The effect of spraying Moringa leaves extract on some vegetative and chemical growth characteristics of two olive cultivars (*Olea europaea* L.)

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Abstract

The experiment was conducted in the wooden canopy of the Department of Horticulture and gardening Landscape on September 5- 2023, on two cultivars of one-year-old olive seedlings (Manzanillo and Bashiqi) and the second factor was spraying with moringa leaves extract at three concentrations (0.20, 40) g.L⁻¹ and their interaction on vegetative and chemical characteristics.

The factorial experiment was carried out with a complete randomized design (R.C.B.D). With three replicates, the number of seedlings was 54.

Significant differences in the vegetative and chemical characteristics of the variety and moringa leaf extract are as follows:

The results of vegetative characteristics indicate the superiority of treating moringa leaf extract at a concentration of 40 g.1⁻¹ with the Manzanillo variety in giving the highest seedling height of (90.4) cm and the highest number of leaves of (127.3) leaves. Plant⁻¹ and the highest number of branches was for the Bashiqi variety and the concentration of 40 g.L⁻¹ of moringa leaf extract reached 19.39 branches. Seedling⁻¹ and the highest leaf area when treated with moringa leaf extract at a concentration of 40 g.l⁻¹ with the Manzinillo variety reached (913.6 cm²)

The results of the chemical characteristics of carbohydrates indicate the superiority of the treatment of the Manzanillo variety with a concentration of 40 g.1⁻¹ of moringa leaf extract, as it reached (17.66 mg⁻¹g⁻¹.dry weight, compared to the Bashiqi treatment, which gave the lowest rate of (15.1). gm⁻¹. g⁻¹. dry weight. As for chlorophyll, it gave the highest rate of (72.1 mg. 100 g⁻¹. soft substance) compared to Bashiqi, which gave the lowest rate of (50.4 mg. 100 g⁻¹. soft substance).

Keywords: moringa leaves extract, Manzanillo, Bashiqi.

Introduction:

The Olive (*Olea europea* L.) belongs to the Oleaceae family, which includes about 20-29 genera, the most important of which is the Olea genus, to which the olive belongs. The olive tree is one of the evergreen and economically important trees. It is a perennial evergreen tree.

The olive tree is one of the trees that has lasted for hundreds of years and has a special importance in the economy of the Mediterranean countries, Syria, Palestine and Lebanon, which is considered its original homeland, as it spreads in these countries wildly and from there it spread to the rest of the world, so the number of olive trees reached about 750 million trees (Al-Khafaj, M, Alwan et al., 1990) As for the Bashiqi, it is a local cultivar and is considered one of the most famous table varieties in Iraq. Its cultivation is widespread in the Bashiqi district of Mosul. The fruits are medium to large and the fruit is conical in shape and pointed at the tip, and its oil percentage reaches 12-51% of its weight (Mahdi et al., 2011).

The olive tree has the ability to adapt and grow in harsh conditions such as drought and lands of little depth and fertility. Olive tree cultivation is widespread in the warm temperate regions of the world.

The economic value of the olive tree is mainly due to the extraction of oil with high nutritional value from its fruits, as the oil is considered rich in nutritional elements such as amino acids, creatine, and various vitamins. As for the medical importance of olive fruits, it is due to the fact that their oil contains a high percentage of fatty acids, and multiple alcohols such as glycerin and mannithol and protein, . In addition, there are some compounds with medicinal use found in the fruits and leaves, such as saponins and coumarin. The fruits also contain oleuropein, which is one of the phenolic compounds that represents 2% of the weight of the fruit.

Olive trees, they are grown in poor, rugged lands, semi-desert and semi-arid lands, where it is difficult to grow other varieties.

One of the modern methods of stimulating plants to grow is the use of plant extracts, which are safe to use compared to industrial and chemical materials, including growth regulators, which pose a danger to human life, the environment, and the organisms that live in this environment. The trend was to find alternatives to natural compounds that perform the same purpose. But with less or no risk to humans and the environment, therefore, specialists moved towards benefiting from natural plant extracts, and among these extracts is moringa leaves extract, which is a source of proteins, fatty acids, vitamins and nutrients, which has taken on a new field in agricultural applications on fruit, vegetable and ornamental plants.

Moringa oleifera L. is a species of Moringa, which belongs to the Moringaceae family, which includes 12 other species. Due to its Materials and methods

1- research site

The research was conducted in the wooden canopy of the Department of Horticulture and gardening Landscape , College of Agriculture, Al-Qasim Green University, on September 5, 2023, on seedlings of two cultivar of olives (Manzanillo and Bashiqi) to determine the effect of spraying moringa leaves extract on the characteristics of vegetative and chemical growth. 54 seedlings of olives were used in the experiment. The olives seedlings are one year old. The seedlings were brought from the Ataba nurseries in Karbala and planted in

medicinal uses, it has been called the tree of miracles or life. It is a very nutritious tree that tolerates drought conditions and grows greatly, providing many benefits to countries of the world, especially India. Pakistan and other parts of Africa and it was also used to clean water (Oyeyinka and Oyeyinka, 2018)

Moringa leaves are a source of protein, calcium, potassium, iron, carotenoids, plant compounds, zeatins, hormones, such as cytokanin, vitamin C, a-tocopherferol, and organic pigments such as anthocyanins, carotene, flavonoids, niazemycine, glucosinolates, minerals, and sterols, all of which are responsible substances. On the composition of antioxidants (Fuglie et al., 1999)

Moringa leaves also contain higher protein compared to eggs and milk, making them a great source of nutrition (Marfori, 2010).

Moringa leaf extract also contains a substance called zeatin, which acts as a natural plant hormone. along with growth other micronutrients that contribute to various physiological activities of plants. It also sufficient concentrations contains of cytokinins and gibberellic acid, which are vital plant hormones, in addition to ascobens, minerals, and phenols (Makkar). et al., 2007) Moringa leaves contain high levels of zeatin, which plays an important role in cell division and elongation (Taiz and Zeiger, 2010).

mixed soil in perforated polyethylene bags with a capacity of 5 kg soil. The two cultivar of olive seedlings were were treated with three levels of moringa leaves extract, in concentration (0.20.40) mg/liter. The first spraying was conducted on September 12-2023, and the second spraying was carried out two weeks after the first spraying.

Experimental design

The factorial experiment was carried out with a randomized complete block design (R.C.B.D) and with three replicates. The experiment consists of two factors: cultivars and moringa leaves extract with three replicates and three plants in experiment unit so the number of treatments becomes 54 seedlings.

Preparation of moringa leaves extract:

I took a group of moringa leaves weighing 10 kg. 100 g of the fresh material was taken in a bowl with 10 ml of distilled water and ground with a pestle to be squeezed using manual pressure. Then it was filtered through a soft cloth and the solution was re-filtered using filter paper following a method developed by Fugie. Li 2000 and dilute the extract with distilled water ratio of at а 1:32 (volume/volume). The extract is used 5 hours after the extraction process. The juice is stored at 0 degrees Celsius and is not taken out except when needed to use it.

Studied traits

1- plant height (cm)

Plant height was measured using a metric tape, starting from the soil surface level to the growing tip of the seedling, and the rate of each experimental unit for each treatment was calculated.

2-number of leaves

The number of fully developed leaves piled on the plant was calculated at the end of the research, adding the number of leaves taken to estimate the chlorophyll and carbohydrate content in the leaves.

3-leaf area (cm²)

Measuring the leaf area according to the method(Chou,1966), where a group of leaves was taken, and the maximum length x maximum width x0.66 was calculated for each leaf, and the average area was extracted as approximately one, then multiplied by the number of seedling leaves, and the total area of the seedling was extracted.

4- Number of branches

Determine the rates of the number of vegetative branches growing from olive plant seedlings for each treatment separately

5- Stem diameter (mm)

Main stem diameter rates were measured using a digital foot (Vernier) at a height of 5

Results and discussion

1- plant height (cm)

cm from the soil surface for all replicates and for each studied treatment.

6- Estimating the chlorophyll content of leaves (mg. 100 g⁻¹ fresh weight)

Chlorophyll was estimated in the leaves by taking random samples from the seedlings. They were washed well with water to remove any dust stuck to them. After that, 0.5 g was taken from each sample and 10 ml of 80% acetone was added to it. It was placed in a ceramic mortar and crushed. Then the filtrate was separated from the leaves using filter paper. Then he continued. A volume of 20 ml of acetone was made according to the method (Goodwin, 1976), then it was filtered using a spectrophotometer at two lengths (645,663 nm), then the total amount of chlorophyll was calculated with the following equation:

Total

chlorophyall=20.2*D(645)+8.02*D(663)(V/W *100)*100

D(663) = Optical absorption reading at a wavelength of 663 nm

D(645) = Optical absorption reading at a wavelength of 645 nm

V = final volume of extract 20 ml

W = weight of plant tissue 0.5 g

7- Percentage of carbohydrates (mg⁻¹ .g⁻¹ .dry weight)

The Joslyn (1970) method was used to estimate the percentage of total carbohydrates in the leaves. For each experimental unit, 0.2 g of powdered dry sample was taken and prochloric acid (1N) was added. The sample was placed in a water bath for 60 minutes at a temperature of 60°C, and centrifugation was performed for 15 minutes at a speed of 3000. rpm then collect the clear solution and complete the volume to 100 ml by adding distilled water. 1 ml of the diluted solution is taken and 1 ml of 5% phenol solution and 5% concentrated sulfuric acid are added to it. Then the absorbance is read with а spectrophotometer at a wavelength of 490 nm and according to the following equation:

Carbohydrates % = (dilutions x concentration / 1000 x 1 ml x sample weight) x 100

It is clear in Table (1) that spraying with moringa leaves extract had a significant effect on the plant height, as it gave the highest rate of (90.4) cm for the Manzanillo cultivar compared to the Bashiqi cultivar, which gave (73.8) cm, and the concentration of 40 mg/L gave the highest rate of plant height of (86.2 cm compared to the comparison treatment, which gave the lowest rate of (76.7) cm. As for the bilateral interaction between the cultivar and the concentration of moringa leaves extract, the treatment of the Manzanillo cultivar with a concentration of 40 mg/L of moringa leaves extract gave the highest rate of (96.3) cm compared to the comparison treatment that The lowest rate was given (70.0) cm.

Table (1) The effect of cult	ivars and spraying N	Moringa leaves extract	on seedling height (cm)
	and spraying i	indinga iou i co chinact	

cultivars	moringa			
average of moringa leaves extract	Manzanillo	Bashiqi	Leaves extract	
76.7	83.4	70.0	0	
82.8	91.6	75.4	20	
86.2	96.3	74.8	40	
	90.4	73.4	average of cultivars	
cultivarMoringa leaves ex16.008.3	tract Interfe 38	erence 5.01	L.S.D At a probability level 0.05	

2- Number of leaves

It is clear from Table (2) that cultivars and spraying moringa leaves extract had a significant effect on the number of leaves, the Manzanillo cultivar excelled, which gave the highest rate of (112.3) leaf number compared to the Bashiqi cultivar, which gave (106.8) leaf, while the results of the same table show that there are significant differences between the concentrations of Moringa leaves extract, where the concentration of 40 mg/L gave the highest average number of leaves, reaching (124.3) leaf Compared it with the comparison treatment, which gave the lowest rate of (95.5) leaf.

The results of the binary interaction between the two factors also showed the presence of significant differences, as the highest value was (127.3) leafin the treatment with a concentration of 40 mg/L of moringa leaves extract and the Manzanillo cultivar, compared to the comparison treatment, which gave the lowest rate of (94.1) leaf.

Cultivars	Moringa		
average of moringa leaves xtract	Manzanillo	Bashiqi	Leaves extract
95.5	97.0	94.1	0
108.8	112.7	105.0	20
124.3	127.3	121.3	40
	112.3	106.8	average of cultivars
cultivarMoringa leaves ex0. 393.11	xtract Interference 2.1	ce	L.S.DAta probability level 0.05

Table (2) The effect of cultivars and spraying moringa leaves extract on the number of leaves (seedling leaf $^{-1}$)

3- Number of branches (branch. plant⁻¹) It is clear in Table (3) the effect of spraying with moringa leaves extract and the cultivar on the average number of branches of olive seedlings that there are significant differences between the cultivars. The Manzanillo cultivar gave the highest rate of (14.29 branches. Plant⁻¹) compared to the Bashiqi cultivar, which gave the lowest rate of (15.09) branches. Plant⁻¹. The results of the same table showed that there are significant differences between the concentration of 40 mg/L gave the highest rate of number of branches, reaching (18.16) branches. Plant⁻¹ compared to the control treatment, which gave the lowest rate of 11.16 (branches. Plant⁻¹).

As the results of Table (3) showed, there are significant differences in the bilateral interaction between the cultivars and the concentrations of the moringa leaves extract. A treatment with a concentration of 40 mg/L of moringa leaves extract was given with the Bashiqi cultivar, with the highest rate reaching (19.39) branches. Plant⁻¹ compared to the comparison treatment, which gave the lowest rate of (10.55 branches. Plant⁻¹.

Table (3)	The effe	ect of	cultivars	and	spraying	Moringa	leaves	extract	on the	number	of
branches	(branch.	Plant ⁻	¹)								

Cultivars	Moringa leaves extract			
Average of moringa leaves extract	Manzanillo	Bashiqi	i nuves carriet	
11.16	11.78	10.55	0	
13.24	14.15	12.33	20	
18.16	16.93	19.39	40	
	14.29	15.09	Average of cultivars	
cultivar Moringa leaves 4.68	L.S.D Ata probability level 0.05			

4- leaf area (cm²)

It is clear from Table (4) the effect of cultivars and spraying with moringa leaves extract on the leaf area of olive seedlings that there are significant differences between the treatments of the cultivars as the Manzanillo cultivar gave the highest rate (**452.89**) cm² compared to the Bashiqi cultivar, which gave the lowest rate (**433.62**) cm². The results of the same table also showed that there are significant differences between the concentrations of the extract, as the concentration of 40 mg/L gave the highest rate of leaf area, amounting to (500.55) cm^2 , compared to the comparison treatment, which gave the lowest rate of (391.57) cm^2 .

The results of table (4) also showed that there are significant differences between the cultivars and the concentrations of moringa leaves extract. The binary interaction between the Manzanillo cultivar and a concentration of 40 mg/L of moringa leaves extract gave the highest rate of (**509.98**) cm² compared to the comparison treatment, which gave the lowest rate of (**386.11**). cm².

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Table (/L) The attact of	cultivare and ci	nroving moringo l	lagvas avtract an	logt grog (cm ⁻)
\mathbf{I} and (\mathbf{T}) incontrol of	. Cultivals allu si	DIAVINE INVENIEA		
		F		

Cultivars	Moringa leaves extract		
Average of moringa leaves extract	Manzanillo	Bashiqi	
391.57	397.04	386.11	0
437.63	451.65	423.62	20
500.55	509.98	491.13	40
	452.89	433.62	Average of cultivar
cultivarMoringa leaves extr18.8723.18	act Int. 37.32	erference	L.S.D Ata probability level 0.05

5- The chlorophyll content of the leaves (mg.100 g⁻¹. fresh weight):-

It is clear from the results in Table (5) that there is a significant effect between the effect of spraying Moringa leaves extract and the cultivar on the chlorophyll content in the leaves. The Manzanillo cultivar had a significant effect on the chlorophyll content in the leaves by giving the highest chlorophyll content of (64.7 mg.100 g⁻¹). Fresh weight (compared to the Bashiqi cultivar, which gave the lowest rate of (54.7 mg.100 g⁻¹). Fresh weight).

The results of the same table also show that spraying with moringa leaves extract at a concentration of 40 mg/L gave the highest

content of chlorophyll, amounting to (65.1 mg. 100 g^{-1} fresh weight), compared to the control treatment, which gave the lowest content amounting to (52.5 mg. 100 g^{-1} fresh weight). The results of Table (5) also show that the binary interaction had a significant effect on the chlorophyll content of the leaves. The spraying treatment with Moringa leaves extract at a concentration of 40 mg/L and the the Manzanillo cultivar gave highest chlorophyll content in the leaves, reaching (72.1 mg.100 g⁻¹. Fresh weight) compared to the treatment. The comparison that gave the lowest content was (50.4 mg. 100 g⁻¹. Fresh weight).

Cultivars	Moringa leaves extract		
Average of moringa leaves extract	Manzanillo	Bashiqi	
52.5	60.6	50.4	0
58.5	61.5	55.5	20
65.1	72.1	58.1	40
	64.7	54.7	Average of cultivars
CultivarMoringa leaves extra20.9913.09	ct Interferen 9.58	nce 3	L.S.D Ata probability level 0.05

Table (5) The effect of cultivars and spraying Moringa leaves extract on the chlorophyll content of leaves (mg.100 g^{-1} .fresh weight)

6- Percentage of carbohydrates (mg⁻¹.g⁻¹.g⁻¹.dry weight)

It is clear from the results of Table (6) the effect of cultivars and spraying Moringa leaves extract on the percentage of carbohydrates, as significant differences were found in the percentage of carbohydrates of the Manzanillo cultivar, which gave the highest percentage of carbohydrates of (16.84 mg⁻¹.gm ⁻¹.dry weight) As for the Bashiqi cultivar, it gave the lowest percentage (15.82) mg⁻¹.gm⁻¹.dry weight).

The results of the same table also show that spraying with moringa leaves extract at a concentration of 40 mg/L gave the highest rate of 17.66 mg⁻¹.g⁻¹. Dry weight (compared with the comparison treatment, which gave the lowest rate of 15.22) mg⁻¹.g⁻¹. dry weight)

Table (6) The effect of cultivars and s	spraying moringa	leaves extract	on the percentage of
carbohydrates (mg ⁻¹ .g ⁻¹ .dry weight)			

Cultivars	Moringa leaves extract		
Average of moringa leaves extract	Manzanillo	Bashiqi	
15.22	15.34	15.1	0
16.78	17.54	16.2	20
17	17.66	16.34	40
	16.84	15.82	Average of cultivar
cultivarMoringa leaves extra0.220.61	act Interference 0.16		L.S.D Ata probability level 0.05

The reason for these results and the increase in most of the vegetative characteristics for Manzanillo cultivar may be attributed to the increase in chlorophyll pigment and leaf area (Table 6 and 4), which led to an increase in the carbohydrate content of the leaves as a result of the increase in the efficiency of the photosynthesis process. Also, the increase in leaf area and chlorophyll works to increase the absorption of nutrients to meet the need for vegetative growth (Zeiger, Taiz, 2010).

Also, the Moringa extract contains major nutrients, especially nitrogen and potassium, in addition to minor elements, which are absorbed by the plant directly through the spraying process and then work to increase the vegetative characteristics of the seedlings such as seedling height, leaf area, number of leaves, and number of branches. It is also due to the presence of growth-enhancing substances in addition to the nutrients in the Moringa extract (Issa, 1990).

Moringa leaves extract also contains a substance called zeatin, which acts as a natural plant growth hormone, along with other micronutrients that participate in the physiological processes of plants.

Moringa extract also contains a sufficient cytokinin and gibberellic concentration of acid, which are vital plant hormones, in addition to other compounds that promote growth, such as

Conclusions and recommendations 1- Conclusions

1- Spraying with moringa leaves extract had positive effect improving in the a characteristics of vegetative growth to Manzanillo cultivar

2 - The interaction between the study factors, which are Moringa leaves extract and the Manzanillo cultivar, led to a significant increase in most vegetative and chemical traits.

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