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STUDY OF THE EFFECT OF FOLIAR SPRAYING WITH DIONYFER AND AZOMIN ON SOME ANATOMICAL TRAITS OF THE LEAVES OF *LAWSONIA INERMIS* L.

Shams Taha Ghani and Mahmoud Shaker Abdel Wahed
Department of Horticulture and Landscape Engineering, College of Agriculture and Marshlands University, Dhi Qar University, Iraq, Email: mahmud@utq.edu.iq

Abstract
This study was conducted in the lath house belonging to the College of Agriculture and Marshlands, the University of Dhi Qar on henna leaves seedlings during the 2020 growing season. The results can be summarized as follows: The results of the study showed that foliar spraying with Dionyfer had a positive, significant effect in improving the anatomical traits of the leaves of the henna plant. The foliar spraying treatment with Dionyfer at a concentration of (300 ml 100 L^{-1}) recorded a significantly excelled in (cuticle thickness, Epidermis thickness, mesophyll cell diameter, vascular bundle diameter, and tannin cell diameter), and the lowest averages with a significant difference compared to the control treatment. The interactions had a clear effect on the studied traits, where the spraying interaction (Foliar of Dionyfer 300 ml 100 L^{-1} + Azomin 350 ml 100 L^{-1}) was significantly excelled in giving the highest increase in cuticle thickness, Epidermis thickness, mesophyll cell diameter, vascular bundle diameter, and diameter tannin cells.

Keywords: henna plant, Dionyfer, Azomine, mesophyll

Introduction

The henna shrubs *Lawsonia inermis* L., which belongs to the Lythraceae family is one of the shrubs of medical and economic importance, in addition to being an ornamental plant. Henna is a perennial plant that stays in the ground for three years and may extend to ten years or more. The branches are green and turn brown at maturity, and the leaves are simple, leathery, opposite on the stem, which contains colored materials (Qutb, 1985 and Nasr, 1986 and Nasr, 2003). The henna plant is considered one of the medicinal, aromatic and cosmetic plants that man has known since the dawn of the first civilizations, where the Babylonians and the Pharaohs used it in their religious rituals. It is one of the plants of the tropics, and its original home is likely to be either South America, Iran, or India, and its cultivation has spread in North Africa, southwest Asia, and Australia. Tawfiq, 2004).Many henna trees in Iraq suffer from a weakness in their vegetative growth, due to their exposure to many stresses, where most of the soils in the agricultural areas in southern Iraq tend to have a basic pH (7.5-8.2) and a high content of lime and a dry and hot climate in summer in addition to the salinity of the soil Irrigation water, which leads to a large loss of many nutrients through their precipitation and a decrease in their availability, which negatively affects the growth and yield of the plant, both quantitatively and qualitatively. In addition to the fact that henna trees are evergreen, they deplete large amounts of nutrients annually. Therefore, it has recently been adopted to use modern agricultural methods that seek to improve the growth of plants and of high quality in a manner that protects the environment, including the use of biostimulants, and these catalysts include the use of the Azomine and Dionyfer catalyst, which has proven its efficiency in improving the growth and productivity of various horticultural plants.The transverse

section of the leaves of the henna plant is composed of the epidermis, which is a single layer of cells of varying size, shapes between rectangular and oval, and covered from the outside with a thick layer of cuticle. Next to the skin is the cortex area, followed by the chlorenchyma cells . Which consists of two types of cells, followed by the inside, which consists of several rows of parenchyma cells, which are distinguished by their different shapes and sizes with clear spaces between them. Then comes a thick layer of sclerenchyma cells.It is followed by the vascular bundles formed by the phloem and xylem. Then comes a layer of the marrow Pith, and the marrow consists of parenchymal cells of different sizes and shapes, containing spaces between them.

Materials and methods

The experiment was conducted in one of the fields of the College of Agriculture and Marshlands - the University of Dhi Qar during the autumn season 2020-2021 to study the effect of foliar spraying with Dionyfer and Azomin in improving some anatomical traits of henna leaves, for the purpose of studying some anatomical changes in each of the leaves of henna plants treated with Dionyfer and Azomin. Henna leaves and the following steps were conducted according to the method (Willey 1971)

1-The sections cut from the leaves of the henna plant were fixed in the fixative (F.A.A) prepared from 5 ml formalin, 5 ml glacial acetic acid and 90 ml of ethyl alcohol 70% concentration for 24 hours, then the sections were washed with 70% ethyl alcohol to remove traces of installer

2- The cut sections were passed in an ascending series of ethyl alcohol (70, 80, 95 %) for an hour at each concentration and then to 100% absolute alcohol for an entire night with the alcohol replaced after six hours

3- The samples were placed in bottles containing a mixture of absolute alcohol: xylene in the ratio (1:3, 1:1, 3:1) for 30 minutes in each mixture, then left in pure xylene for 30 minutes, after which they were placed in a mixture of xylene and paraffin wax in An oven at a temperature of (60-65) C for two hours, then transferred to paraffin wax and left for a whole night at the same temperature.

4- Paraffin was prepared at the previous temperature and poured into special plastic cubes, then the models were placed inside these cubes after learning, and then they were left to cool for a long time, so that they were ready for cutting.

5- The models were cut by means of a rotary microtome and parched by placing them in xylene for a whole night, then passed a grading series of ethyl alcohol 100%, 90%, 80%, 70%, 50%, and then to distilled water for five minutes in each, after which safranin pigment was applied (Prepared by dissolving 1 g in 100 ml of 70% alcohol) for 30-60 minutes. Washed with distilled water to remove excess pigment .it then passed a series of escalating series of ethyl alcohol 70, 80, 90, 100% and then placed in fast green pigment prepared by dissolving 0.5 g of pigment in 100 ml of absolute ethyl alcohol for 15-30 seconds.Then it was washed with absolute alcohol to remove the excess pigment and then passed with xylene three times in a row for 5 minutes each time and then carried with the addition of drops (DPX) and put the slide cover on it and then transferred to the hot plate at a temperature of 60 °C for two hours and after it was ready for examination the characteristics were studied The following anatomical microscopy:

1-Thickness of the Epidermis layer and cuticle

2- The epidermis thickness
3- The diameter of the mesophyll tissue cells
4- Thickness of the diameter of the vascular bundle
5- Thickness and diameter of tannin cells

Results and discussion

1- The thickness of the cuticle layer (micrometer)

Table (1) shows that the study factors and their interactions had a significant effect on the thickness of the cuticle layer in the leaves. The plants that were sprayed with Dionyfer at a concentration of 300 ml 100 L^{-1} significantly excelled in this trait, the highest percentage of cuticle thickness was recorded, which amounted to (2.64) mμ compared to the control plants, which recorded the lowest percentage of (1.05 mμ). The effect of the interaction between the two factors of the study by spraying Dionyfer and Azomin had a significant effect on the thickness of the cuticle layer in the leaves. With the lowest percentage (0.78) mμ produced from the control plants. This confirms the plant's response to foliar spraying.

Table (1) Effect of foliar spraying of Dionyfer and azomin and their interactions on the thickness of the cuticle layer in henna leaves (μm)

Azomin effect	Dionyfer effect			Azomin effect average
	100ml 100L^{-1}	200ml 100L^{-1}	300ml 100L^{-1}	
0	0.78	1.00	1.12	1.56
150ml 100L^{-1}	0.99	1.71	2.10	2.13
250ml 100L^{-1}	1.10	1.76	2.47	2.87
350ml 100L^{-1}	1.35	1.82	2.7	3.52
Dionyfer effect average	1.05	1.57	2.09	
R.L.S,D	Azomin=0.69	Dionyfer=0.69	Interaction= 0.89	

2- thickness of epidermis cells (micrometers)

Table (2) shows that the study factors and their interactions had a significant effect on the thickness of the epidermis cells in the leaves, where the plants sprayed with the compound Dionyfer at a concentration of 300 ml 100 L^{-1} significantly excelled in this trait, the highest percentage of epidermis cell thickness was recorded (7.12) mμ compared to the control plants which The lowest percentage was recorded (3.10) mμ.The interaction effect between the study factors of foliar spraying of Dionyfer and Azomin had a significant effect on the thickness of the epidermis cells in the leaves. The lowest percentage (2.42) mμ was obtained from the control plants.

Table (2) Effect of foliar spraying of Dionyfer and Azomin and their interactions on the thickness of Epidermis cells in henna leaves (µm)

Azomin effect	Dionyfer effect			Azomin effect average
	100ml 100L^{-1}	200ml 100L^{-1}	300ml 100L^{-1}	
0	2.42	3.26	3.86	4.36
150ml 100L^{-1}	2.56	4.43	5.46	6.42
250ml 100L^{-1}	3.56	4.90	8.10	8.76
350ml 100L^{-1}	3.89	5.24	8.61	8.96
Dionyfer effect average	3.10	4.45	6.50	
R.L.S,D	Azomin=0.17	Dionyfer=0.17	Interaction=0.22	

3- Diameter of mesophyll cells (micrometers)

Table (3) shows that the study factors and their interactions had a significant effect on the diameter of the mesophyll tissue cells in the leaves. The plants that were sprayed with the compound Dionyfer at the concentration of 300 ml 100 L^{-1} significantly excelled in this trait, the highest percentage of mesophyll tissue diameter was (12.47) mµ compared to the control plants, which recorded the lowest percentage of (6.42) mµ. The interaction effect between the two factors of the study, spraying with Dionyfer and Azomin, had a significant effect on the diameter of the mesophyll tissue in the leaves, as the plants sprayed with Dionyfer gave a concentration of 300 ml 100 L^{-1} with Azomine a concentration of 350 ml 100 L$^{-1,}$ the highest percentage of mesophyll diameter was (15.57) µm compared with the lowest a percentage of (4.30) mµ was obtained from the control plants. This confirms the plant's response to foliar spraying.

Table (3) Effect of spraying with the compounds Dionyfer and azomin and their interactions on the diameter of the mesophyll tissue cells in henna leaves (µm)

Azomin effect	Dionyfer effect			Azomin effect average
	100ml 100L^{-1}	200ml 100L^{-1}	300ml 100L^{-1}	
0	4.30	6.96	7.97	8.82
150ml 100L^{-1}	5.40	9.23	10.91	11.57
250ml 100L^{-1}	7.61	9.91	12.17	13.94
350ml 100L^{-1}	8.38	10.34	12.86	15.57
Dionyfer effect average	6.42	6.42	10.97	
R.L.S,D	Azomin=0.89	Dionyfer=0.89	Interaction=1.34	

4-Vascular bundle diameter (micrometer)

Table (4) shows that the study factors and their interactions had a significant effect on the diameter of the vascular bundle in the leaves, where the plants sprayed with Dionyfer at a concentration of 300 ml 100 L^{-1} significantly excelled in this trait. The lowest percentage was (25.30) mμ.The interaction effect between the study factors, spraying with the two compounds Dionyfer and Azomine had a significant effect on the diameter of the vascular bundle in the leaves.The highest percentage of bundle diameter was (70.22) µm in comparison with the lowest percentage (22.32) µm produced from the control plants. This confirms the plant's response to foliar spraying.

Table (4) Effect of spraying with Dionyfer and azomine and their interactions on the diameter of the vascular bundle in henna leaves (µm)

Azomin effect	Dionyfer effect			Azomin effect average
	100ml 100L^{-1}	200ml 100L^{-1}	300ml 100L^{-1}	
0	22.32	25.30	27.40	29.60
150ml 100L^{-1}	24.10	31.80	36.20	37.30
250ml 100L^{-1}	25.20	34.00	47.20	51.60
350ml 100L^{-1}	29.60	36.20	47.20	70.22
Dionyfer effect average	25.30	31.80	40.05	
R.L.S,D	Azomin=10.11	Dionyfer=10.11	Interaction=12.12	

5- the diameter of the tannin cells (micrometers)

Table (5) shows that the study factors and their interactions had a significant effect on the diameter of the tannin cells in the leaves, where the plants sprayed with the compound Dionyfer at a concentration of 300 ml 100 L^{-1} significantly excelled in this trait. The lowest percentage was recorded (4.44) mμ.The effect of the interaction between the two study factors, foliar spray, Dionyfer and Azomin, had a significant effect on the diameter of the tannin cells in the leaves. The plants that were sprayed with Dionyfer at a concentration of 300 ml 100 L^{-1} with Azomine at a concentration of 350 ml 100 L^{-1} gave the highest percentage of tannin cells diameter (10.52) µm compared to the lowest percentage of (3.52) µm produced from the control plants.

Table (5) Effect of spraying with the two compounds Dionyfer and azomin and their interactions on the diameter of tannin cells in henna leaves (µm)

Azomin effect	Dionyfer effect			Azomin effect average
	100ml 100L^{-1}	200ml 100L^{-1}	300ml 100L^{-1}	
0	3.52	4.32	5.22	6.13
150ml 100L^{-1}	3.80	6.62	7.98	8.22
250ml 100L^{-1}	4.72	7.11	8.48	9.17

350ml 100L^{-1}	**5.72**	**7.62**	**8.87**	**10.52**
Dionyfer effect average	**4.44**	**6.41**	**7.63**	
R.L.S,D	**Azomin=0.29**	**Dionyfer=0.29**	**Interaction=0.98**	

The reason for the excelled of the characteristics of (cuticle thickness, epidermis thickness, mesophyll cell diameter, vascular bundle diameter and tannin cell diameter) treated by foliar spray with Dionyfer is due to its content of seaweed extracts, which contain plant hormones and growth-stimulating substances such as auxins and cytokinins and the gibberellins that increase the number and diameter of cells, where the auxin in cooperation with the gibberellins encourage an increase in cell diameters and encourage their longitudinal growth, in addition to the well-known role of cytokinins in encouraging cells to divide, and this is consistent with (Al-Ugaili, 2020; Denney, 1992; Sweden, 2012; Atti, 2017).

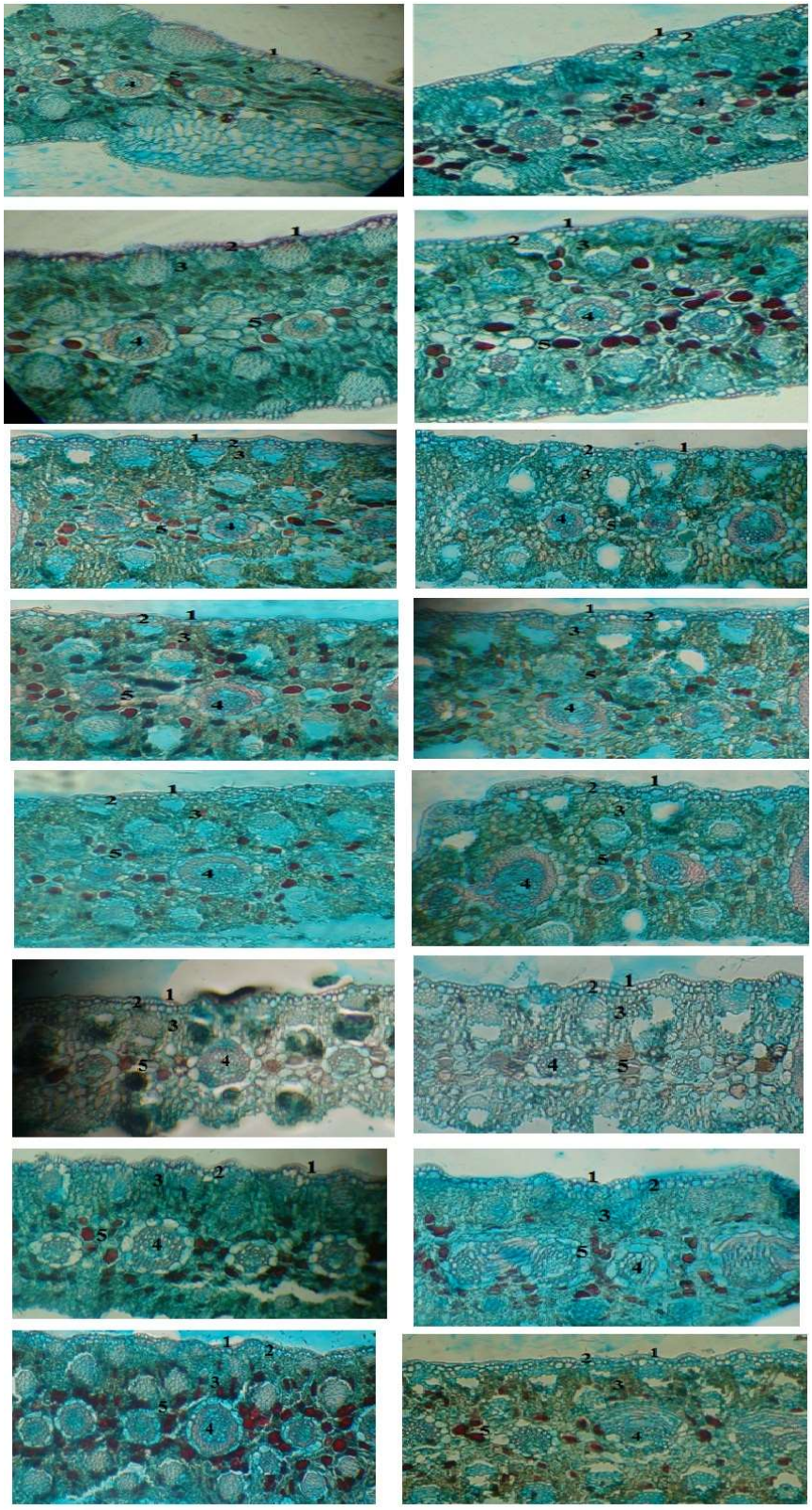

Figure (1) represents microscopic pictures 1-Cuticle, 2-Epidermis, 3-Parenchyma cell, 4-Vascular bundle ,5-Tannin cell

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