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Study the effect of foliar spraying with Dionyfer and Azomin on the vegetative growth indicators of the leaves of Henna plant(Lawsonia inermis L).

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Abstract:

This study was conducted in the lath house for the College of Agriculture and the Marshes - University of Dhi Qar on the leaves of henna seedlings during the 2020 growing season. The results can be summarized as follows:

1- Spraying plants with Dionyfer stimulator at a concentration of (300 ml 100 L^{-1}) led to a significantly excelled in physical traits(plant height (cm), number of secondary branches/plant, the total number of leaves/plant, leaf area (cm^2),The weight of the fresh vegetative growth (g), the weight of the dry vegetative growth(g), the weight of the fresh root system (g), the weight of the dry root system (gm), which amounted to (109.08 cm, 6.66 plant $branch^{-1}$, 246.33 plants, 8.07 cm^2 plants $^{-1}$, 69.91 g, 31.36 g, 31.78 g, 14.14 g) respectively.

2- As for the interactions, they had a significant effect on the vegetative growth indicators under study between the Dionyfer stimulator at a concentration (300 ml 100 L^{-1}) and Azomin stimulator at a concentration (350 ml L^{-1}), as all the studied traits excelled within the vegetative growth indicators under study.

Key words: henna, Dionyfer , Azomin , leaf area.

I. INTRODUCTION

The henna shrubs (*Lawsonia inermis* L.), which belongs to the Lythraceae family, it 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, as 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)

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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 was recently adopted to use modern agricultural methods that seek to improve the growth of high-quality plants in a method that protects the environment.Including the use of biological stimuli, and among these stimuli, the use of the stimulator Dionyfer and Azomin, which has proven its efficiency in improving the growth and productivity of various horticultural plants.(Al-Ali, 2014) found in his study the effect of auxin (IBA) on the vegetative traits of henna plants when using 3 concentrations (3000, 5000, 8000). The results showed that the concentration of 8000 excelled in all vegetative traits (number of leaves, number of branches, leaf area).(Al-Dulaimi, 2005) found that there was a significant increase in the vegetative traits of the carnation plant *Dianthus caryophyllus* L. Chabaud cultivar when sprayed with foliar nutrition extract at concentrations (0,1,2) ml L^{-1} significantly in improving the vegetative growth indicators, where the plant height and leaf area increased and the fresh and dry weight compared to the control plants.In a study conducted by Sridhar and Rengasamy (2010) on the Jaafari plant treated with brown grass extract. At concentrations of (1.5,1,0.5,0.25)%, the treatment with a concentration of 1% was significantly excelled in increasing plant height, number of lateral branches, fresh and dry weight of the plant compared to other and control concentrations.(Al-Hormozi, 2011) showed in a study conducted on the strawberry plant Fragaria X ananassa Duch by spraying it with seaweed extract Alga600 at two concentrations of (0.3) ml L^{-1}, the plants sprayed with seaweed extract at a concentration of 3 ml L^{-1} significantly excelled in leaf area and fresh weight. It reached 1.628 cm, 122.3 cm^2 and 34.22 g, compared to the control plants, which amounted to 1.352 cm, 103.3 cm2 and 26.00 g, respectively.

II. MATERIALS AND METHODS

The experiment was conducted in the greenhouse belongs to the Department of Horticulture / College of Agriculture and Marshes _ University of Dhi Qar during the growing season 2020-2021, where a number of henna seedlings, one year old, were selected, for the purpose of studying the effect of spraying with Dionyfer and Azomin on them, where the following traits were estimated:

First: Indicators of vegetative growth

1- plant height (cm)

Measure the plant height from the area where the stem contacts the growing medium to its apex with a meter, then extract the rate of each treatment.

2- Number of secondary branches/plant

The number of secondary branches growing on each main branch of each plant was calculated and then the average of each treatment was extracted.

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3- Total number of leaves/plant

According to the total number of leaves for each plant and then extract the rate for each treatment

4- Leaf area (cm^2)

The leaf area of the plant was measured using a leaf area measuring device (CI-202 LASER AREA METER) produced by the American CID company (Ci D. BIO-Science Made in U-S-A)).

5-The fresh weight of vegetative growth (g)

Three plants were taken from each experimental unit, chosen randomly, and after cleaning them from dust and separated from the root system, their fresh weight was recorded with a sensitive scale, and their average was taken in grams for each treatment.

6- The Dry weight of vegetative growth (g)

After taking the weight of the fresh vegetative, they were collected and dried in an electric oven at 70° C for 48 hours until the weight was stable. Then the dry weight of it was recorded, where the average of the total vegetative weight was taken for each treatment.

III. RESULTS AND DISCUSSION

First: Indicators of vegetative growth

1- plant height (cm)

The results in Table (1) show that the study factors and their interactions had a significant effect on plant height, where the plants treated with Dionyfer at a concentration of (300 ml 100 L^{-1}) significantly excelled and gave the highest value of (109.08) cm compared with each of the Azomin treatments that recorded the lowest average reached (97.75) cm. The reason for this may be due to the fact that the catalyst from seaweed extracts contains the macro elements N, P, K, which the plant needs in its growth and development because it is involved in the formation of chlorophyll, amino acids, and energy-rich compounds (Idris, 2009), or it may be due to the role of foliar spraying of the catalyst that Facilitates the rapid transfer of nutrients to the vegetative parts, improves vegetative growth, and increases the efficiency of the photosynthesis process, which may increase the height of the plant (Mohammed and Moayyad 1991, Abdul Muttalib 2011).. These results agreed with Hassan (2003) on the plant of Cardinia and Dulaimi (2005) on the carnation plant, and Al-Hussein and Al-Omrani (2018) on the rosemary plant.While the interaction effect between the two factors of the study, spraying with Dionyfer and Azomin , had a significant effect in this trait, where the plants sprayed with the two compounds Dionyfer (300 ml 100 L-1)

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and Azomin (350 ml 100 L-1) gave the highest height of (111.00) cm compared to the lowest height It was (89.66) cm for the control plants. This confirms the plant's response to foliar spraying.

Table (1) Effect of spraying with the two compounds Dionyfer and Azomin and their interactions on the height of henna plant (cm)

Dionyfer effect	Azomin effect				Dionyfer effect average
	0	150ml 100L^{-1}	250ml 100L^{-1}	350ml 100L^{-1}	
0	89.66	91.33	92.33	93.33	91.66
100ml 100L^{-1}	94.66	96.00	97.00	98.33	96.50
200ml 100L^{-1}	99.00	99.66	102.00	106.66	101.83
300ml 100L^{-1}	107.66	108.33	109.33	111.00	109.08
Azomin effect average	97.75	98.83	100.16	102.33	
R.L.S.D	Azomin=0.3742	Dionyfer=0.3742	Interaction=0.7483		

2- Number of secondary branches plant^{-1}

Table (2) shows that spraying plants with the compound Dionyfer at a concentration (300 ml 100 L^{-1}) led to a significant increase in the number of main branches, where the largest number was recorded (6.66) plant branches^{-1} compared with each of the Azomin treatments that recorded the lowest average. It reached (3.83) plant branch$^{-1.}$ The reason for the excelled is due to the role of the catalyst in increasing the efficiency of nutrient absorption, which is reflected positively in the increase in the vegetative total and the efficiency of the photosynthesis process of the plant as a result of its content of nutrients that have an effective effect in increasing cell division and thus increasing the characteristics of vegetative growth and the number of branches, especially at high concentrations of this The extract, in addition to the formation of a good root system, which increases the absorption of nutrients, which positively affects the increase in the number of branches as a result of its effect on the differentiation of the vascular contact area between the lateral bud and the stem (Moore, 1982).Or, the nitrogen contained within the stimulator, Dionyfer , may increase the number of branches through its effect on reducing the concentration of oxygen inside the plant and thus reducing the apical dominance, allowing the buds to open and grow in a larger number (Mcintyre et al., 1972),or perhaps the reason for the superiority of the treatments sprayed with Dionyfer is due to the effect of nutrients in the process of photosynthesis, respiration, and cellular metabolism, where they enter into the composition of nucleic acids necessary for cell division and the formation of proteins, enzymes, and hormones, which lead to an increase in plant branches and strength of growth. (Al-Sahhaf, 1989 and Abd El-Mooty, 2010).It agrees, while the interaction effect between the two factors of the study, spraying with the two compounds Dionyfer with Azomin , had a significant effect on the number of main branches, as the plants sprayed with Dionyfer at a concentration of (300 ml 100 l-1) with Azomin at a concentration (350 ml 100 l-1), gave the largest number of the branches reached (7.33) plant-1 branches

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compared to the lowest number of branches reached (2.00) plant-1 branches resulted from the control plants and the number of branches increased with increasing concentration. This confirms the plant's response to foliar spraying.

Table (2) Effect of spraying with the two compounds Dionyfer and Azomin and their interactions on Number of main branches of the henna plant (branch.plant^{-1})

Dionyfer effect	Azomin effect				Dionyfer effect average
	0	150ml 100L^{-1}	250ml 100L^{-1}	350ml 100L^{-1}	
0	2.00	2.66	3.00	3.00	2.66
100ml 100L^{-1}	3.33	4.00	4.00	4.00	3.83
200ml 100L^{-1}	4.00	4.00	5.00	5.00	4.50
300ml 100L^{-1}	6.00	6.33	7.00	7.33	6.66
Azomin effect average	3.83	4.25	4.75	4.83	
R.L.S.D	Azomin=0.2219	Dionyfer=0.2219	Interaction=0.4438		

3- Total number of leaves / plant

The results in Table (3) show that the study factors and their interactions had a significant effect on the number of leaves, where the plants treated with Dionyfer at a concentration of (300 ml 100 L^{-1}) significantly excelled and gave the highest value of (246.33) plants compared with each of the Azomin treatments which were recorded the lowest rate was (163.67) plants.The reason may be due to the fact that the Dionivir catalyst contains seaweed extract, which consists of growth-encouraging substances, which have an important role in carbohydrate metabolism and building amino acids, which represent the basic units for building proteins, which was positively reflected in the growth and increase in the number of leaves (Nagoda, 1991)or, the reason may be due to the effect of the stimulator of Dionyfer in increasing the number of secondary branches (table (9)), which led to an increase in the total number of leaves/plant. While the interaction effect between the study factors, spraying with Dionyfer and Azomin had a significant effect in this trait, as the plants sprayed with Dionyfer (300 ml 100 L^{-1}) and Azomin (350 ml 100 L^{-1}) gave the highest height of (259.00) plants compared to the lowest height was (109.33) plants for control plants. This confirms the plant's response to the foliar spray, and may also be due to the effect of the factors mentioned in each of the effect of foliar spraying with Dionyfer and Azomin above.

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Table (3) Effect of spraying with the two compounds Dionyfer and Azomin and their interactions on number of leaves of the henna plant (leaf.plant^{-1})

Dionyfer effect	Azomin effect				Dionyfer effect average
	0	150ml 100L^{-1}	250ml 100L^{-1}	350ml 100L^{-1}	
0	109.33	112.00	119.33	132.67	118.33
100ml 100L^{-1}	142.33	150.00	152.67	163.67	152.17
200ml 100L^{-1}	170.67	181.00	219.00	224.00	198.67
300ml 100L^{-1}	232.33	237.67	256.33	259.00	246.33
Azomin effect average	163.67	170.17	186.83	194.83	
R.L.S.D	Azomin=1.088	Dionyfer=1.088	Interaction=2.175		

1- Leaf area (cm^2 plants^{-1})

Table (4) that the compound of Dionyfer had a significant effect in increasing the leaf area of henna plants that were sprayed with a concentration of (300 ml 100 L^{-1}), as the largest leaf area was recorded at (8.07) cm^2 plant^{-1} compared with each of the Azomin treatments which were recorded The lowest rate was (5.37) cm^2 plant^{-1}.The reason may be due to the efficiency of the catalyst Dionivir in its positive effect on the leaves through what it contains growth stimulants, amino, and organic acids, and plant growth hormones, which have a role in vegetative growth and the emergence of the chlorophyll molecule and increasing the absorption of nutrients led to an increase in the metabolic activities of the plant.Including the necessary potassium element, which helps in the synthesis of important chlorophyll and this is reflected in an increase in photosynthesis and thus an increase in carbohydrates and processed materials and their accumulation in the leaves and the provision of energy necessary for growth, which was positively reflected on the increase in the leaf area (Salisbury, 1978 and Oyoo et al., 2010 and Tawfiq, 2012).The reason for increasing the leaf area is due to the increase in the concentration of the extract as well as the increase in the number of spraying times. This is consistent with what he obtained, Kadhim (2012) on geranium and Al-Khuzaey and Al-Asadi (2019) on narcissus.While the interaction effect between the two factors of the study, spraying with Dionyfer and Azomin, had a significant effect in increasing the leaf area of henna plants, as the plants sprayed with Dionivir gave a concentration of (300 ml 100 L^{-1}) with (350 ml 100 L^{-1}) the largest leaf area reached (8.75) cm^2 plant^{-1} compared to the smallest leaf area which was (3.73) cm^2 plant^{-1} produced m\ of control plants. This confirms the plant's response to foliar spraying.

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Table (4) Effect of spraying with the two compounds Dionyfer and Azomin and their interactions on Leaf area of henna plant (cm^2 $plant^{-1}$)

Dionyfer effect	Azomin effect				Dionyfer effect average
	0	150ml $100L^{-1}$	250ml $100L^{-1}$	350ml $100L^{-1}$	
0	3.73	3.90	3.99	4.10	3.93
100ml $100L^{-1}$	4.55	4.86	5.02	5.24	4.92
200ml $100L^{-1}$	5.96	6.14	6.48	6.77	6.34
300ml $100L^{-1}$	7.23	7.74	8.55	8.75	8.07
Azomin effect average	5.37	5.66	6.01	6.21	
R.L.S.D	Azomin=0.0807	Dionyfer=0.0807	Interaction=0.1614		

Fresh weight of vegetative growth (g)

Table (5) showed that the study factors and their interactions had a significant effect on the fresh vegetable weight of henna leaves, where the plants sprayed with Dionyfer concentration (300 ml 100 L^{-1}) significantly excelled, where it gave the highest fresh vegetable weight of (69.91) g compared with each of the Azomin treatments, which recorded the lowest average, reached (52.89) g.The reason may be attributed to the fact that the Dionyfer stimulator contains many growth-encouraging compounds, as mentioned previously, which led to a significant increase in all vegetative growth traits under study (plant height, increase in the number of main branches and leaf area), and this was reflected positively on the increase in the fresh weight of the vegetative total, and these agreed The result is with Ahmed (1998) on the marjoram plant, Ahmed (2004) on the chamomile plant, and Abdul Qadir (2005) on the henna plant.While the interaction effect between the study factors, spraying with Dionyfer and Azomin had a significant effect in this trait, as the plants sprayed with a concentration of (300 ml 100 l-1) and those sprayed with Azomin (350 ml 100 l-1) gave the highest fresh weight of (72.96) g compared to With the lowest fresh weight of leaves (34.64) g, it was obtained from control plants that were sprayed with water only. This confirms the plant's response to foliar spraying.

Table (5) Effect of spraying with the two compounds Dionyfer and Azomin and their interactions on fresh weight of vegetative of henna (g)

Dionyfer effect	Azomin effect				Dionyfer effect average
	0	150ml $100L^{-1}$	250ml $100L^{-1}$	350ml $100L^{-1}$	
0	34.64	38.45	39.96	41.51	38.64

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100ml 100L^{-1}	51.12	51.91	52.94	55.11	52.77
200ml 100L^{-1}	58.70	60.11	63.71	65.64	62.04
300ml 100L^{-1}	67.11	69.49	70.07	72.96	69.91
Azomin effect average	52.89	54.99	56.67	58.80	
R.L.S.D	Azomin=0.2664	Dionyfer=0.2664	Interaction=0.5328		

6- Dry weight of vegetative growth (g)

Table (6) shows that the study factors and their interactions had a significant effect on the vegetative dry weight of the leaves, where the plants sprayed with Dionyfer significantly excelled on the concentration (300 ml 100 L^{-1}), as it gave the highest vegetative dry weight of (31.36) g compared with each of the Azomin treatments the lowest average was (23.13) g. The reason for the increase may be due to the role of the Dionyfer stimulator, which affects the increase in plant height and number of branches (Table 7 and 8), which was positively reflected in the increase in the weight of the dry vegetative total. This agreed with what happened to El-Sayed et al. (2002) on the coriander plant and Abdel Qader (2005) on the henna plant.While the effect of the interaction between the study factors, spraying with Dionyfer and Azomin, was significant, the same table showed that the treatment of plants with Dionyfer concentration (300 ml 100 L^{-1}) and Azomin(350 ml 100 L^{-1}) gave the highest dry weight of the leaves was 32.69 g, while The control plants gave the lowest weight (12.90) g. This confirms the plant's response to foliar spraying.

Table (6) Effect of spraying with the two compounds Dionyfer and Azomin and their interactions on dry weight of vegetative growth of Henna Leaves (g)

Dionyfer effect	Azomin effect				Dionyfer effect average
	0	150ml 100L^{-1}	250ml 100L^{-1}	350ml 100L^{-1}	
0	12.90	14.84	16.03	17.18	15.24
100ml 100L^{-1}	21.83	23.72	25.08	27.18	24.45
200ml 100L^{-1}	27.66	28.04	29.08	29.65	28.61
300ml 100L^{-1}	30.13	30.83	31.80	32.69	31.36
Azomin effect average	23.13	24.36	25.50	26.67	
R.L.S.D	Azomin=0.1930	Dionyfer=0.1930	Interaction=0.3860		

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