

EFFECT OF SPRAYING MYRRHA EXTRACT AND ORGANIC FERTILIZER ON SOME CHEMICAL AND ANATOMICAL CHARACTERISTICS OF POMEGRANATE PLANT *PUNICA GRANATUM L.*

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Abstract

The experiment was conducted at the Agricultural Research Station of the College of Agriculture - University of Basra during the two growing seasons, 2021-2022 on pomegranate seedlings *Punica granatum L.* Shahrban cultivar in order to study the effect of spraying myrrha extract at three concentrations (0, 3, 6) g.L⁻¹ and the effect of spraying The organic fertilizer Foliarex also with three concentrations (0, 5, 10) ml.L⁻¹ and the effect of the interaction between them on some chemical and anatomical characteristics in the leaves of pomegranate seedlings and with two periods of spraying the fall season starting from 10/15/2022 and the spring season starting 3/15/2022 with six sprays in each season, between one spray and another one week, the experiment was a factorial with two factors according to the design of the complete random sectors and the least significant difference (LSD) test was used to compare between the averages of the treatments and at the level of probability (0.05), the results showed that spraying with myrrha extract with a concentration of 6 g.L⁻¹ led to a significant increase in some chemical components such as total chlorophyll and the percentage of carbohydrates, as well as improving all studied anatomical characteristics such as the thickness of the cuticle layer, epidermal cells, the mesophyll layer, the diameter of the vascular bundles and tannins in pomegranate leaves, while spraying with organic fertilizer Foliarex at a concentration of 10 ml.L⁻¹ resulted in an improvement in most of the chemical and anatomical characteristics, while the effect of the interaction led to the treatment (6g.L⁻¹ of myrrha extract and 10ml.L⁻¹ of organic fertilizer) significantly in all studied traits compared with the control treatment.

Key words: myrrha, organic fertilizer, anatomy, pomegranate

Introduction

The pomegranate plant *punica granatum L.* belongs to the pomegranate family puniceae. Pomegranate trees are widely cultivated in the subtropical regions of the world between latitudes 41 north and south of the equator, and they can grow at high altitudes of up to 2400 m, as well as in coastal areas, it is also characterized by their tolerance of soil salinity. Pomegranate tree is one deciduous trees in cold regions and evergreen to partially deciduous in tropical and subtropical regions (Mir et al., 2010).

Due to the side effects that industrial chemicals pose, which may be negative, the tendency has been to find alternatives from natural compounds that can perform an effect similar to that of industrial chemical compounds. There are many plant extracts that have a role in encouraging growth characteristics. This is due to the fact that these plants containing a number of natural chemical compounds that differ according to the plant parts, stages of growth and environmental conditions to which plants are exposed (Al Rabeeah, 2022). Myrrha is a resinous secretion by exudation from the cracks that usually form in the bark of the *Commiphora myrrha* tree automatically or by human intervention and contains mineral elements, carbohydrates, proteins and other organic compounds (Al-Samarrai, 2017).

Recently, it has been noticed that many farmers are paying attention to agriculture that does not pollute the environment, including the shift towards organic fertilization and avoidance of chemical fertilizers, which may cause health problems for humans in the long run (Willer and Lernoud, 2016). From the plant's need for nutrients when conditions are not suitable in the soil to absorb those nutrients .

Bosabalidis and Exarchou (1995) showed, in their study, the effect of some growth regulators on the morphology and anatomy of *Origanum X intercedens* that treatment with GA3 led to internal changes in the plant tissues that make up the plant organ and they found an increase in the thickness of epidermal cells that amounted to 35.83% compared to the control treatment. that gave 27.26% as well as an increase in the mesophyll layer in the leaf by 39.52%. Selim (2015) also studied the effect of liquid organic fertilizer (Com sol) on the growth of apple seedlings *Malus domestica*, genus Anna, and found a concentration of 10 ml.L⁻¹ which led to a significant increase in the leaves content of chlorophyll 85.23 mg.100 g and carbohydrates 13.01%. In a study conducted by Al-Hawezy (2014) that spraying the marine extract Kelpak at concentrations (0, 1.200, 1.250 and 1.300 ml.L⁻¹) on trees *Eriobotya Jappanica* L. led to a significant increase at a concentration of 1.250 ml.l.⁻¹ in the chlorophyll content of leaves compared with the control treatment. Al-Zubaidi (2017) found that in studying the effect of organic fertilizer with three concentrations (0, 5 and 10) ml.L⁻¹ on olive trees, it led to a significant increase of most traits at a concentration of 5 ml.L⁻¹, including the chlorophyll content of the leaves by 40.67%.

Materials and methods-:

Experiment site, plant preparation and cultivation medium

The field experiment was conducted at the research station of the College of Agriculture, University of Basra during the growing season (2021-2022) for the purpose of knowing the effect of spraying myrrha extract and foliarex organic fertilizer on some anatomical and chemical indicators of the pomegranate plant *Punica granatum* L. Under the environmental conditions of southern Iraq, a selection of Twenty-seven seedlings of pomegranate, cultivar Shahrban, from one of the private nurseries in Basra city, two years old, homogeneous in terms of size and vegetative growth. And then planting it directly in the ground by planting 2.5 * 2.5 m in the hollow that has

been prepared and mixing an agricultural medium for it consisting of fine sand with peat moss in a ratio of 3:1 and distributing the mixture over the hollow in the amount of (50-60) kg per hole. The date for planting seedlings in the ground was 10/5/2021.

Table (1) Physical and chemical properties of field soil during the growing season

Soil Separators (%)	
79.12	sand
9.56	Silt
11.32	Clay
Loamy-sand	Soiltextur
8.3	(PH) Soil reaction degree
4.9	Desi Siemens. M ⁻¹ (E.C.) Electrical conductivity
0.022	(%)Total Nitrogen
0.19	phosphorous (mg.kg ⁻¹)
6.66	Calcium Carbonate (%)
0.38	Organic matter (%)
0.17	Organic carbonate (%)

The analysis was carried out in the central laboratory of the College of Agriculture-University of Basra

Table (2) Some chemical properties of irrigation

Valuable	properties of water
7.18	Reaction degree (pH)
8.37	Electrical conductivity (E.C.) DC Siemens. M ⁻¹
2658.56	Cl ⁻ (mg. L ⁻¹)
1343.97	Ca ⁺² (mg.L ⁻¹)
28.87	No ₃ ⁻ (mg. L ⁻¹)
98.97	Na ⁺ (mg. L ⁻¹)
39.34	K ⁺ (mg. L ⁻¹)
532.12	Mg ⁺² (Mg. L ⁻¹)

It was analyzed in the central laboratory of the College of Agriculture, University of Basrah

Prepare the transactions for the experiment

Fertilizer treatments used in spraying were prepared by dissolving 3 and 6 g.L⁻¹ of myrrha in distilled water to prepare the extract. Likewise, liquid organic fertilizer was prepared at concentrations of 5 and 10 ml.L⁻¹, and the volume allocated for each tree was 1 liter. As for the comparison treatment, which Use distilled material only.

Statistical design and analysis

The experiment data was analysed statistically as a factorial experiment according to the Randomized Complete Block Design (R.C.B.D.) and the experiment had two factors for each factor, three concentrations and three replications, so the total number of experimental units = 27 experimental units. The statistical analysis of the experimental data was carried out using the statistical program (Genstat 31-dec 2008), and the least significant difference was (0.05).

Studied parameters:

1-Leaves content of total chlorophyll (mg.100g⁻¹ fresh weight).

The total chlorophyll pigment in leaves was estimated according to Goodwin (1976) method. The total chlorophyll pigment was estimated as in the following equation . Total chlorophyll = 20.2 x D645 + 8.02 x D663 (V/W x 1000) x 100

2-Leaves content of total carbohydrates (mg.g⁻¹).

by the phenolic-sulfuric acid method described from (Dobois *et al.*, 1956).

3- Anatomical characteristics of leaves of pomegranate seedlings

The anatomical sections were prepared according to the method mentioned in Al-Mayahi (2004).

Results and discussion

First: The effect of spraying myrrha extract and the organic fertilizer Foliarex and the interaction between them on some chemical components of the leaves of pomegranate seedlings, Shahrban cultivar.

The data of Table (3) indicate that there is a significant difference between the concentrations of myrrha extract in its effect on total chlorophyll, as it is noted that the concentration treatment of 6 g.l⁻¹ was significantly superior to the rest of the treatments, followed by the treatment with a concentration of 3 g.l⁻¹ that gave (5.67, 5.05). mg.100g⁻¹ fresh weight, respectively, compared to the control treatment that gave the lowest amount of total chlorophyll amounted to 4.69 mg.100g⁻¹ fresh weight.

As for the effect of the organic fertilizer Foliarex, the data of the same table show that the concentration treatment of 10 ml.L⁻¹ was significantly superior in the amount of total chlorophyll compared to the rest of the treatments, as it gave the highest amount, followed by the treatment of concentration of 5 ml.L⁻¹ in the same effect (5.55, 5.15). mg.100g⁻¹ fresh weight, respectively,

while the control treatment gave the least amount of total chlorophyll amounting to 4.71 mg.100g⁻¹ fresh weight .

As for the effect of overlapping treatments, treatment (6 g.l⁻¹ + 10 ml.l⁻¹) was significantly superior as it gave the highest amount of total chlorophyll amounting to 6.11 mg.100g⁻¹ fresh weight compared with the rest of the treatments, while the control treatment gave the lowest The amount of total chlorophyll amounted to 4.19 mg. 100g⁻¹ fresh weight..

Table (3) Effect of spraying myrrha extract and organic fertilizer Foliarex and the interaction between them on the amount of chlorophyll (mg.100g⁻¹ fresh weight) in the leaves of pomegranate seedlings, Shahrban cultivar

Average organic fertilizer	Concentration of myrrha extract (g.L ⁻¹)			Foliarex Organic Fertilizer Concentrate (ml.L ⁻¹)
	6	3	0	
4.71	5.22	4.73	4.19	0
5.15	5.69	5.02	4.73	5
5.55	6.11	5.39	5.14	10
	5.67	5.05	4.69	Myrrha extract average
	overlap	The organic fertilizer	Myrrha extract	L. S.D.
	0.30	0.17	0.17	0.05

The data of Table (4) indicate that there is a significant difference between the concentrations of myrrha extract in their effect on the percentage of carbohydrates, as it is noted that the concentration treatment of 6 g.L⁻¹ was significantly superior compared to the rest of the treatments, which gave the highest percentage, followed by the concentration treatment of 3 g.L⁻¹. It reached (3.70, 3.38)%, respectively, while the control treatment gave the lowest rate in the percentage of carbohydrates, which amounted to 3.20%.

As for the concentration of the organic fertilizer Foliarex, the data of the same table show that the concentration treatment of 10 ml.L⁻¹ was significantly superior in the percentage of carbohydrates compared to the rest of the treatments, as it gave the highest percentage, followed by the treatment of concentration of 5 ml.L⁻¹ in the same effect (3.63, 3.43)%, respectively, while the control treatment gave the lowest rate in the percentage of carbohydrates, amounting to 3.21%.

As for the effect of the overlap treatments, the treatment (6 g. L⁻¹ + 10 ml. L⁻¹) was significantly superior and gave the highest percentage of carbohydrates amounting to 3.94% compared to the rest of the treatments, and the control treatment gave the lowest percentage of carbohydrates, amounting to 3.02%.

Table (4) Effect of spraying myrrha extract and organic fertilizer Foliarex and the interaction between them on the percentage of carbohydrates (%) in the leaves of pomegranate seedlings, Shahrban cultivar

Average organic fertilizer	Concentration of myrrha extract (g.L ⁻¹)			Foliarex Organic Fertilizer Concentrate (ml.L ⁻¹)
	6	3	0	
3.21	3.42	3.21	3.02	0
3.43	3.75	3.35	3.19	5
3.63	3.94	3.58	3.38	10
	3.70	3.38	3.20	Myrrha extract average
	overlap	The organic fertilizer	Myrrha extract	L. S.D.
	0.097	0.056	0.056	0.05

The content of myrrha extract contains a large and balanced group of micro-nutrients such as copper, which plays a role in oxidation-reduction reactions, as it is included in the synthesis of Phenolases and Laccase enzymes, as it is a necessary element for the formation of chlorophyll and may have an effective role in the photosynthesis process, in addition to magnesium, which forms an important part in The composition of the chlorophyll molecule as well as iron, which is important in the formation of the enzymes responsible for photosynthesis, and thus was positively reflected in the increase in total chlorophyll and carbohydrates Tables (3, 4) respectively. The role of the organic fertilizer Foliarex in improving the chemical characteristics is due to the role of the basic nutrients in the (NPK) In addition to the micro elements are subject to the influence of the nutrients combined, the nitrogen enters into the ring of porphyrin, the main constituent of chlorophyll, and thus increases the amount of total chlorophyll, which reflected positively on the increase in the process of photosynthesis and its products such as carbohydrates (wample *et al.*, 1991), while phosphorus may improve vegetative growth by During its participation in the process of photosynthesis and its entry into energy-rich compounds, which was reflected in the production of carbohydrates (Jundiye, 2003), potassium has a role in the division of new cells, growth and

regulation of the mechanism of opening and closing the stomata, which led to an increase in the activity of transport vessels and increased growth and transport of carbohydrates to the rest of the plant parts (Martin, 2012).

Second: The effect of spraying myrrha extract and the organic fertilizer Foliarex and the interaction between them on the anatomical characteristics of the leaves of pomegranate seedlings, Shahrban cultivar.

The data of Table (5) indicate that there is a significant difference between the concentrations of myrrha extract in its effect on reducing the thickness of the cuticle layer, as it is noted that the concentration treatment of 6 g.L⁻¹ was significantly superior compared to the rest of the treatments, which gave the lowest thickness rate of 1.58 µm, while the treatment gave The control had the highest cuticle thickness of 1.96 µm..

As for the effect of organic fertilizer concentrations Foliarex, the data of the same table show that the concentration treatment of 5 ml.L⁻¹ was significantly superior in reducing the thickness of the cuticle layer, compared to the control treatment, which did not differ significantly with the treatment of the concentration of 10 ml.L⁻¹ in the same effect, amounting to (1.71 , 1.70) µm, respectively, and the thickness of the cuticle layer in the control treatment was 1.94 µm.

As for the effect of overlapping treatments, the treatment (6 g.L⁻¹ + 5 ml.L⁻¹) was significantly superior as it gave the lowest thickness in the cuticle layer of 1.35 µm compared to the rest of the treatments, and the control treatment recorded the highest rate in the thickness of the cuticle layer of 2.10 µm.

Table (5) Effect of spraying myrrha extract and organic fertilizer Foliarex and the interaction between them on the thickness of the cuticle layer (µm) in the leaves of pomegranate seedlings, Shahrban cultivar

Average organic fertilizer	Concentration of myrrha extract (g.L ⁻¹)			Foliarex Organic Fertilizer Concentrate (ml.L ⁻¹)
	6	3	0	
1.97	1.84	1.97	2.10	0
1.71	1.35	1.81	1.98	5
1.70	1.55	1.73	1.82	10
	1.58	1.84	1.96	Myrrha extract average

	overlap	The organic fertilizer	Myrrha extract	L. S.D.
	0.34	0.20	0.20	0.05

The data of Table (6) indicate that there is a significant difference between the concentrations of myrrha extract in its effect on the thickness of the epidermal cells, as it is noted that the concentration treatment of 6 g.L⁻¹ was significantly superior compared to the rest of the treatments, which gave the highest thickness of the epidermal cells, followed by the concentration of 3 g.L⁻¹ reached (5.19, 4.60) μm, respectively, while the control treatment gave the lowest epidermal cell thickness of 4.35' μm..

As for the effect of the organic fertilizer Foliarex, the data of the same table show that the concentration treatment of 10 ml.L⁻¹ was significantly superior in the thickness of the epidermal cells, compared with the rest of the treatments, and it gave the highest rate in the thickness of the epidermal cells, followed by the treatment of the concentration of 5 ml.l⁻¹ in the same effect. They were (5.21 , 4.81) μm, respectively, while the control treatment gave the lowest thickness of epidermal cells, which was 4.12 μm..

As for the effect of overlapping treatments, treatment (3 g.L⁻¹ +10 ml.L⁻¹) was significantly superior as it gave the highest thickness of epidermal cells amounting to 6.69 μm compared to the rest of the treatments and the control treatment gave the lowest thickness of epidermal cells amounting to 4.07μm.

Table (6) The effect of spraying myrrha extract and the organic fertilizer Foliarex and the interaction between them on the thickness of epidermal cells (μm) in the leaves of pomegranate seedlings, Shahrban cultivar

Average organic fertilizer	Concentration of myrrha extract (g.L ⁻¹)			Foliarex Organic Fertilizer Concentrate (ml.L ⁻¹)
	6	3	0	
4.12	4.17	4.13	4.07	0
4.81	5.37	4.76	4.31	5
5.21	6.05	6.89	4.68	10
	5.19	4.60	4.35	Myrrha extract average

	overlap	The organic fertilizer	Myrrha extract	L. S.D.
	0.25	0.13	0.13	0.05

The data of Table (7) indicate that there is a significant difference between the concentrations of myrrha extract in their effect on the average thickness of the mesophyll layer, as it is noted that the concentration treatment of 6 g.L⁻¹ was significantly superior compared to the rest of the treatments, which gave the highest thickness rate, followed by the concentration treatment of 3 g.L⁻¹ were (5.29 , 4.95) µm respectively, while the control treatment gave the lowest average thickness in the mesophyll layer, which was 4.77 µm.

As for the effect of the organic fertilizer Foliarex, the data of the same table show that the concentration treatment of 10 ml.L⁻¹ was significantly superior in the average thickness of the mesophyll layer compared to the rest of the treatments, as it gave the highest thickness rate, followed by the concentration treatment of 5 ml.L⁻¹ in the same effect (5.37 , 5.10) µm, respectively, while the control treatment gave the lowest average thickness in the mesophyll layer of 4.54 µm..

As for the effect of overlapping treatments, treatment (6 g.L⁻¹ + 10 ml.L⁻¹) was significantly superior and gave the highest average thickness in the mesophyll layer amounted to 5.38 µm compared to the rest of the treatments, and the control treatment gave the lowest average thickness in the mesophyll layer amounted to 4.43 µm.

Table (7) Effect of spraying myrrha extract and organic fertilizer Foliarex and the interaction between them on the thickness of the mesophyll layer (µm) in the leaves of pomegranate seedlings, Shahrban cultivar

Average organic fertilizer	Concentration of myrrha extract (g.L ⁻¹)			Foliarex Organic Fertilizer Concentrate (ml.L ⁻¹)
	6	3	0	
4.54	4.59	4.60	4.43	0
5.10	5.38	5.08	4.84	5
5.37	5.38	5.16	5.04	10
	5.29	4.95	4.77	Myrrha extract average

	overlap	The organic fertilizer	Myrrha extract	L. S.D.
	0.19	0.11	0.11	0.05

The data of Table (8) indicate that there is a significant difference between the concentrations of myrrha extract in their effect on the diameter of the vascular bundles, as it is noted that the concentration treatment of 6 g.L⁻¹ was significantly superior compared to the rest of the treatments, which gave the highest diameter, followed by the concentration treatment of 3 g.L⁻¹. They were (26.91, 25.01) μm, respectively, while the control treatment gave the smallest diameter of vascular bundles of 23.41 μm.

As for the effect of the organic fertilizer Foliarex, the data of the same table show that the concentration treatment of 10 ml.L⁻¹ was significantly superior in the diameter of the vascular bundles, compared with the rest of the treatments, as it gave the highest diameter, followed by the treatment of concentration of 5 ml.L⁻¹ in the same effect, which amounted to (26.63, 25.50) μm, respectively, while the control treatment gave the lowest diameter of vascular bundles, which was 23.27 μm.

As for the effect of overlapping treatments, (6 g. L⁻¹ + 10 ml. L⁻¹) was significantly superior and gave the highest diameter of vascular bundles of 29.00 μm compared to the rest of the treatments. The control treatment recorded the lowest diameter of vascular bundles of 22.30 μm.

Table (8) The effect of spraying myrrha extract and the organic fertilizer Foliarex and the interaction between them on the diameter of the vascular bundles (μm) in the leaves of pomegranate seedlings, Shahrban cultivar.

Average organic fertilizer	Concentration of myrrha extract (g.L ⁻¹)			Foliarex Organic Fertilizer Concentrate (ml.L ⁻¹)
	6	3	0	
23.27	23.93	23.58	22.30	0
25.50	27.82	25.09	23.59	5
26.63	29.00	26.54	24.35	10
	26.91	25.01	23.41	Myrrha extract average
	overlap	The organic fertilizer	Myrrha extract	L. S.D. 0.05

	0.50	0.29	0.29	
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The data of Table (9) indicate that there is a significant difference between the concentrations of myrrha extract in their effect on the diameter of the tannins cells, as it is noted that the concentration treatment of 6 g.L⁻¹ was significantly superior compared to the rest of the treatments, which gave the lowest diameter, followed by the concentration treatment of 3 g.L⁻¹ They reached (3.56, 3.86) μm, while the control treatment gave the highest diameter of tannin cells, which amounted to 4.21 μm..

As for the effect of the organic fertilizer Folirarex, the data of the same table show that the concentration treatment of 10 ml.L⁻¹ was significantly superior in the diameter of tannin cells compared to the rest of the treatments, as it gave the lowest diameter, followed by the treatment of concentration of 5 ml.L⁻¹ in the same effect (3.45, 3.65) μm, respectively, while the control treatment gave the highest diameter of tannin cells, which reached 4.54μm.

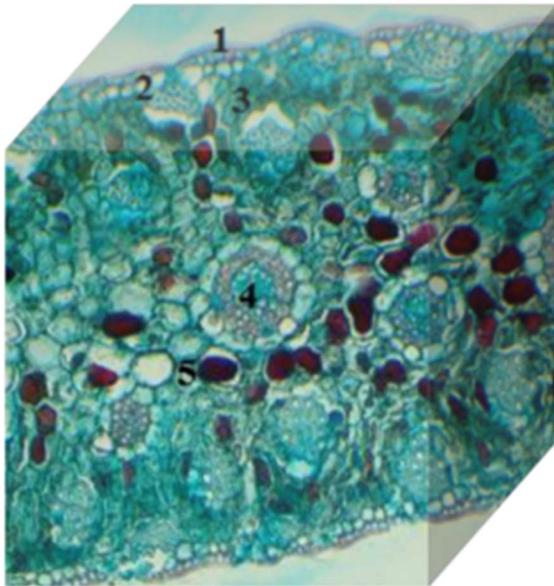
As for the effect of overlapping treatments, treatment (6 g.L⁻¹ + 10 ml.L⁻¹) was significantly superior as it gave the lowest diameter of tannin cells amounted to 3.07 μm compared to the rest of the treatments and the control treatment gave the highest diameter of tannin cells amounted to 4.62 μm.

Table (9) The effect of spraying myrrha extract and the organic fertilizer Foliarex and the interaction between them on the diameter of tannin cells (μm) in the leaves of pomegranate seedlings, Shahrban cultivar

Average organic fertilizer	Concentration of myrrha extract (g.L ⁻¹)			Foliarex Organic Fertilizer Concentrate (ml.L ⁻¹)
	6	3	0	
4.54	4.44	4.58	4.62	0
3.65	3.18	3.68	4.10	5
3.45	3.07	3.33	3.95	10
	3.56	3.86	4.21	Myrrha extract average
	overlap	The organic fertilizer	Myrrha extract	L. S.D.
	0.20	0.12	0.12	0.05

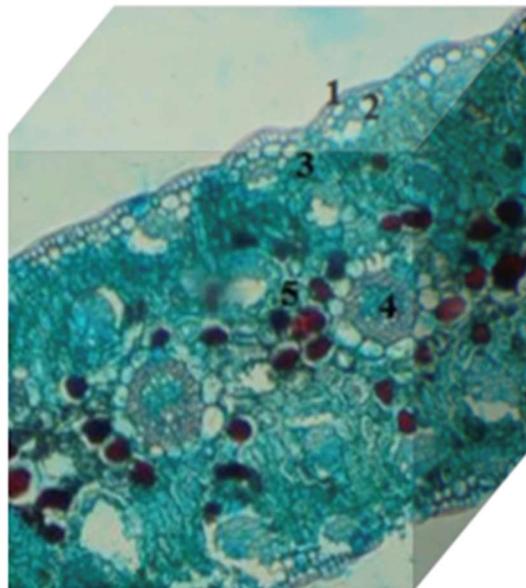
The myrrha extract contains many organic substances that have a direct effect on plant metabolism, such as carbohydrates, proteins, some enzymes and amino acids, which have a role in stimulating physiological processes, activating enzymes in the plant, increasing the efficiency of photosynthesis, and then increasing the accumulation of organic compounds that increase the size and number of cells and its transmission to other parts of the plant, which had a positive role in most of the anatomical characteristics and a clear increase in the thickness of the epidermal cells, the mesophyll layer and the vascular bundles (Tables 6, 7, 8), respectively, growth and plant size, which is reflected in one way or another on the morphological appearance of the plant. This study confirmed that the fertilizer treatments led to changes in the anatomical structure of the leaf (Tables 5, 6, 7, 8, 9), and this may have been reflected in the vascular components of the plant, and the results obtained are consistent with what was mentioned by Bosabalidis and Exarchou, (1995) who indicated that morphological and anatomical changes occurred in a pattern similar to what was obtained in this study.

3 gr.L⁻¹ myrrha extract



+

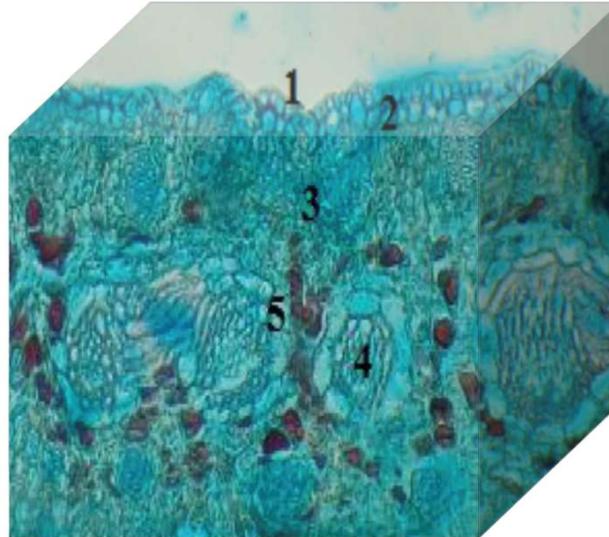
0 gr.L⁻¹ myrrha extract



+

+
0 ml.L⁻¹ organic fertilizer

+
0 ml.L⁻¹ organic fertilizer

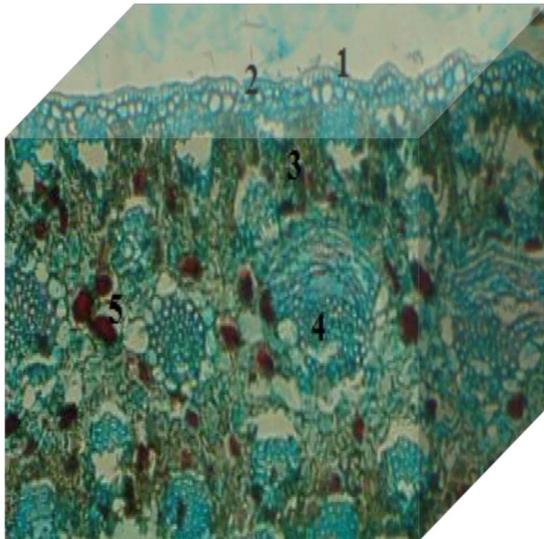


6 gr.L⁻¹ myrrha extract
+
0 ml.L⁻¹ organic fertilizer

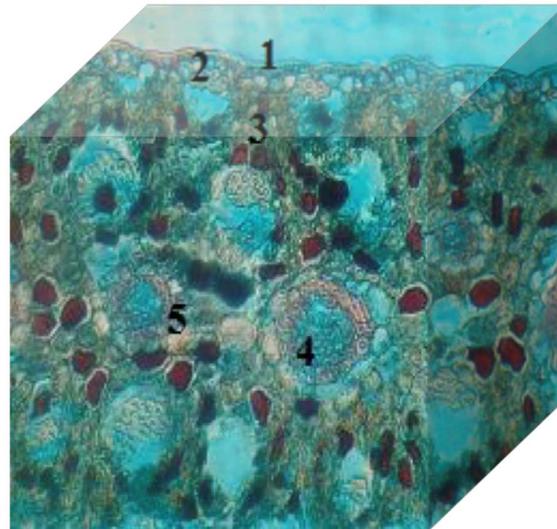
Panel (1-a) a transverse-section of the leaves of pomegranate seedlings, Shahrban cultivar, illustrating the anatomical structure For some traits (1- cuticle, 2- epidermal cells, 3- mesophyll layer, 4- Vascular bundles, 5- tannin cells) under 10X magnification

0 gr.L⁻¹ myrrha extract

0 gr.L⁻¹ myrrha extract



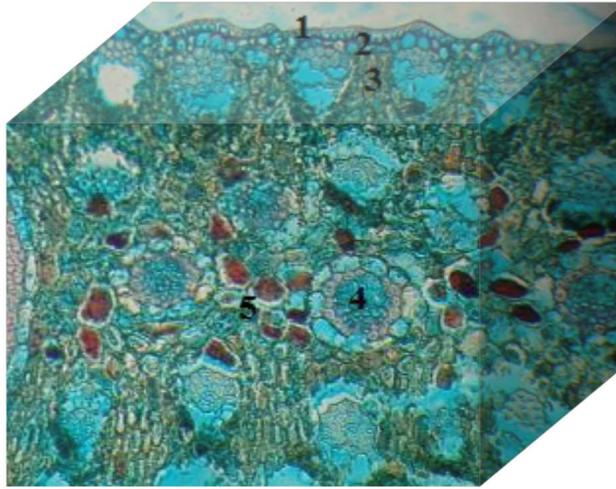
+
5ml.L⁻¹ organic fertilizer



+
10ml.L⁻¹ organic fertilizer

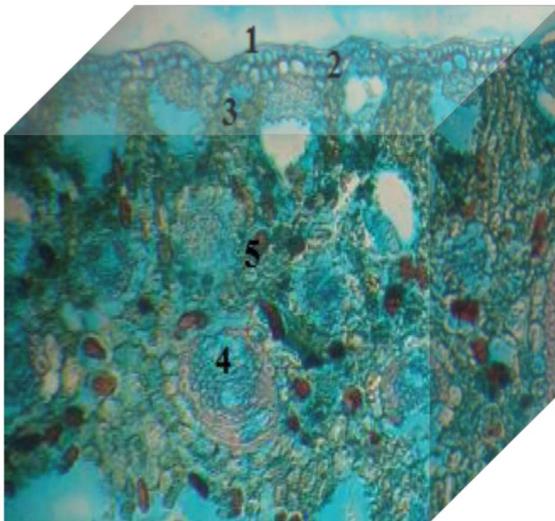
3gr.L⁻¹ myrrha extract

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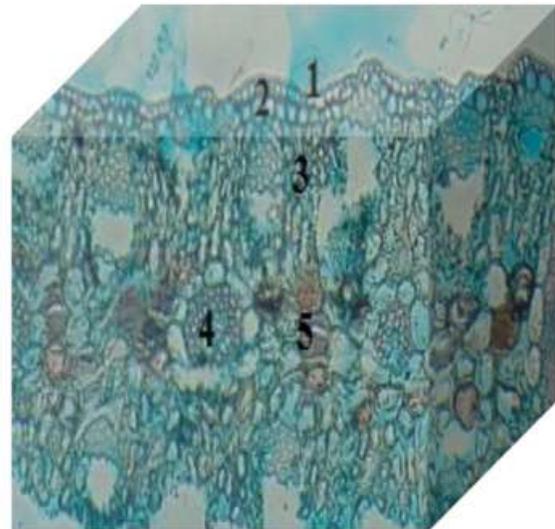
5ml.L⁻¹ organic fertilizer

Panel (1-b) a transverse-section of the leaves of pomegranate seedlings, Shahrban cultivar, illustrating the anatomical structure For some traits (1- cuticle, 2- epidermal cells, 3- mesophyll layer, 4- Vascular bundles, 5- tannin cells) under 10X magnification



3 gr.L⁻¹ myrrha extract

+



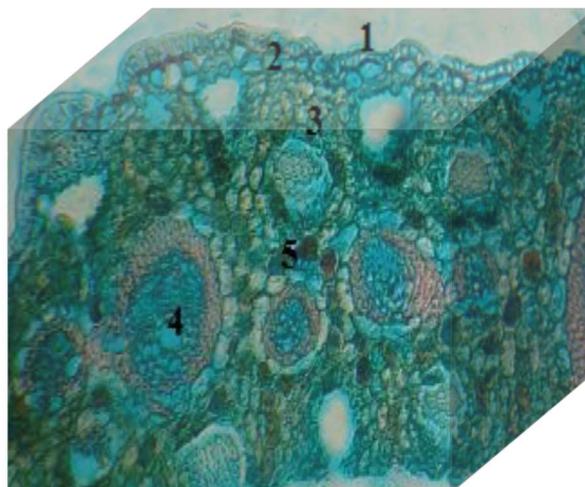
6 gr.L⁻¹ myrrha extract

+

10 ml.L⁻¹ organic fertilizer

5 ml.L⁻¹ organic fertilizer

6gr.L⁻¹ myrrha extract



+

10ml.L⁻¹ organic fertilizer

Panel (1-a) a transverse-section of the leaves of pomegranate seedlings, Shahrban cultivar, illustrating the anatomical structure For some traits (1- cuticle, 2- epidermal cells, 3- mesophyll layer, 4- Vascular bundles, 5- tannin cells) under 10X magnification

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