost fertilizer in volatile oil percentage (0.383%) compared to the control's 0.249%. The interaction treatment of 5 tons ha^{-1} vermicompost fertilizer and 20 g L^{-1} conocarpus leaf extract was significantly superior yielding the highest percentage of 0.449%, while the control treatment recorded the lowest at 0.213% (**Table 11**).

Table 11. The effect of vermicompost and plant extract on volatile oil percentage

Average	Plant extract (g L^{-1})				Vermicompost (ton ha^{-1})
	30	20	10	0	
0.249	0.303	0.245	0.237	0.213	0
0.383	0.418	0.449	0.353	0.314	5
LSD	0.361	0.347	0.295	0.263	Average
0.0078	LSD 0.05				LSD
	0.0110				0.0055

Specific gravity of oil

As **Table 12** shows, there was significant superiority of the vermicompost fertilizer treatment at 5 ton per hectare in terms of the specific gravity of oil, recording 0.62 mg compared with spraying 20 g L^{-1} conocarpus leaf extract which produced 0.58 mg. The interaction treatment involving 5 tons ha^{-1} vermicompost fertilizer and 20 g L^{-1} conocarpus leaf extract was significantly

superior, giving the highest specific gravity (0.71 mg), while the control treatment recorded the lowest value (0.33 mg).

Table 12. The effect of vermicompost and plant extract on the specific gravity of oil

Average	Plant extract (g L^{-1})				Vermicompost (ton ha^{-1})
	30	20	10	0	
0.41	0.49	0.44	0.36	0.33	0
0.62	0.64	0.71	0.61	0.54	5
LSD	0.57	0.58	0.49	0.44	Average
0.022	LSD 0.05				LSD
	0.030				0.015

Discussion

The research factors represented by vermicompost and foliar spraying with conocarpus extract significantly affected the study characteristics. They achieved an increase in the growth indicators examined, namely plant height (Table 3), number of leaves (Table 4), leaf chlorophyll content (Table 5), dry weights of the shoot and root systems (Tables 6, 7), leaf area (Table 8), plant yield per hectare (Table 9), and the percentage of volatile oils (Table 10) of the coriander plants. This may be attributed to the role of vermicompost fertilizer, which had a practical effect and a positive role in increasing growth indicators (1) through its decomposition in the soil and the release of elements and nutrients . The compost is a stimulating and activating agent for the growth and reproduction of microorganisms in the soil, which works to secrete organic acids and growth-stimulating hormones (10) such as auxins, gibberellins, and cytokinins that actively contribute to the process of cell division and elongation. It also helps regulate the distribution of carbon metabolism products, maintains chlorophyll, and delays aging, which stimulates plant growth in addition to improving the physical, chemical, fertility and biological properties of the soil (12, 16).

Vermicompost improves soil porosity and its water retention efficiency by encouraging the plant to build a strong and efficient root system to absorb nutrients (21), thereby creating a healthy and balanced ecosystem and increasing the soil's organic matter content (19). The soil’s hormones and enzymes are strengthened to effectively increase the number and activity of microorganisms in the soil, which work to decompose organic matter and increase the availability of nutrients. In addition, increasing the activity of microorganisms in the soil (8) leads to an increase in the release of carbon dioxide gas, which when dissolved in water forms carbonic acid, which creates an acidic medium in which the availability of elements increases to support growth .

The dual interaction between vermicompost and spraying with aqueous extract of the conocarpus plant raised the availability of elements and creates an efficient root system in the depth of the soil (17) enhancing absorption. It thus has a positive effect in increasing the efficiency of photosynthesis and increasing growth indicators (1), as the aqueous extract has good proportions of elements (Table 1) such as nitrogen. It has an effective role in the stages of growth and increased plant production as it constitutes the most important part of the protein molecule found in the protoplasm of living cells and phosphorus, and increasing ATP energy compounds important for carbon metabolism (7). Nutrients support the synthesis of proteins and carbohydrates, which helps improve vegetative growth and biomass accumulation. In this context, the synergistic effects of NPK fertilizers combined with plant growth regulators influence plant growth dynamics and vital functions .Its regulatory and catalytic role in the process of building proteins, and magnesium, is important for the plant as one of the components of chlorophyll, and is essential for the representation and maintenance of proteins in the thylakoids of the chlorophyll molecule .

In addition, the leaf extract of the conocarpus contains calcium, which plays an important role in cell division and differentiation, and iron, an essential element in building chlorophyll (5). Although it does not enter into its composition, it has an important role in forming enzymes responsible for producing chlorophyll and other elements. The increase in plant growth

indicators may be attributed to the storage of nutrients present in the plant extract. All these reasons may lead to improving the plant's nutritional status and activating and enhancing the process of carbon building (11), thus increasing manufactured carbohydrate materials and the growth rates, yields, and production of volatile oil. The improved plant growth indicators may be attributed to the storage of nutrients present in the plant extract. Its effective role in growth is due to its wide range of compounds and nutrients, including macro- and micronutrients (such as nitrogen, phosphorus, and potassium), and amino acids.

Conclusion

Conocarpus leaf extract had a significant role in the vital activities of the coriander plant, which registered higher growth indicators, yield, and volatile oil in the coriander plant due to the elements and nutrients it contains. The addition of vermicompost had a positive effect on the measured characteristics of the coriander plant, with the optimum results appearing when it was combined with foliar feeding of the leaf extract of the conocarpus plant.

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مقالة أصيلة

تاثير السماد الدودي ومستخلص اوراق نبات الكونوكاربس في نمو وحاصل نبات الكزبرة ومحتواه من الزيت الاساس

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الخلاصة

نفذ البحث في كلية التربية للعلوم الصرفة ابن الهيثم / جامعة بغداد عند خط عرض 33.37 درجة وخط طول 44.36 درجة ، بهدف دراسة تأثير إضافة السماد الدودي والمستخلص المائي لأوراق الكونوكاربس على نبات الكزبرة *Coriandrum sativum* L. وهو نبات عشبي حولي ورقي، لموسم النمو 2023-2024. وتضمنت التجربة عاملين، الأول بمستويين من الفيرميكومبوست بمستويات 0 و5 طن هكتار$^{-1}$، والعامل الثاني هو الرش بالمستخلص المائي لأوراق الكونوكاربس بتركيزات 0 و10 و20 و30 غم لتر$^{-1}$. وأظهرت النتائج أن معاملة التداخل السماد الدودي 5 طن هكتار$^{-1}$ والرش بالمستخلص النباتي بتركيز 20 غم لتر$^{-1}$ أعطت أفضل النتائج لمؤشرات النمو المتمثلة بعدد الأوراق (51.33 ورقة نبات$^{-1}$)، ومحتوى الأوراق من الكلوروفيل (41.77 سباد)، والوزن الجاف للمجموع الخضري (13.87 غم نبات$^{-1}$)، والوزن الجاف للمجموع الجذري (6.30 غم نبات$^{-1}$)، والمساحة الورقية (14.533 سم^2 نبات$^{-1}$)، وعدد النورات (44.37) نورة، والحاصل في الهكتار (669.21 كغم هكتار$^{-1}$)، ونسبة الزيت الطيار في أوراق الكزبرة (0.449%)، والوزن النوعي للزيت (0.71 ملغم) مقارنة بمعاملة المقارنة والتي أعطت (30.67 ورقة نبات$^{-1}$، و26.57 سباد، و5.83 غم نبات$^{-1}$). 1.90 غم نبات$^{-1}$، 5.033 سم^2 نبات$^{-1}$، 19.57 نورة 303.07 كغم هكتار$^{-1}$، 0.213%، 0.33 ملغم على التوالي، ولنفس مؤشرات النمو، أثبتت نتائج التجربة استجابة نبات الكزبرة للسماد الدودي والرش بالمستخلص المائي لأوراق الكونوكاربس وتحقيق هدف البحث بإعطاء أفضل النتائج في النمو الخضري والمحصول ونسبة الزيوت الطيارة

الكلمات المفتاحية: نبات الكزبرة، السماد الدودي، مستخلص نباتي، مركبات فعالة