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The Response Of Bioactive Compounds In Coriander Plant (*Coriandrum Sativum L.*) To Foliar Application Of Moringa Leaf And Barley Seed Extracts And Bio-Fertilization.

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Abstract: *Modern guidelines focus on enhancing plant productivity and growth through the use of organic extracts and biofertilizers, which are considered natural reservoirs of various nutrients. These substances are effective and readily absorbed by plants. A field experiment was conducted during the autumn season of 2024–2025 to enhance the bioactive compounds in coriander (Coriandrum sativum L.) using organic extracts and microbial inoculants, thereby reducing the harmful impact of chemical fertilizers.The experiment was Implemented using a split-plot arrangement within a randomized complete block design (R.C.B.D) with two factors:Factor I: Microbial treatments(Control without addition, Mycorrhiza at 10 g·L⁻¹, Trichoderma at 10 g·L⁻¹, and Bacillus at 10 g·L⁻¹), represented as M1, M2, M3, and M4, respectively.Factor II: Foliar spray extracts(Control without addition, moringa leaf extract at 10 g·L⁻¹, and sprouted barley extract at 100 g·L⁻¹), denoted as E1, E2, and E3, respectively.Treatment means were compared using the Least Significant Difference (L.S.D) test at a 0.05 probability level.The results revealed significant differences among both the individual and combined treatments. The individual treatment M4 exhibited significant superiority in total chlorophyll content, dry matter percentage, nitrogen, phosphorus, total phenolic compounds, and flavonoids in coriander leaves, with the highest values recorded as follows:(62.36 SPAD, 15.83%, 3.292%, 0.2389%, 65.70 mg·kg⁻¹ dry weight, and 29.61 mg·kg⁻¹ dry weight), respectively.As for potassium content, treatment M3 showed the highest value of 2.649%.The foliar spray treatments also showed significant effects, where treatment E2 recorded the highest chlorophyll content in the leaves (59.56 SPAD). Treatment E3 resulted in the highest values for dry matter percentage, phosphorus, and phenolic content, reaching (14.58%, 0.2291%, and 65.16 mg·kg⁻¹ dry weight), respectively.Regarding the interaction between the two factors, the combined treatment M4E3 achieved significant superiority in total chlorophyll content, dry matter percentage, total phenolics, and flavonoids in coriander leaves, with maximum values of (65.77 SPAD, 16.74%, 73.83 mg·kg⁻¹ dry weight, and 31.14 mg·kg⁻¹ dry weight), respectively.Additionally, the treatment M4E2 recorded the highest nitrogen percentage (3.781%), while M4E3 resulted in the highest phosphorus content (0.2427%), and M3E1 showed the highest potassium percentage (2.723%).*
Keywords: *Foliar spray extracts ,Coriander, Biofertilizers.*

INTRODUCTION:

Coriander (*Coriandrum sativum L.*) belongs to the Apiaceae family, which includes approximately 300–400 genera and 3,000–3,750 species distributed widely across Europe, Asia, and Africa. Members of this family are typically herbaceous plants characterized by their distinctive aroma, attributed to the presence of various essential oils in both fruits and leaves (Rajeshwari, 2011). Coriander is an annual aromatic herb that can grow up to 50 cm in height. It has upper leaves and small flowers. It is considered one of the most prominent medicinal plants historically used for therapeutic purposes. It is known by several common names, including "Coriander," "Cilantro," "Chinese parsley," "Mexican parsley," as well as local names such as Tagdah Kisfrah and Kozhara. Therapeutic purposes. It is known by several common names, including "Coriander," "Cilantro," "Chinese parsley," "Mexican parsley," as well as local names such as Taqdah, Kisfrah, and Kozbara (Moharram, 2010). Historical references to coriander can be found in the Holy Bible, and it was also used in herbal medicinal formulations in ancient Babylon (Al-Hamawi, 2006). Coriander seeds, leaves, and fruits are edible, aromatic, and commonly used to flavor Indian dishes such as curry and soups. Coriander seeds are also well-known for their medicinal use, particularly in Ayurvedic preparations. Traditionally, they have been used by various tribes to treat a range of ailments. Coriander is regarded as a medicinal herb in traditional medicine due to its diverse benefits, including diuretic, antidiabetic, antihypertensive, anti-inflammatory, and antiasthmatic properties (Thakur *et al.*, 2021). Bhadra (2020) stated that coriander is distinguished by its very low content of saturated fats, in addition to being rich in linoleic acid, which is an excellent source of vitamins A and K. The leaves of coriander are also known to be high in fiber and antioxidants, which contribute to heart health and reduce inflammation. Coriander seeds contain large quantities of polyphenols and essential oils. The characteristic flavor of coriander comes from its essential oil, which contains a high proportion of linoleic acid and furanocoumarins. Coriander is considered a tropical crop that can be grown as a summer or winter crop, depending on climatic conditions. It requires a cool climate during its growth phase and a warm, dry climate during maturation. It can be grown in most soil types suitable for the crop, and cold climates or high altitudes can produce seeds of superior quality with a high content of aromatic oils (Sahib *et al.*, 2013). Among the leading countries in coriander production are Turkey, China, France, Bulgaria, and Switzerland, with Egypt being one of the most important Arab countries producing coriander and fennel (2008). According to statistics conducted by the Food and Agriculture Organization (FAO) (Ouf, 2008), extracts from sprouted seeds have become increasingly popular in recent years for several reasons, including their richness in nutritional components and natural hormones that contribute to enhancing growth. These extracts contain high concentrations of gibberellins, a hormone that plays a crucial role in stimulating growth. They also contain low levels of abscisic acid, which is often growth-inhibiting (Taiz *et al.*, 2014). The extracts are characterized by their simple composition and ease of absorption, making them useful in various fields such as health nutrition, dietary supplements, and even in agricultural applications to improve crop productivity. These extracts can be applied as foliar sprays directly onto plants after preparation. One such extract is moringa leaf extract, which is a good source of calcium, phosphorus, protein, iron, and many other nutrients required by plants. Moringa leaf extract has been used in agriculture to improve crop growth productivity. The importance of moringa leaf extract lies in its content of minerals, nutrients, vitamins, sugars, proteins, fibers, free proline, and phenols. It also contains large quantities of plant hormones such as gibberellins, auxins, and cytokinins, which help in seed germination, root development, and act as biostimulants to enhance crop growth and delay fruit senescence (Mashamaite *et al.*, 2022). Feeding with sprouted barley seed extract has been shown to increase protein content and vitamin E levels (Distinguished Agricultural Production, Yasser Al-Manawy, 2014). On the other hand, biofertilizers are considered one of the key innovations in sustainable agriculture. They are viewed as an alternative to chemical fertilizers and help enhance crop productivity and improve soil quality in a natural way, by enhancing the physical and chemical properties of the soil. Biofertilizers contain beneficial microorganisms that are applied to seeds or soil, and they work by converting organic substances into inorganic forms, offering a sustainable method to improve soil quality (Kaushal *et al.*, 2020). Biofertilizers also play an active role in integrated nutrient management, as their use stimulates plant growth and improves nutrient availability, thereby enhancing the plant's ability to tolerate various types of stress such as drought or nutrient deficiency (Itelima *et al.*, 2018). Additionally, biofertilizers enhance the adaptability of plants to harsh environmental conditions, leading to increased agricultural productivity and improved crop quality. Therefore, biofertilizers are considered an effective tool for achieving sustainable agriculture.

RESEARCH OBJECTIVES

1- To evaluate the response of active compounds in coriander (Coriandrum sativum L.) to foliar application of moringa leaf extract and sprouted barley seed extract.
2- To assess the response of active compounds in coriander to biofertilization using mycorrhiza, Trichoderma, and Bacillus spp.
3- To study the interactive effects between foliar extracts and biofertilizers on the active compounds in coriander plants

MATERIALS AND METHODS:

The field experiment was conducted during the 2024–2025 agricultural season in the Al-Azawiyah area, Al-Mahaweel District, located approximately 40 km north of the center of Babylon Governorate. The study aimed to evaluate the response of active compounds in coriander (*Coriandrum sativum L.*) to foliar spraying with moringa leaf extract, sprouted barley seed extract, and biofertilization.The field soil designated for the experiment was prepared by removing residues of the previous crop, followed by plowing, leveling, and homogenizing the soil. A drip irrigation system was used for irrigation purposes. Subsequently, a soil analysis was performed at the laboratory of the Directorate of Agriculture in Diwaniyah. Random soil samples were collected from the field at a depth of 30 cm, air-dried, thoroughly mixed, and composite samples were taken to determine selected physical and chemical soil properties.

Field Layout and Experimental Design:The field soil was divided into three blocks, each comprising 12 experimental units. Each experimental unit was 4 meters in length and consisted of three rows, with a spacing of 50 cm between rows. Each row contained 8 plants, spaced 50 cm apart, totaling 24 plants per experimental unit. A spacing of 1 meter was maintained between main plots.Coriander seeds were sown on October 6, 2024. The experiment was arranged in a Randomized Complete Block Design (RCBD) using a split-plot arrangement. Two factors were studied: microbial inoculants and foliar spray extracts. Microbial treatments were assigned to the main plots and included four levels:M1: Control (no inoculation),M2: Mycorrhiza,M3: Trichoderma,M4: Bacillus.The sub-plots included three levels of foliar spray treatments:E1: Distilled water only (control),E2: Moringa leaf extract at a concentration of 10 g L^{-1},E3: Sprouted barley extract at a concentration of 100 g L^{-1}.

Preparation of Moringa Leaf Extract:Fresh moringa leaves (10 kg) were placed in a container and mixed with water at a ratio of 10 mL per 10 g of fresh material. The mixture was crushed manually using a mortar and pestle to extract the juice through manual pressing. The extract was then filtered using a fine cloth and further clarified by filtration, following the method of Fuglie (2000). The resulting extract was diluted with distilled water at a ratio of 1:32 (v/v) and sprayed directly onto coriander plants. The extract was used within 5 hours of preparation and is rich in amino acids, fatty acids, vitamins, essential nutrients, carbohydrates, and proteins. Preparation of Sprouted Barley Extract:A quantity of 1000 g of barley grains was washed thoroughly and soaked in water for 24 hours. After soaking, the water was drained, and the grains were spread in a single layer over gauze-lined trays and kept in the dark. The grains were regularly moistened with water as needed to maintain adequate humidity. After 72 hours, once the emergence of radicles was observed, the grains were considered sprouted. The sprouted grains were then homogenized using an electric blender until a uniform mixture was obtained. The extract was filtered and the volume was adjusted to 10 liters with distilled water. The extract was applied immediately to the plants via foliar spray.The sprouted barley extract is known to contain essential macro- and micronutrients such as nitrogen, phosphorus, calcium, magnesium, and iron, as well as zinc and the plant growth hormone gibberellin.) Al-Khafaji، 2021).

INDICATORS AND EXPERIMENTAL MEASUREMENTS

Five plants were randomly selected from each experimental unit for conducting the measurements on December 16, 2024. The following physiological and biochemical parameters were evaluated: chlorophyll content in leaves was determined using a SPAD chlorophyll meter (SPAD units).Dry matter percentage of the vegetative growth was calculated. nitrogen percentage in the leaves was measured using the Kjeldahl method, as described by Al-Sahhaf (1989).Phosphorus content (%) was determined using a spectrophotometer at a wavelength of 410 nm, according to the method of Al-Mosuli et al. (2018).Potassium content (K%) was measured using a Flame Photometer, following the procedure outlined by Al-Sahhaf (1989). phenolic content in leaves was estimated according to the method described by Liu et al. (2011). flavonoid content in the leaves was also determined following the method of Liu et al. (2011).

RESULTS AND DISCUSSION:

1. Chlorophyll Content

The results presented in the table (1) indicate significant differences among the microbial treatments in terms of chlorophyll content in coriander plants. The treatment M4 (Bacillus) recorded the highest chlorophyll value at 62.36 SPAD, while the control treatment (M1) recorded the lowest value at 55.34 SPAD.Similarly, significant differences were observed among the foliar spray treatments. The treatment E2 (Moringa leaf extract) significantly outperformed the others, achieving the highest chlorophyll content at 59.56 SPAD, whereas the control treatment (E1) recorded the lowest value at 56.72 SPAD.Regarding the interaction between the two experimental factors, the M4E3 treatment (Bacillus + sprouted barley extract) showed a significant increase and recorded the highest chlorophyll content at 65.77 SPAD, followed by M4E2 (Bacillus + Moringa extract), which gave a high value of 64.83 SPAD. On the other hand, the M1E1 treatment (control + water spray) recorded the lowest chlorophyll content at 49.47 SPAD.

Table 1: The Effect of Microorganisms, Foliar Spray Extracts, and Their Interaction on the Total Chlorophyll Content in *Coriandrum sativum L.* Plants.

M E	E1	E2	E3	Rate
M1	49.47	59.17	57.40	55.34
M2	59.15	57.07	56.57	57.59
M3	61.80	57.17	54.20	57.72
M4	56.47	64.83	6577.	62.36
Rate E	56.72	59.56	58.48	
L.S.D M= 2.251		L.S. D E=1.949	L.S.D M*E=3.899	

2. Dry Matter Percentage of the Vegetative Biomass.

The results presented in the table (2)reveal significant differences among the microbial treatments in terms of dry matter percentage in coriander plants. The M4 treatment (Bacillus) recorded the highest percentage at 15.83%, while the control treatment (M1) showed the lowest value at 13.96%. The M3 treatment (Trichoderma) also showed a reduction, reaching 12.39%.Similarly, significant differences were observed among the foliar spray treatments. The E3 treatment (sprouted barley extract) recorded the highest dry matter percentage at 14.58%, whereas the control treatment (E1) registered the lowest value at 13.14%.Regarding the interaction between the two studied factors, the combination M4E3 (Bacillus + sprouted barley extract) showed a significant superiority by achieving the highest dry matter percentage of 16.74%, followed closely by M4E2 (Bacillus + Moringa extract), which recorded 16.68%. On the other hand, the lowest value was recorded in the M1E1 treatment (control + water spray) at 9.94%.

Table 2: Influence of Microbial Inoculants, Foliar Extract Applications, and Their Interaction on Total Dry Matter Content in *Coriandrum sativum L.* Plants.

M E	E1	E2	E3	RateM
M1	9.94	15.20	16.74	13.46
M2	14.82	13.47	14.01	14.10
M3	11.46	12.60	13.10	12.39
M4	16.32	16.68	.14.49	15.83
Rate E	13.14	14.49	14.58	
L.S.D M= 1.292		L.S. D E=1.119	L.S.D M*E=2.238	

3. Nitrogen Percentage.

The results presented in the table(3) indicate significant differences among the microbial treatments in terms of nitrogen content in coriander leaves. The M4 treatment (Bacillus) recorded the highest nitrogen percentage at 3.292%, while the control treatment (M1) showed the lowest value at 2.611%.On the other hand, the foliar spray treatments did not show statistically significant differences in nitrogen content.However, the interaction between the two studied factors revealed a significant effect. The M4E2 treatment (Bacillus + Moringa leaf extract) achieved the highest nitrogen percentage at 3.781%, whereas the lowest value was recorded in the control treatment M1E1 at 1.690%.

Table 3: Influence of Microbial Inoculants, Foliar Extract Applications, and Their Interaction on Total Nitrogen Content in *Coriandrum sativum L.* Plants.

M E	E1	E2	E3	RateM
M1	1.690	2.530	3.612	2.611
M2	2.781	3.156	2.744	2.894
M3	3.686	3.052	2.501	3.080
M4	2.921	3.781	3.173	3.292
Rate E	2.770	3.130	3.008	
L.S.D M=0.4655		L.S. D E=N.S	L.S.D M*E=0.7123	

4. Phosphorus Percentage.

The results presented in the table(4) indicate significant differences among the microbial treatments with respect to phosphorus percentage in coriander leaves. The M4 treatment (Bacillus) recorded the highest phosphorus percentage at 0.2398%, while the control treatment (M1) showed the lowest percentage at 0.1878%.Similarly, significant differences were observed among the foliar spray treatments. The E3 treatment (sprouted barley extract) recorded the highest phosphorus percentage at 0.2291%, compared to the control (E1), which recorded the lowest percentage at 0.1959%.Furthermore, the interaction between the two factors exhibited a significant effect. The M4E3 treatment (Bacillus + sprouted barley extract) achieved the highest phosphorus percentage at 0.2427%, whereas the lowest value was recorded in the control M1E1 at 0.1463%.

Table 4: Influence of Microbial Inoculants, Foliar Extract Applications, and Their Interaction on Total Phosphorus Content in *Coriandrum sativum L.* Plants.

M E	E1	E2	E3	RateM
M1	0.1463	0.1900	0.2270	0.1878
M2	0.2253	0.1970	0.2283	0.2169
M3	0.1747	0.2203	0.2183	0.2044
M4	0.2373	0.2393	0.2427	0.2398
Rate E	0.1959	0.2117	0.2291	
L.S.D M=0.01503		L.S. D E=0.00978	L.S.D M*E=0.02025	

5. Potassium Percentage .

The results presented in the table(5) indicate significant differences among microbial treatments in terms of potassium content in coriander plants. The M3 treatment (Trichoderma) recorded the highest potassium percentage at 2.649%, while the control treatment (M1) recorded the lowest percentage at 2.382%.On the other hand, no significant differences were observed among the foliar spray treatments regarding potassium percentage.As for the interaction between the studied factors, the M3E1 treatment (Trichoderma + water spray) achieved the highest potassium percentage at 2.723%, while the M1E2 treatment (control + moringa extract) recorded the lowest percentage at 2.293%.

Table 5: Influence of Microbial Inoculants, Foliar Extract Applications, and Their Interaction on Total Potassium Content in *Coriandrum sativum L.* Plants.

M E	E1	E2	E3	RateM

M1	2.367	2.293	2.487	2.382
M2	2.550	2.437	2.573	2.520
M3	2.723	2.593	2.630	2.649
M4	2.517	2.570	2.583	2.557
Rate E	2.539	2.473	2.568	
L.S.D M= 0.2589		L.S. D E=N.S	L.S.D M*E= 0.3045	

6. Total Phenolic Content in Leaves (mg·kg⁻¹ dry weight)

The results presented in Table (6) indicate statistically significant differences among the microbial treatments. The treatment M4 (inoculation with Bacillus spp.) recorded the highest dry weight value, reaching 65.70 mg·kg⁻¹, whereas the control treatment M1 (no microbial inoculation) showed the lowest value of 57.43 mg·kg⁻¹.Similarly, significant differences were observed among the foliar spray treatments. The treatment E3 (application of barley seed extract) achieved the highest dry weight of 65.16 mg·kg⁻¹, while the control treatment E1 (no foliar spray) recorded the lowest value of 58.38 mg·kg⁻¹.As for the interaction between the microbial inoculants and foliar spray treatments, the combination M4E3 (Bacillus spp. + barley extract) showed a significant superiority by attaining the highest dry weight value of 73.83 mg·kg⁻¹. This was followed by the treatment M2E2 (Mycorrhiza + moringa extract), which gave a value of 64.24 mg·kg⁻¹. In contrast, the lowest value was recorded by the control combination M1E1 (no microbial inoculation + no foliar spray), which reached only 48.53 mg·kg⁻¹.

Table 6:Influence of Microbial Inoculants, Foliar Extract Applications, and Their Interaction on Total Phenolic Content in *Coriandrum sativum L.* Plants.

M E	E1	E2	E3	RateM
M1	48.53	60.67	63.07	57.43
M2	64.06	64.24	61.20	63.17
M3	59.48	63.51	62.56	61.85
M4	61.43	61.83	73.83	65.70
Rate E	58.38	62.56	65.16	
L.S.D M=6.994		L.S. D E=4.690	L.S.D M*E=9.589	

7. Total Flavonoid Content in Leaves (mg·kg⁻¹ dry weight).

The results shown in Table (7) reveal statistically significant differences among the microbial treatments. The treatment M4 (inoculation with Bacillus spp.) recorded the highest dry weight value of 29.61 mg·kg⁻¹, whereas the control treatment M1 (no microbial inoculation) exhibited the lowest value at 25.09 mg·kg⁻¹. The treatment M2 (Mycorrhiza inoculation) followed, with a dry weight of 26.42 mg·kg⁻¹.Conversely, no significant differences were observed among the foliar spray treatments in this experiment.Regarding the interaction between the microbial inoculants and foliar spray treatments, the combined treatment M4E3 (Bacillus spp. inoculation combined with barley seed extract foliar spray) showed significant superiority, achieving the highest dry weight value of 31.14 mg·kg⁻¹. This was followed by M4E1 (Bacillus spp. inoculation without foliar spray), which resulted in a relatively high value of 28.96 mg·kg⁻¹. Meanwhile, the lowest dry weight value was recorded for the control combination M1E1 (no microbial inoculation and no foliar spray), measuring 21.77 mg·kg⁻¹.

Table7: Influence of Microbial Inoculants, Foliar Extract Applications, and Their Interaction on Total Flavonoid Content in *Coriandrum sativum L.* Plants.

M E	E1	E2	E3	RateM

M1	21.77	26.46	27.04	25.09
M2	27.68	25.50	26.09	26.42
M3	25.66	27.22	25.46	26.11
M4	28.96	28.73	31.14	29.61
Rate E	26.02	26.98	27.43	
L.S.D M=1.680		L.S. D E=N.S	L.S.D M*E=3.461	

DISCUSSION OF RESULTS:

The significant increase observed in the studied parameters of coriander (chlorophyll content, dry weight, nitrogen, phosphorus, and potassium concentrations) can be attributed to the application of biofertilizers and foliar extracts. Arbuscular mycorrhizal fungi play a crucial role in enhancing the physical properties of the soil by aggregating soil particles and retaining organic matter. These fungi demonstrate several positive effects on improving plant nutrition and supplying nutrients, particularly increasing potassium and sodium content in plant tissues, thereby enhancing plant growth (Kumar *et al.*, 2019). Moreover, mycorrhizal fungi significantly contribute to phosphorus availability in the soil, improve root development, and enhance the plant's ability to absorb nutrients from areas otherwise inaccessible (Pandey *et al.*, 2019). Trichoderma fungi also enhance root and plant growth, improve productivity, facilitate nutrient uptake, and increase resistance to environmental stresses such as temperature fluctuations, humidity, and soil salinity. They also promote root development and nutrient absorption, in addition to their capacity to solubilize both organic and inorganic phosphates. Furthermore, they stimulate the production of plant hormones such as indole-3-acetic acid (IAA) and gibberellins (GA), which are essential for growth and flowering (Varkpeh, 2013). The application of Bacillus bacteria, a type of beneficial rhizobacteria, enhances plant growth and productivity when applied to seeds or roots. These bacteria can solubilize insoluble phosphate minerals, making them available for root uptake, while also producing growth-promoting hormones and antibiotics. This aligns with the findings of Ali *et al.* (2023), who reported that applying Bacillus and fungi to coriander plants significantly improved growth traits, plant height, number of branches, and dry weight. The application of biofertilizers significantly increases nutrient concentrations in leaves due to the enhanced availability of essential elements, particularly potassium. These microorganisms commonly secrete organic acids and plant growth regulators, which positively affect plant development Regarding foliar extracts (moringa leaf extract and sprouted barley extract), aqueous extracts can enhance and improve plant growth (Tables 1-2-3-4-5). These extracts serve as a reservoir of minerals such as potassium, calcium, iron, along with amino acids, fatty acids, vitamins, essential nutrients, carbohydrates, and proteins, making them an excellent biostimulant for crop development. This finding is consistent with the study of Abd-ElKafie *et al.* (2016), which aimed to promote vegetative growth, fruit production, and chemical composition of coriander through foliar application of plant extracts, resulting in significant increases in dry weight and leaf NPK concentrations.

Regarding bioactive compounds (phenolics and flavonoids), the results in Tables (6 and 7) indicate a significant influence of biofertilizers and foliar extracts. The findings showed a significant increase in leaf content of secondary metabolites. This can mainly be attributed to the increased dry matter accumulation resulting from enhanced photosynthetic activity, which leads to greater production of primary metabolites and the subsequent accumulation of intermediate compounds involved in the biosynthesis of secondary metabolites such as phenolics and flavonoids.The correlation between vegetative growth and photosynthetic rate increases the plant's demand for antioxidant compounds to maintain enzymatic activities and regulate free radical formation. The elevated concentration of ascorbic acid plays a key role in the Glutathione-Ascorbate Cycle, helping to scavenge intracellular hydrogen peroxide (H_2O_2) produced under heightened biological activity. Additionally, carbohydrate accumulation contributes to phenolic biosynthesis via the Shikimic acid pathway (Barbero *et al.*, 2014).The increase in flavonoid content depends on nutrient availability in the soil or through nutrient-rich plant extracts. The observed increases in phenolics and flavonoids can also be linked to enhanced plant growth and carbohydrate accumulation via the Shikimic acid pathway. These findings are consistent with those of

Jiménez-Gómez *et al.* (2020), who reported that applying Bacillus to coriander increased potassium, carbon, calcium, and iron content, alongside notable improvements in phenolic content and overall plant growth.

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استجابة المركبات الفعالة في نبات الكزبرة (***Coriandrum sativumL***) للرش الورقي
بمستحلص أوراق المورينجا وبذور الشعير والتسميد الحيوي.

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المستخلص :تعمل الارشادات الحديثة على انتاجية ونمو النباتات من خلال استخدام المستخلصات العضوية والاسمدة الحيوية التي تعتبر مستودعاً طبيعياً للعديد من العناصر الغذائية وتعتبر فعالة وسهلة الامتصاص من قبل النبات.أجريت التجربة الحقلية خلال الموسم الخريفي2024-2025لتعزيز المواد الفعالة في نبات الكزبرة بأستعمال مستخلصات عضوية وأحياء مجهرية وبتالي سوف تقلل من التأثير الضار للأسمدة الكيماوية. حيث طبقت التجربة باستخدام الألواح المنشقة ضمن تصميم القطاعات العشوائية (R.C.B.D) وبعاملين.

العامل الاول:- الاحياء المجهرية (معاملة المقارنة دون اضافة، ما يكورايزا 10 غم .لتر -1,تراكيودرما 10 غم.لتر-1 , Bacillus 10 غم .لتر-1) يرمز لها (1M4,M3,M2,M) على التوالي. العامل الثاني مستخلص الرش الورقي (معاملة المقارنة دون اضافة،مستخلص أوراق المورينجا 10 غم.لتر. مستخلص الشعير المستنبت 100 غم .لتر) رمز لها (1E3,E2,E) وتم مقارنة متوسط المعاملات باستخدام اقل فرق معنوي L. S. D، عند مستوى احتمال 0.05. اظهرت النتائج ان المعاملات الفردية والمتداخلة قد اختلفت معنويا عن بعضها. حيث حققت المعامله الفردية4M تفوقاً معنوياً في محتوى الكلوروفيل الكلي ونسبة المادة الجافة والنتروجين والفسفور والمحتوى الكلي للفينولات والفلافونيدات للاوراق في نبات الكزبرة، اذ بلغت اعلى النسب (spad62.36، 15.83%، 3.292%،0.2389.65.70,ملغم.كغم$^{-1}$ وزن جاف،29.61ملغم.كغم$^{-1}$وزن جاف) على التوالي. اماالنسبة المئوية للبوتاسيوم فقد حققت المعامله3Mاعلى نسبه بلغت (2.649%). كما اظهرت النتائج تفوق معنوي في معاملات الرش الورقي حيث بلغت المعامله2E اعلى نسبه في محتوى الكلي في الاوراق(59.56)spad.أما النسبة المئوية للمادة الجافة والفسفور والفينولات في الاوراق فقدبلغت المعاملة 3E اعلى النسب (14.58% ،0.2291% ،65.16 ملغم.كغم$^{-1}$ وزن جاف)على التوالي. أما نتائج معاملات التوليفة بين العوامل المستخدمة فقد حققت تفوقا معنويا اذ بلغت المعاملة 3M4E في محتوى الكلوروفيل الكلي والنسبة المئوية للمادة الجافة والمحتوى الكلي للفينولات والفلافونيدات للاوراق في نبات الكزبرة اعلى النسب (spad65.77، 16.74%،73.83ملغم.كغم$^{-1}$وزن جاف،31.14ملغم.كغم$^{-1}$وزن جاف) على التوالي. اماالنسبة المئوية للنتروجين فقد حققت المعامله 2M4E اعلى نسبه بلغت (3.781%).النسبة المئوية للفسفور فقد حققت المعامله 3M4E اعلى نسبه بلغت (0.2427%).اما النسبة المئوية للبوتاسيوم فقد حققت المعامله 1M3E اعلى نسبه بلغت (2.723%).
الكلمات المفتاحية:مستخلصات الرش الورقي;الكزبرة;التسميد الحيوي.