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Response vegetative growth of three grape cultivars (*Vitis vinifera* L.) to foliar application of GA_3 and NAUTA fertilizer

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Abstract

This study was carried out in the vineyard of the Department of Horticulture and Landscape Design, College of Agriculture and Forestry at the University of Mosul, Mosul City, Iraq. During the growing season 2022 to study the effect of foliar fertilization of Nauta fertilizer containing amino acids and seaweed extracts and foliar spraying with gibberellic acid (GA_3) on three varieties of table grapes, Halawani, Kamali and Khalili and the extent of their impact on vegetative growth. Foliar spraying of organic fertilizer NAUTA with 0, 250 and 500 mg l^{-1} and spraying with a solution of gibberellic acid with 0, 50 and 100 mg l^{-1}. The most important results obtained that vegetative growth differed according to the varieties under this study, Foliar application of NAUTA organic fertilizer, especially at a concentration of 250 mg l^{-1}, led to a significant increase in the rate of height and diameter of the main stem, the leaf area , the leaf area of the seedling, the concentration of chlorophyll in the leaves. Spraying with 100mg l^{-1} of gibberellic acid, led to a significant increase in the average height and diameter of the main stem, leaf area, the leaf area of the seedling, protein. The results of the triple interaction between the levels of the studied factors showed a significant effect on vegetative growth.

Keywords: GA_3, Nauta Fertilizer, Growth, Grape.

Introduction

Grape is one of the most important fruit species and are beloved by consumers of the fruit, which belongs to the family Vitaceae. Its fruits contain water, sugars, organic acids, vitamins and mineral salts (Winkler, *et al*, 1974). The grapes Halwani, Kamali and Khalili are distinguished table grape varieties in terms of growth and production and varying in the ripening dates in Iraq.

Gibberellins are a group of growth hormones that have been isolated since the thirties of the last century from the mushroom extract Gibberell Fugikuroi and are characterized by their effect on the elongation of stunted plants, cambium activity and division and ductility of cell walls (Saupe, 2007). It also has a role in stimulating vegetative growth. Gibberellins are important plant growth regulators that stimulate cell division and expansion and activate many enzymes that contribute to plant growth and development and increase the activity of the vital and physiological processes of the cell by increasing the construction of DNA, RNA and protein (Hopkins and Hunner, 2004). Interest in the use of marine algae extracts has recently increased through foliar spray fertilization, which leads to increased vegetative growth as it works to provide nutrients well, and is more effective compared to ground addition due to reducing loss (Kemira, 2004). The extract of marine algae is used in large quantities in the agricultural field, which stimulates plant growth in low concentrations and contains macro and micronutrients and also contains growth-promoting substances such as auxins, vitamins, amino and organic acids, as well as sugars that increase plant resistance to salinity and drought (Morales and Norrie, 2010).

Amino acids are a simple and basic non-humic organic nitrogenous compound common to all living organisms that contains 20 types of amino acids, and amino acids bind together to form proteins, which are the main component of protein. Amino acids, especially Glutamic acid and glycine, are involved in the formation of chlorophyll, which increase the rate of photosynthesis and regulate most of the basic functions of plant growth and development. The spraying of amino acids acts as an osmotic equilibrium agent in the cytoplasm of guard cells and improves the process of closing and opening

stomata. In addition to its role in the process of phytohormonal formation (Singh, 1999; Nag *et al.,* 2001; Havlin *et al*., 2005).

This research aims to improve the vegetative growth of grape variety transplants through foliar spraying with gibberellic acid and organic fertilizer NAUTA which containing amino acids and seaweed extracts, for vigorous growing of young vines.

Materials and Methods

This study was conducted in the vineyard of the Department of Horticulture and Landscape Design / College of Agriculture and Forestry / University of Mosul during the growing season 2022 to study the improvement and increase of vegetative growth of young vines of three varieties of grapes through foliar spraying with gibberellic acid and organic fertilizer Nauta. The seedlings of three varieties of grapes were planted at the age of one year on the first of February 2022 and pruned on two eyes and planted at a distance of 3×2 m. Samples of soil with a depth of 25-50 cm were taken before spraying operations in the experiment and some physical and chemical properties were analyzed in them shown in Table 1.

Factorial experiment was applied using three factors, three grape cultivars Halawani, Kamali and Kkalili was the first factor, spraying with three concentrations of GA_3 0, 50 and 100 mg l^{-1} as the second factor in addition to foliar application with organic fertilizer NAUTA with three concentrations 0, 250 and 500 mg l^{-1} as third factor, and study the interaction between these factors using Randomize Complete Block Design (RCBD) with three repeats, and two seedlings per experimental unit.(Al-Rawi, and Khalafalla. 2000).

Table (1): Physical and characteristics of experimental soil samples at 25-50cm.

Characteristic	Measuring unit	Values
Soil pH	-------	7.3
EC	dec.m^{-1}	0.3
Organic matter	%	2.2
Available N in soil	Ppm	0.43
Available P in soil		6.5
Available K in soil		100
Sand	%	42.05
Silt		23.95
Clay		34
Soil texture	**Sandy loam**	

The analysis was carried out in the central laboratory of the College of Agriculture and Forestry / University of Mosul.

The seedlings of three grape cultivars were sprayed with gibberellic acid in the early morning till runoff, by three sprays during the first growing season in late April 26/4/2022 and the second a month after the first spray and a third workshop in early September, in addition to foliar application with organic fertilizer NAUTA by three sprays, the first on 9 May 2022 and the second a month after the first spray and the third after a month from the second spray.

The characteristics of vegetative growth were studied: Seedling height (cm) and the diameter of the main stem of the seedling (mm) on the first of November, the number of leaves for each young vine on the main stem and the branches of each young vine was calculated , leaf area (cm^2) was estimated, by taking 20 leaves for each seedling by measurement the maximum length and width of each leaf according to the equation of (Montero *et al*. 2000), seedling leaf area (cm^2. $seedling^{-1}$) was calculated as:

Seedling leaf area = number of leaves per seedling × average leaf area. finally, fresh and dry weight and the percentage of dry matter of the leaves were measurements too.

Results and Discussion

Stem height: It is clear from the data of Table (2) that the grapes variety Halwani was significantly outperformed the average height of the main stem of the seedlings over the variety Khalili and Kamali. It is noted from the data of the same table that the spraying treatment at a concentration of 250 mg l^{-1} of nauta fertilizer is significantly superior to the comparison treatment in the height of the main stem of the seedling. The data of Table (2) also found significant differences, especially spraying with a concentration of 100 mg l^{-1} of gibberellic acid significantly on the treatments 0 and 50 mg l^{-1}. In

addition, the spraying with 50 mg l^{-1} of gibberellic acid was significantly outperformed the comparison treatment that recorded the lowest values for the average height of the main stem. It is clear from the data of the same table that for the bilateral overlap, especially the data of triple interference between the studied factors, the significant superiority of the grapes seedlings Halawani, which was sprayed with a concentration of 250 mg l^{-1} of Nauta fertilizer and 100 mg l^{-1} of gibberellic acid, which achieved the highest rate in the height of the main stem of grape seedlings of 125.83 cm. While the spraying treatment of 250 mg l^{-1} of nauta fertilizer with zero mg l^{-1} of gibberellic acid for the Kamali grape variety recorded the lowest values for the average height of the main stem of the grape seedling of 73.33 cm.

Table(2): Effect of foliar application with gibberellic acid and Nauta fertilizer on the main stem (cm) of seedlings of three grape varieties.

cultivar	Nauta (mg l^{-1})	Giberellic acid conc. (mg l^{-1})			Cvs. × Nauta	Effect of cvs.
		0	50	100		
	0	92.00 g h i	93.83 i-f	107.66 b c d	97.83b	
Halwani	250	95.66 e-i	106.66 b c d	125.83 a	109.38a	106.43 a
	500	110.83 b c	110.50 b c	114.83 b	112.05a	
	0	73.83 l	91.66 g h i	102.00 e-h	89.16 c d	91.07 b
Kamali	250	73.33 l	95.50 e-i	105.33 b-e	91.38e	
	500	79.66 i j l	86.66 k j l	111.66 b c	92.66 b c	
	0	86.83 l j k	93.33 f i	103.66 c-f	94.61 b c	
Khalili	250	87.66i j	98.00 d-i	99.50 d h	95.05b c	91.56 b
	500	76.50 k l	88.83h l j	89.66h i j	85.00d	
Effect of GA_3		86.26c	96.11 b	106.69 a		
	Halwani	99.50 c d	103.66 b c	116.11 a	**Effect of Nauta**	
Cvs. × GA_3	**Kamali**	75.61h	91.27 f	106.33 b	**(mg l^{-1})**	
	Khalili	83.66 g	93.38 e f	97.61d e		
	0	84.22 f	92.94 d f	104.44 a b	93.87 b	
Nauta × GA_3	250	85.55 f	100.05 b c	110.22a	98.61 a	
	500	89.00 e f	95.33 c d	105.38a b	96.57 a b	

Means within the columns with the same letter are not significantly different at *P* = 0.05 according to Duncan's test.

Stem diameter: The data of Table (3) indicate that there are significant differences between the varieties in the diameter of the main stem of Halwani and Kamali grape seedlings, and Kamali variety was significantly outperformed Khalili variety in this characteristic. It is also noted in the same table that spraying at 250 mg l^{-1} of Nauta fertilizer significantly outperformed the comparison treatment, while it is noted from the same table that gibberellic acid has a clear significant effect in increasing the average diameter of the stem, as grape seedlings sprayed with 100 mg l^{-1} of gibberellic acid significantly outperformed the 0 and 50 mg l^{-1}. The table also shows that for bilateral interactions, especially the data of triple interaction between the studied factors, it is clear that the spraying treatment at 250 mg l^{-1} of Nauta fertilizer and spraying at 100 mg l^{-1} of gibberellic acid for the grape variety Halawani is significantly superior to this parameters of 9.11 mm. While the control treatment for the Khalili grape variety recorded the lowest values for the average diameter of the main stem for grape seedlings, which amounted to 5.52 mm.

Number of leaves: It is clear from the data of Table (4) that Halwani and Kamali varieties are significantly superior to the Khalili variety in the average number of leaves. In addition, the spraying with 250 mg l^{-1} of Nauta fertilizer is significantly superior to the treatment of 500 and zero mg l^{-1} of Nauta fertilizer as well. In addition, with 500 mg l^{-1} of Nauta fertilizer significantly was outperformed the control treatment. While spraying with 50 and 100 mg l^{-1} of gibberellic acid was significantly outperformed the comparison treatment.

Table (3): Effect of foliar application with gibberellic acid and Nauta fertilizer on the main stem diameter (mm) of seedlings of three grape varieties.

Cultivar	Nauta (mg l^{-1})	Giberellic acid conc. (mg l^{-1})			Cvs. × Nauta	Effect of cvs.
		0	50	100		
	0	6.40 c-f	7.37 a-f	7.49 a-f	7.08 a b c	
Halwani	250	7.01 a-f	8.03 a b c	9.11 a	8.05 a	7.61 a
	500	7.52 a-f	7.66 a –e	7.96 a-d	7.71 a b	
	0	5.64 e f	6.69 b-f	8.72 a b	7.02 a b c	
Kamali	250	6.88 b –f	7.74 a-e	8.00 a b c	7.54 a b	7.38 a
	500	6.65 b-f	7.47 a-f	6.63 a b	7.58 a b	
	0	5.52 f	6.60 b- f	6.69 b-f	6.27 c	
Khalili	250	6.30 c-f	6.43 c- f	7.62 a-f	6.78 b c	6.62 b
	500	5.86 d e f	6.43 c-f	8.15 a b c	6.81 b c	
Effect of GA_3		6.42 c	7.16 b	8.04 a		
	Halwani	6.97 c d e	7.69 a b c	8.18 a b	Effect of Nauta	(mg l^{-1})
Cvs. × GA_3	Kamali	6.39 d e	7.30 b c d	8.45 a		
	Khalili	5.89 e	6.48 d e	7.48 a b c d		
	0	5.85 c	6.89 b c	7.63 a b	6.79 b	
Nauta × GA_3	250	6.73 b c	7.40 a b	8.24 a	7.46 a	
	500	6.67 b c	7.18 a b	8.24 a	7.37 a b	

Means within the columns with the same letter are not significantly different at *P* = 0.05 according to Duncan's test.

Table (4): Effect of foliar application with gibberellic acid and Nauta fertilizer on the number of leaves per seedling of three grape cultivars.

Cultivar	Nauta (mg l^{-1})	Giberellic acid conc. (mg l^{-1})			Cvs. × Nauta	Effect of cvs.
		0	50	100		
	0	407.00 g-j	484.00 d-h	448.00 f-i	446.33 c d	
Halwani	250	579.67b c d	735.67 a	641.00 a b	652.11 a	550.48 a
	500	495.67 d-g	613.33 b c	550.00 b-f	553.00 b	
	0	328.67 j k	362.00 i j k	403.67 g-f	364.78 e	
Kamali	250	407.00 g-j	513.00 c-g	566.33 b-e	495.44 c	428.85 a
	500	274.00 k	431.33 g j	573.67 b-e	426.33 d	
	0	325.00 j k	360.67 i j k	368.67 h-k	351.44 e	
Khalili	250	346.00 i j k	578.67 b c d	426.67 g-j	450.44 c d	408.59 b
	500	399.67 g-j	460.33 e-i	411.67 g-j	423.89 d	
Effect of GA_3		395.85 b	504.33 a	487.74 a		
	Halwani	494.11 b c d	611.00 a	546.33 b	Effect of Naua	(mg l^{-1})
Cvs. × GA_3	Kamali	336.56 g	435.44 d e	514.56 b c		
	Khalili	356.89 f g	466.56 c d	402.33 e f		
	0	353.56 d	402.22 c d	406.78 c d	387.52 c	
Nauta × GA_3	250	444.22 c	609.11 a	544.67 b	532.67 a	
	500	389.78 c d	501.67 b	511.78 b	467.74 b	

Means within the columns with the same letter are not significantly different at *P* = 0.05 according to Duncan's test.

Through the study of bilateral interactions and triple interference between the studied factor, it is clear that the spraying treatment at a concentration of 250 mg l^{-1} of Nauta fertilizer and spraying with 50 mg l^{-1} of gibberellic acid for the grape variety Halawani was significantly superior to most of treatments (735.67 leaves. seedling^{-1}). While spraying with 500 mg l^{-1} of Nauta fertilizer and spraying at zero mg l^{-1} of gibberellic acid for the Kamali grape variety recorded the lowest values in the average number of leaves of 274 leaves. seedling^{-1}.

Leaf area: It is noted from the data of Table (5) that the Khalili grape variety was significantly outperformed to Kamali and Halwani varieties, in addition to the superiority of the Kamali grape variety was significantly over the Halwani variety in

the average leaf area. In addition, the spraying with 250 mg l^{-1} of Nauta fertilizer is significantly superior to the treatment of 500 and 0 mg l^{-1} of the same fertilizer, and spraying with 500 mg l^{-1} of Nauta fertilizer is significantly superior to the control treatment. In addition, the spray with 100 mg l^{-1} of gibberellic acid exceeds the treatment of 50 and 0 mg l^{-1}. The spray treatment at 50 mg l-1 of gibberellic acid is also significantly outperformed to the control treatment. From the data of Table (5), it is noted that the interaction between the three factors has a significant effect in increasing the leaf area, spraying with 250 mg l^{-1} of Nauta fertilizer with spraying with 100 mg l^{-1} of gibberellic acid for the Khalili grape variety outperformed most of the treatments of 29.53 cm^2. $leaf^{-1}$. While the spraying with 250 mg l^{-1} of Nauta fertilizer, which was sprayed with 0 mg l^{-1} of gibberellic acid for the grapes variety Halwani, recorded the lowest values in the leaf area of 13.39 cm^2. $leaf^{-1}$.

Table (5): The effect of foliar application with gibberellic acid and Nauta fertilizer on the leaf area (cm2) for seedlings of three grape varieties

Cultivar	Nauta (mg l^{-1})	Giberellic acid conc. (mg l^{-1})			Cvs. × Nauta	Effect of cvs.
		0	50	100		
Halwani	0	14.23 l m	14.25 l m	17.48 j	15.32 e	15.39 c
	250	13.39 m	15.66 k l	17.06 j k	15.37 e	
	500	14.83 l m	15.65 k l	15.95 j k l	15.48	
Kamali	0	21.61 g h i	23.44 e f	25.99 d	23.68 c d	24.17 b
	250	21.04 h i	23.99 e	28.57 a b	24.53 b c	
	500	21.39 g h i	23.46 e f	28.05 a b c	24.30 bcd	
Khalili	0	20.07 i	23.96 e	26.49 c d	23.51 d	24.89 a
	250	22.20 f g h	27.68 b c	29.53 a	26.47 a	
	500	23.00 e f g	23.81 e f	27.29 b c d	24.7 bc	
Effect of GA_3		19.08 c	21.32 b	24.05 a	Effect of Nauta (mg l^{-1})	
Cvs. × GA_3	Halwani	14.15 g	15.18 f	16.83 e		
	Kamali	21.35 d	23.63 c	27.54 a		
	Khalili	21.76 d	25.15 b	27.77 a		
Nauta × GA_3	0	18.64 g	20.55 d e	23.32 b c	20.83 c	
	250	18.88 f g	22.44 c	25.05 a	22.12 a	
	500	19.74 e f	20.97 d	23. 76 b	21.49 b	

Means within the columns with the same letter are not significantly different at *P* = 0.05 according to Duncan's test.

Total leaf area of the seedling: The results data in the table (6) highlighted the superiority of the grape varieties Kamali and Khalili were significantly over the Halwani variety in the total leaf area of the seedling, in addition to the superiority of the spraying with 250 mg l^{-1} of Nauta fertilizer was significantly over 500 and 0 mg l^{-1} of the same fertilizer, and spraying with 500 mg l^{-1} of Nauta fertilizer was significantly outperformed the comparison treatment. Spraying with gibberellic acid with 100 mg l^{-1} was significantly increased the total leaf area of the seedling compared to concentrations of 0 and 50 mg l^{-1} of gibberellic acid, in addition to the spraying with 50 mg l^{-1} of gibberellic acid was significantly superior to the control treatment. Through the triple interaction data between the factors studied in Table (6), the treatment of spraying with 250 mg l^{-1} of Nauta fertilizer and spraying with 100 mg l^{-1} of gibberellic acid for the Kamali grape variety was significantly outperformed most of the treatments of (16193 cm^2. $Seedling^{-1}$), while the comparison treatment for Halwani grape variety was recorded the lowest values in the total leafy area of grape seedlings of 5803 cm^2. $Seedling^{-1}$.

Total chlorophyll content in the leaves: The results of the table (7) showed the superiority of the Kamali grape variety was significantly over the Halawani and Khalili varieties, in addition to the superiority of the Khalili grape variety was significantly over the Halawani variety in the total chlorophyll content in the leaves. Treatments 0 and 250 mg l^{-1} of Nauta fertilizer were significantly outperformed the treatment of 500 mg l^{-1} of the same fertilizer. In addition, the spraying treatment with gibberellic acid with 50 and 100 mg l^{-1} were significantly outperformed the control treatment.

Table (6): Effect of foliar application with gibberellic acid and Nauta fertilizer on the total leaf area of seedlings (cm^2 $seedling^{-1}$) for seedlings of three grape varieties.

Cultivar	Nauta (mg l^{-1})	Giberellic acid conc. (mg l^{-1})			Cvs. × Nauta	Effect of cvs.
		0	50	100		
	0	5803m	6883k l m	7809h e	6831.6 d	
Halwani	250	7725i m	11542b c d	10901b f	10056.1 b	848.5 b
	500	7359j m	9565d i	8774l e	8565.7 c	
	0	7118k l m	8457g l	10525b g	8700.2 c	
Kamali	250	8568f l	12260b c	16193a	12340.5 a	10577.6 a
	500	5860m	10123c h	16093a	10692.2 b	
	0	6505l m	8623e l	9794d i	8307.4 c	
Khalili	250	7674l m	15400a	12617b	11897.1 a	10225.7 a
	500	9195d k	10981b e	11242b c d	10472.5 b	
Effect of GA_3		7311.9 c	10426.0 b	11549.8 a		
	Halwani	6962.1 e	9329.8 d	9101.5 d	**Effect of Nauta (mg l^{-1})**	
Cvs. × GA_3	**Kamali**	7182.2 e	10280.3 c d	14270.4 a		
	Khalili	7791.3 e	11668.0 b	11217.7 b c		
	0	6475.2 d	7987.8 c	9376.1 b	7946.4 c	
Nauta × GA_3	250	7989.3 c	13067.4 a	13237.0 a	11431.2 a	
	500	7471.1 c d	10223.0 b	12036.4 a	9910.2 b	

Means within the columns with the same letter are not significantly different at $P = 0.05$ according to Duncan's test.

Table (7): Effect of foliar application with gibberellic acid and Nauta on the total chlorophyll (mg/ml green material suspension) in the leaves of seedlings of three grape varieties.

Cultivar	Nauta (mg l^{-1})	Giberellic acid conc. (mg l^{-1})			Cvs. × Nauta	Effect of cvs.
		0	50	100		
	0	26.10 i l	28.32 e k	30.51 c h	28.31 c	
Halwani	250	24.64 k l	27.35 g k	25.68 j k l	25.89 d	26.29 c
	500	25.47 j k l	25.44 j k l	23.17 l	24.69 d	
	0	29.81 i c	34.97 a b	34.79 a b	33.19 a b	
Kamali	250	32.73 bcd	37.91 a	33.68 b c	34.77 a	3354 a
	500	31.19 b g	32.03 b e	34.75 a b	32.65 b	
	0	26.57 h l	31.82 b f	29.20 d i	29.19 c	
Khalili	250	28.43 e k	30.10 c i	29.87 c i	29.46 c	29.17 b
	500	27.89 f k	29.42 d j	29.31 d l	28.87 c	
Effect of GA_3		28.09 b	30.81 a	30.10 a		
	Halwani	25.40 e	27.03 d e	26.45 d e	**Effect of Nauta (mg l^{-1})**	
Cvs. × GA_3	**Kamali**	31.24 b	34.97 a	34.40 a		
	Khalili	27.63 c d	30.44 b	29.46 b c		
	0	27.49 c	31.70 a	31.50 a	30.23 a	
Nauta × GA_3	250	28.60 b c	31.78 a	29.74 a b	30.04 a	
	500	28.18 b c	28.96 b c	29.07 b c	28.74 b	

Means within the columns with the same letter are not significantly different at $P = 0.05$ according to Duncan's test.

Through the triple overlap data in Table (7) between the studied factors, we note the significant superiority of the spraying treatment at a concentration of 250 mg l^{-1} of Nauta fertilizer and spraying at a concentration of 50 mg l^{-1} of gibberellic acid for the grape variety Kamali on most of the treatments of (37.91 mg/ml green matter suspension), while the spraying treatment at a concentration of 500 mg l^{-1} of Nauta fertilizer and spraying with 100 mg l^{-1} of gibberellic acid for Halwani grape variety was recorded the lowest values for the

total chlorophyll content of leaves (23.17 mg/ml green substance suspension).

The variance of cultivars is attributed to vegetative growth characteristics and total chlorophyll content

in leaves of grape seedlings are to the genetic susceptibility and differences of genetic factors controlling the growth strength of the varieties in terms of giving the number of leaves, the length of the internodes, the size of the leaves, the extent of their expand, the strength and activity of cambium cells and their impact on increasing vegetative growth, which varies from one variety to another, and this is consistent with Alimam 1998, Nuzzo *et al*. (2000) and Alimam and Al-Obaidi (2020). The increase and enhancement of vegetative growth of grape seedlings, especially when foliar with 250 mg l^{-1} of Nauta fertilizer containing amino acids and seaweed extracts, is attributed to the increased content of endogenous hormones in grape seedlings (Khan *et al*., 2012), which improves and increases the chlorophyll content in the leaves Table (7) as a result of amino acid treatment (Awad *et al*., 2007 and El-Shabasi *et al*., 2005), which leads to an increase in the efficiency of photosynthesis and respiratory rate, which increases the growth of seedlings (Spinelli *et al*., 2009). In addition, spraying with amino acids and sea weeds extracts leads to an increase in the content of leaves of plant growth hormones, vitamins and total chlorophyll, which leads to an increase and stimulation of vegetative and root growth of seedlings (Andreu, 2009). Through the results obtained in increasing the height and diameter of the main stem, especially when spraying at a concentration of 100 mg l^{-1} of gibberellic acid, which is attributed to the vital role of gibberellic acid in that spraying with gibberellic acid function to increase cell division and elongation, which leads to an increase in the number of leaves and the leaf area and thus increase the efficiency of photosynthesis that is used to increase vegetative growth, including increasing the leaf area of seedlings (Al-Jubouri and Al-Hamidawi, 2013). And help gibberelins in the formation of some secondary tissues during secondary thickening, which function to increase the diameter of the main stem of seedlings, in addition to the responsibility of gibberellins in the formation of mRNA of DNA and thus for protein synthesis in the presence of cytokinins, which work to increase vegetative growth (Opik and Relfe, 2006) and also causes the elongation of internodes , as well as the vital role of gibberellic acid in stimulating the production of auxins and reducing the effectiveness of enzymes IAA-oxidase and Peroxidase, which works to increase vegetative growth for grape seedlings (Dujaili and Rashid, 2010). Increasing the stimulation of visceral tissue in the leaf and its total chlorophyll content, delaying its demolition, increasing the effectiveness of photosynthesis, transferring the materials processed in the leaves to seedlings, encouraging their growth and increasing the number of leaves (Davies, 1995).

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