Nat. Volatiles & Essent. Oils, 2021; 8(6): 2263-2275

NVEO
Natural Volatiles &
Essential Oils

Effect Of Treatment With Humic And Fulvic Acids On The Chemical Traits Of The Leaves Of Two Sexes Of Seedlings Of Ornamental Palm Washingtonia Ia Filifera And Phoenix Canariensis)

Rusul Ibrahim Ali Ahmed , Mohamed Abdel Amir Hassan Al-Najjar and Wasan Fawzi Fadel Al-Abrasem

College of Agriculture, University of Basrah, Iraq

Abstract

The study was conducted at the Agricultural Research Station of the College of Agriculture / University of Basrah during the growing season 2020-2021 for the purpose of studying the effect of treatment with humic and fulvic acids on palm seedlings of two sexes Washingtonia ia filifera and phoenix canariensis, the ground was added at average of once every two weeks for a period of six months to humic acid at concentrations (0, 10, 15 ml.) and fulvic acid at concentrations (0, 5, 10 $g.L^{-1}$), and their effect on the chemical traits of seedling leaves was studied. The results of the study showed that humic acids had a significant effect on the chemical properties of seedling leaves, and they caused the improvement of these traits. Humic acid concentration 15 $ml.L^{-1}$ increased the percentage of nitrogen, phosphorous, potassium, chlorophyll and carbohydrates at average of (2.268, 2.430, 8.72) % 14.14 $mg.100\ g^{-1}$, 4.287 mg 100 g^{-1} dry weight, respectively. Fulvic acid also has a similar effect on these traits. The triple interaction also had a significant effect on the studied traits, where the interaction between Washingtonia palm and a concentration of 15 $ml.L^{-1}$ humic acid and 10 $g.L^{-1}$ fulvic acid gave the highest values in the leaves content of nitrogen, phosphorous, potassium, chlorophyll and carbohydrates at an average of (3.160, 3.320, 11.76).) %, 18.11 $mg.100\ g^{-1}$, 5.230 mg 100 g^{-1} dry weight,The Washingtonia palm scored a significantly excelled on the canary palm in the leaves content of nitrogen, phosphorous, potassium and carbohydrate, at average of (1.881, 2.172, 7.82)%, 3.99 mg 100 g^{-1} dry weight, respectively.

Keywords: Humic acid-folvic acid-Canariensis-Washingtonia ia chemical content

Introduction

Ornamental palm trees are among the beautiful trees used in landscaping and interior decoration of facilities, buildings and homes. The palm trees are distinguished by their regular shape, Where they are planted on both sides of the entrances to the gardens as groups in the natural design gardens or individually in the green area (Tawajen, 1987).The Canary palm, phoenix canariensis, is native to the Canary Islands and belongs to the Arecaceae family. This plant is the hardest of the palm plant, but it is considered very attractive because it is slow in growth. A 5-year-age palm may reach a height of 1-1.5 m. The fronds are divided into many parts that arise from a central base with graceful and narrow curvatures of the leaves, it reproduces by seeds and offshoot(Abu Zahra and Al-Qasim, 2015).It is a monocotyledonous dicotyledonous unisexual (Unisexual) its

growth is very slow and it reproduces through seeds and offshoots (Galeb, 2003). Washingtonia ia filifera follows the palm family Arecaceae, the home of this plant is northwest Mexico, western Arizona and California. It reaches a height of 25 meters under appropriate conditions, and the planted from it does not excel 15 meters in height, the plant ranges between 3-5 meters, leaf is large in size with a strong neck armed with thorns Durable, sharp on its edges, and the leaf blade is round with folds and divided into several sections, with fibers appearing between them (Higher Commission for the Development of Riyadh, 2013).The Washingtonia palm is a perennial evergreen tree with a large crown. It is characterized by having a long stem that is straight and thick at the base, swollen and covered with the bases of the leaves. It is also characterized by having fan-shaped leaves and the ends of its leaves are hanging in the form of large threads (Askar, 2011).The number of its leaves ranges between (40-70) leaves and on its edges there are fibers and thin threads. The leaf stalks are relatively long and tough containing strong thorns that resemble saw teeth. It is rare to be clustered offshoots that bloom in summer and then turn into black fruits that have one seed, and their age is It ranges between 80-250 years or more (Al-Batal, 2005).The Washingtonia palm is a monocotyledonous plant, the stem is covered with the bases of the old leaves (Tawajen, 1987).Humic acid is composed of several nutrients, the most important of which are carbon, hydrogen, oxygen, nitrogen, sulfur, phosphorous and other mineral elements, while fulvic acid represents a group of compounds with high molecular weights similar in their structural structure. The compositional structure of fulvic acid differs from that of humic acid in that the former contains less carbon and nitrogen and a greater proportion of hydrogen and oxygen. (Muslat and Musleh, 2015). The addition of humic and fulvic acids leads to an increase in the absorption of nutrients by the plant, as it acts as a medium for transporting nutrients to the plant, and its addition leads to an increase in the growth of the root system, an increase in the percentage of germination and an improvement in the anatomical characteristics of the plant (Al-Alaf, 2012; Blackt and Al-Hamidawi, 2015; Khalesro et al. Dahesh, 2015.It has been proven by many studies to improve the chemical content of plant leaves when using organic acids (Al-Tamimi et al., 2017).

Materials and methods

The seeds of ornamental palms Washingtonia (W) and Canary (C) were planted in a pot of 25 cm in diameter, containing river soil and peat moss at a ratio of (1:1) and fulvic acid (F) in concentrations (0, 5 and 10 $g.L^{-1}$) by ground addition at an average of once every two weeks and the addition continued for six months. leaves samples were collected from all treatments and the following measurements were taken:

1- Nitrogen content of leaves:

The total nitrogen in the digested samples was estimated by the steam distillation apparatus (Kildal), as described in (page et al, 1982).

2- Leaves content of phosphorous and potassium:

The dried plant samples (at a temperature of 70 °C) of leaves were digested by the acid mixture (H_2SO_4 - $HClO_4$) 4% according to the method of Cresser and Parsons (1979) and the phosphorous was determined in the digestion solution after adjusting the acidity of the mixture according to the method of Murphy and Riley

(1962). and potassium using a Flame Photometer after adjusting the acidity of the concentrations of standard solutions.

Materials and methods

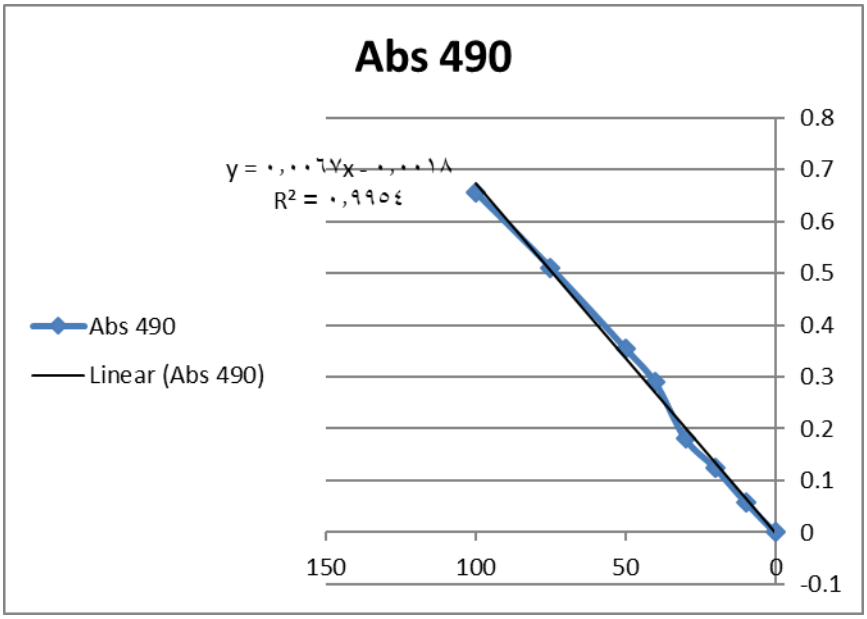
The seeds of ornamental palms Washingtonia (W) and Canary (C) were planted in a pot of 25 cm in diameter, containing river soil and peat moss at a ratio of 1:1. -1)and fulvic acid (F) in concentrations (0, 5 and 10 $g.L^{-1}$) by ground addition at an average of once every two weeks and the addition continued for six months. leaves samples were collected from all treatments and the following measurements were taken:

1- Nitrogen content of leaves:

The total nitrogen in the digested samples was estimated by the steam distillation apparatus (Kildal), as described in (page et al, 1982).

2- Leaves content of phosphorous and potassium:

The dried plant samples (at a temperature of 70 °C) of leaves were digested by the acid mixture (H_2SO_4 - $HClO_4$) 4% according to the method of Cresser and Parsons (1979) and the phosphorous was determined in the digestion solution after adjusting the acidity of the mixture according to the method of Murphy and Riley (1962). and potassium using a Flame Photometer after adjusting the acidity of the concentrations of standard solutions.



1- Leaves content of total soluble carbohydrates mg 100 g^{-1} dry weight:

Carbohydrate determination was determined by the Modification of Phenol-Sulfuric acid Colorimetric Method (Al-Najjar et al., 2021). The absorbance was measured using a Spectro Photometer at a wavelength of 490 nm. Total soluble carbohydrates were estimated using the standard glucose curve and according to the following equation.

Total soluble carbohydrates (mg.100g) = Amount of carbohydrate in the standard curve * final volume of extract (ml) * dilutions / sample weight (g).

4- Leaves content of total chlorophyll mg/100g fresh weight:

Estimate the total chlorophyll content of the leaf tissue according to the method described by (Al-Najjar et al., 2021).

Total chlorophyll mg. L^{-1} x 20.2 = optical density at wavelength 645 + 8.02 x optical density at wavelength 665

Converted the amount of chlorophyll from mg.L^{-1} to mg. $100g^{-1}$ according to the following equation

mg.L^{-1}/100ml *100/sample weight (g).

statistical analysis

The results were analyzed using the analysis of variance for the chemical properties of the study factors using the statistical program GeenStat Ver.13. The averages were also analyzed and the significance was tested according to the least significant difference test (LSD) at the probability level of 0.05 (Basheer, 2003).

Results and discussion

The results in Table (1) showed the significant effect of the type of palm on the percentage of total nitrogen in the leaves, where the Washingtonia palm significantly excelled on the canary palm, and the highest average was recorded at 1.881%, while the canary palm recorded the lowest value, which amounted to 1.421%. As for the effect of humic acid, it was The concentration of 15 ml.L^{-1} significantly excelled, and the highest value was 2.268% compared to the control treatment, which recorded 0.697%.Fulvic acid had a significant effect by surpassing the concentration of 10 g.l-1 as it scored 2.168%, while the control treatment gave 0.790%. The bi-interaction between Washingtonia palm and concentration 15 ml.L^{-1} recorded the highest value of 2.507.%, while the interaction between canary palm and concentration 0 ml.L^{-1} recorded the lowest average of 0.533%.Also, the bi-interaction between Washingtonia palm and a concentration of 10 g.L^{-1} of fulvic acid recorded the highest value of 2.413%, while the interaction between canary palm and a concentration of 0 g.L^{-1} of fulvic acid recorded the lowest value, which amounted to 0.600%While the bi-interaction between the concentration of 15 ml. L^{-1} of humic acid and 10 g. L^{-1} of fulvic acid recorded the highest average, which was 2.910%, with a significant difference from the rest of the interactions. As for the triple interaction between the study factors, the interaction between Washingtonia palm trees was recorded. Humic acid at a concentration of 15 ml. L^{-1} and fulvic acid at a concentration of 10 g. L^{-1} had the highest value of 3.160% with a significant difference from the rest of the interactions.

Table (1) Effect of treatment with humic and fulvic acids on the total nitrogen content of Washingtonia and Canary palm leaves

palm species	Humic acid ml.L^{-1}	The average of Triple interaction effect	The effect of the interaction	The average of species effect
		Fulvic acid g.L^{-1}		

		0	5	10	between species and humic	
Washingtonia	0	0.410	0.950	1.220	0.860	1.881
	10	1.150	2.820	2.860	2.277	
	15	1.380	2.980	3.160	2.507	
canary	0	0.390	0.440	0.770	0.533	1.421
	10	0.580	2.180	2.340	1.700	
	15	0.830	2.600	2.660	2.030	
The average of the interaction effect between species and fulvic	Washingtonia	0.980	2.250	2.413	Humic effect average	Fulvic effect average
	canary	0.600	1.740	1.923		
The average of interaction effect between humic and fulvic	0	0.400	0.695	0.995	0.697	0.790
	10	0.865	2.500	2.600	1.988	1.995
	15	1.105	2.790	2.910	2.268	2.168
L.S.D.						
species = 0.2785	humic = 0.3411	fulvic = 0.3411	species-humic interaction = 0.4825	species-fullvic = 0.4825	humic-fulvic = 0.5909	triple interaction = 0.8356

The results in Table (2) showed the significant effect of date palm type on the content of the total percentage of phosphorous in the leaves, where the Washingtonia palm scored a significantly excelled on the canary palm, and it recorded the highest average of 2.172%, while the canary palm recorded the lowest rate, which amounted to 1.548%.As for the effect of humic acid, the concentration of 15 ml.L^{-1} was significantly excelled, and the highest value was 2.430% compared to the control treatment, which recorded 1.057%.Fulvic acid concentration of 10 g.L^{-1} had a significant effect, recording 2.333% compared to the control treatment, which amounted to 1.160%. The bi-interaction between Washingtonia palm and humic acid at a concentration of 15 ml. L^{-1} recorded the highest value in the phosphorous content of leaves, which amounted to 2.800%, while the interaction between canary palm and humic acid at a concentration of 0 ml. L^{-1} recorded the lowest average of 0.837%, and the bi-interaction between Washingtonia and fulvic acid concentration of 10 g.L^{-1} the highest average of phosphorous content in the leaves was 2.697%.Whereas, the interaction between canary palm and fulvic acid at a concentration of 0 g.L^{-1} recorded the lowest value of 0.923%. The effect of the bi-interaction between humic acid at a concentration of 15 ml.L^{-1} and fulvic acid at a concentration of 10 g.L^{-1} had the moral effect by giving it the highest value, which It reached 2.950 % with a significant difference from the rest of the interactions.As for the triple interaction, it was significant, where the interaction between Washingtonia palm

and humic acid at a concentration of 15 ml.L^{-1} and fulvic acid at a concentration of 10 g.L^{-1} recorded the highest value in the phosphorous content of leaves, at average of 3.320% than the rest of the interactions.

Table (2) Effect of treatment with humic and fulvic acids on the phosphorous content of leaves of Washingtonia and Canary palms

palm species	Humic acid ml.L^{-1}	The average of Triple interaction effect			The effect of the interaction between species and humic	The average of species effect
		Fulvic acid g.L^{-1}				
		0	5	10		
Washingtonia	0	0.670	1.370	1.790	1.277	2.172
	10	1.550	2.790	2.980	2.440	
	15	1.970	3.110	3.320	2.800	
canary	0	0.590	0.810	1.110	0.837	1.548
	10	0.990	2.030	2.220	1.747	
	15	1.190	2.410	2.580	2.060	
The average of the interaction effect between species and fulvic	Washingtonia	1.397	2.423	2.697	Humic effect average	Fulvic effect average
	canary	0.923	1.750	1.970		
The average of interaction effect between humic and fulvic	0	0.630	1.090	1.450	1.057	1.160
	10	1.270	2.410	2.600	2.093	2.087
	15	1.580	2.760	2.950	2.430	2.333
L.S.D.						
species = 0.3074	humic = 0.3764	fulvic = 0.3764	species-humic interaction = 0.5324	species-fullvic = 0.5324	humic-fulvic = 0.6520	triple interaction = 0.9221

The results in Table (3) showed the significant effect of palm type on the percentage of potassium in the leaves, where the Washingtonia palm recorded the highest value of 7.82%, while the Canary palm recorded the lowest value of 6.08%. As for the effect of humic acid, the concentration 15 ml.L^{-1} recorded the highest value It reached 8.72% compared to the comparison treatment 4.58%. As for the effect of fulvic acid, it was significant. The concentration of 10 g.L^{-1} recorded the highest value of 8.33% compared with the control treatment of 4.91%. As for the bi- interaction between the type and humic acid, it was significant. The interaction between Washingtonia palm and humic acid at a concentration of 15 ml. L^{-1} recorded the highest average of 9.73%, while the interaction between canary palm and humic acid at a concentration of 0 ml. L^{-1} recorded the lowest

average at 3.91%.The two interactions between Washingtonia palm and fulvic acid at a concentration of 10 $g.L^{-1}$ had a significant effect by giving the highest average potassium content in leaves 9.38% with a significant difference from the rest of the interactions. The two interactions between humic acid at a concentration of 15 $ml.L^{-1}$ and fulvic acid at a concentration of 10$g.L^{-1}$ recorded the highest value of 10.38% with a significant difference from the rest of the interactions. As for the triple interaction of the study factors, the interaction between Washingtonia palm and humic acid at a concentration of 15 $ml.L^{-1}$ and fulvic acid at a concentration of 10 $g.L^{-1}$ recorded the highest value of 11.76%, excelled on the rest of the treatments.

Table (3) Effect of treatment with humic and fulvic acids on the potassium content of leaves of Washingtonia ia and Canary palms.

palm species	Humic acid $ml.L^{-1}$	The average of Triple interaction effect			The effect of the interaction between species and humic	The average of species effect
		Fulvic acid $g.L^{-1}$				
		0	5	10		
Washingtonia	0	3.39	5.87	6.48	5.25	7.82
	10	6.17	9.34	9.89	8.47	
	15	7.11	10.33	11.76	9.73	
canary	0	2.96	3.87	4.91	3.91	6.08
	10	4.44	7.43	7.95	6.61	
	15	5.41	8.74	8.99	7.71	
The average of the interaction effect between species and fulvic	Washingtonia	5.56	8.51	9.38	Humic effect average	Fulvic effect average
	canary	4.27	6.68	7.28		
The average of interaction effect between humic and fulvic	0	3.18	4.87	5.70	4.58	4.91
	10	5.31	8.39	8.92	7.54	7.60
	15	6.26	9.54	10.38	8.72	8.33
L.S.D.						
species = 0.715	humic = 0.876	fulvic = 0.876	species-humic interaction = 1.239	species-fullvic = 1.239	humic-fulvic = 1.518	triple interaction = 2.146

The results in Table (4) showed the significant effect of the date palm type on the chlorine content of the leaves and total oleander. The Washingtonia palm recorded the highest value of 10.37 mg. 100 gm^{-1}. As for the effect of humic acid, the concentration of 15 $ml.L^{-1}$ was significantly excelled, and the highest value was 14.14

mg. $100g^{-1}$ compared to the control treatment, which amounted to 7.12mg. $100g^{-1}$.The concentration of 10 $g.L^{-1}$ of fulvic acid recorded the highest value of 13.83 mg. $100g^{-1}$ compared with the control treatment which was 7.65mg. $100g^{-1}$.As for the effect of the bilateral interaction, it was significant between Washingtonia palm and humic acid, the concentration of 15 ml. L^{-1}, with the highest value of 15.30 mg. 100 g^{-1}, while the interaction between canary palm and humic acid was recorded at a concentration of 0 $ml.L^{-1}$ of the lowest value of 6.29 mg. $100g^{-1}$. The bi-interaction between Washingtonia palm and fulvic acid in a concentration of 10 $g.L^{-1}$ gave the highest average of 14.90 mg. $100g^{-1}$.While the interaction between canary palm and fulvic acid at a concentration of 0 $g.L^{-1}$, the lowest value was 6.99 mg. $100gm^{-1}$. The binary interaction between humic acid concentration of 15 $ml.L^{-1}$ and fulvic acid concentration of $10g.L^{-1}$ gave the significant effect on the chlorophyll content of leaves, where it recorded the highest value of 17.14 mg. 100 g^{-1}, with a significant difference from the rest of the interactions. As for the triple interaction between the study factors, it was significant by the superiority of Washingtonia palm and humic acid at a concentration of 15 $ml.L^{-1}$ and fulvic acid at a concentration of 10 $g.L^{-1}$ with a value of 18.11 mg. 100 g^{-1} and significantly more than the rest of the interactions.

Table (4) Effect of treatment with humic and fulvic acids on the content of chlorophyll in leaves of Washingtonia and Canary palms

palm species	Humic acid $ml.L^{-1}$	The average of Triple interaction effect			The effect of the interaction between species and humic	The average of species effect
		Fulvic acid $g.L^{-1}$				
		0	5	10		
Washingtonia	0	5.34	8.56	9.93	7.94	12.49
	10	9.60	16.44	16.67	14.24	
	15	10.00	17.79	18.11	15.30	
canary	0	5.11	5.88	7.89	6.29	10.37
	10	7.76	13.57	14.21	11.85	
	15	8.10	14.67	16.17	12.98	
The average of the interaction effect between species and fulvic	Washingtonia	8.31	14.26	14.90	Humic effect average	Fulvic effect average
	canary	6.99	11.37	12.76		
The average of interaction effect between humic and fulvic	0	5.22	7.22	8.91	7.12	7.65
	10	8.68	15.00	15.44	13.04	12.82
	15	9.05	16.23	17.14	14.14	13.83
L.S.D.						
species = 2.220	humic = 2.719	fulvic = 2.719	species-humic	species-fullvic =	humic-fulvic = 4.710	triple interaction =

			interaction = 3.846	**3.846**		**6.661**

The results in Table (5) showed the significant effect of the type of palm on the concentration of soluble carbohydrates in the leaves. The Washingtonia palm significantly excelled on the Canary palm and recorded the highest value of 3.993 mg g-1 dry weight, while the Canary palm recorded the lowest value of 3.338 mg g^{-1} Dry weight. A significant response was obtained when treated with humic acid concentration of 15 $ml.L^{-1}$ by giving it the highest concentration of soluble carbohydrates which amounted to 4.287 mg g^{-1} dry weight compared to the control treatment, which recorded the lowest value of 2.775, which was 2.775 mg g^{-1} dry weight. Fulvic acid also had a significant effect on the excelled of treatment 10 $g.L^{-1}$ with a value of 4.173 mg g^{-1} dry weight compared to the control treatment, which amounted to 2.900 mg g^{-1} dry weight. The effect of the binary interaction between Washingtonia palm and humic acid concentration of 15 $ml.L^{-1}$ significantly by recording the highest value of 4.660 mg g-1 dry weight, while the interaction between canary palm and concentration 0 $ml.L^{-1}$ recorded the lowest value of 2.523 mg g^{-1} dry weight. The interaction between the two types of palm and fulvic acid was significant as well. The interaction between Washingtonia palm and fulvic acid at a concentration of 10 g.l-1 recorded the highest value, which was 4.547 $mg.g^{-1}$ dry weight. While the canary palm and a concentration of 0 g.l-1 recorded the lowest. The value was 2.643 mg g^{-1} dry weight The triple interaction had a significant effect, as the interaction between Washingtonia and humic acid at a concentration of 15 $ml.L^{-1}$ and fulvic acid at a concentration of 10 $g.L^{-1}$ recorded the highest value of 5.230 $mg.g^{-1}$ dry weight with a significant difference from the rest of the interactions.

Table (5) Effect of treatment with humic and fulvic acids on the concentration of total soluble carbohydrates in leaves of Washingtonia and Canary palms

palm species	**Humic acid $ml.L^{-1}$**	**The average of Triple interaction effect**			**The effect of the interaction between species and humic**	**The average of species effect**
		Fulvic acid $g.L^{-1}$				
		0	**5**	**10**		
Washingtonia	**0**	**2.380**	**3.120**	**3.580**	**3.027**	**3.993**
	10	**3.340**	**4.710**	**4.830**	**4.293**	
	15	**3.750**	**5.000**	**5.230**	**4.660**	
canary	**0**	**2.290**	**2.480**	**2.800**	**2.523**	**3.338**
	10	**2.660**	**3.960**	**4.110**	**3.577**	
	15	**2.980**	**4.270**	**4.490**	**3.913**	
The average of the interaction effect between	**Washingtonia**	**3.157**	**4.277**	**4.547**	**Humic effect average**	**Fulvic effect average**
	canary	**2.643**	**3.570**	**3.800**		

species and fulvic						
The average of interaction effect between humic and fulvic	**0**	**2.335**	**2.800**	**3.190**	**2.775**	**2.900**
	10	**3.000**	**4.335**	**4.470**	**3.935**	**3.923**
	15	**3.365**	**4.635**	**4.860**	**4.287**	**4.173**
L.S.D.						
species = 0.2890	**humic = 0.3539**	**fulvic = 0.3539**	**species-humic interaction = 0.5005**	**species-fullvic = 0.5005**	**humic-fulvic = 0.6130**	**triple interaction = 0.8669**

We note from Table (1,2,3,3) that the leaf levels of chemical elements increase, and the increase in nitrogen, phosphorous and potassium concentrations in leaves may be due to the increase in the concentration of humic and fulvic acid levels to the role of these acids in increasing the permeability of cell membranes, which stimulates the processes of absorption of water and nutrients.It helps in the movement and transmission of cellular minerals, which in turn activates plant enzymes, as well as the presence of a group of guanine in humic acid, which is a receptor for hydrogen, and at the same time, oxygen is a stimulant and a chemical mediator of oxidation and reduction processes (Al-Hamdani, 2012).Or the increase in nitrogen, phosphorous and potassium elements (table (1,2,3,3) in plant leaves may be attributed to the role of these acids in improving the absorption of water and nutrients and working to improve the physical, chemical and fertility properties of the soil, as these acids contribute to the liberation of potassium in Soil solution as it does not exist freely inside the soil, which makes it easier for the plant to absorb it and thus increase its levels in plant tissues (Table 3) (Cimrin, et.al., 2010). The reason may also be attributed to the organic compounds containing nitrogen, which is included in the composition of chlorophyll and the formation of amino acids, which are the basis for the formation of proteins and enters the composition of cytochromes necessary for the process of photosynthesis and respiration (Al-Nuaimi, 2000).The reason may be due to the increase of nitrogen, phosphorous and potassium elements in the leaves (table (1,2,3) to the nutrients contained in humic acids such as nitrogen, phosphorous and potassium, which in turn contribute to an increase in the leaves' content of chemical elements, which is reflected positively on the growth and development of the plant (Al-Nuaimi, 2000).The use of humic organic acids, including humic and fulvic acids, where a ground addition during watering, has improved the nutritional content of the leaves of the seedlings of Washingtonia ia and Canary palms. Mineral elements from the soil and improve the growth. The spread of the root group, and this, in turn, is reflected in an increase in the concentration of these elements in the content of the leaves (Table 1,2,3), where these high levels increase the efficiency of the leaves to carry out the photosynthesis process (Arancon et al, 2006).), which is included in the construction of the chlorophyll pigment as one of the components of the porphyrins groups, which are included in the composition of this pigment (Havlin et al, 2005).The increase in the leaves' content of total soluble carbohydrates (table (5)) may be due to the ability of organic acids to make the soil more efficient to conserve water and increase the disintegration of soil granules, which improves its aeration (Anonymous, 2005).This, in turn, increases the ease of growth and spread of roots in the soil and increases the plant's ability to absorb elements to meet its requirements of elements, so the accumulation of elements in

plant tissues increases and their entry into some vital compounds inside the plant such as carbohydrates, amino acids and proteins that are used in various growth processes (Al-Dulaimi and Juma'a, 2012).The reason for the increase in the concentration of total soluble carbohydrates in the leaves may be due to the high content of nitrogen in the leaves (table 1), which in turn turns into organic compounds in the chloroplasts, which is the center of carbohydrate manufacturing (Abu Dhahi and Younis, 1988). Also, the increase in potassium in the leaves (table 3), which contributed to the increase in the photosynthesis process by increasing the absorption of water from the roots and carbon dioxide from the air through the stomata, and the representation of CO2 and its conversion into carbohydrates (Mengel and Kirkby, 1982).Also, treatment with humic and fulvic acids caused an increase in the carbohydrate content of the leaves due to their role in increasing the total chlorophyll (Table 4), which was positively reflected othe increase in the efficiency of the photosynthesis process and the increase of manufactured materials in the leaves.

References

1. Abu Zahra, Talib Ratib and Muhammad Saud Al-Qasim. (2015) A guide to indoor ornamental plants and the secrets of their success (National Center for Agricultural Research and Extension.
2. Abu Dahi, Youssef Muhammad and Muayad, Ahmad Al-Younis (1988). Plant Nutrition Guide. Ministry of Higher Education and Scientific Research, University of Baghdad. Iraq
3. Bashir, Saad Zaghloul (2003). Your guide to the SPSS statistical program. Tenth Edition. Arab Institute for Training and Statistical Research. 170-159
4. Albatal, Nabil. 2005. External Ornamental Plants. Damascus University Publications - Syria.
5. Blackt, Raad Taha Muhammad Ali and Abbas Mohsen Salman Al-Hamidawi. (2015). The effect of humic and fulvic organic humic acids and irrigation water quality on some vegetative growth indicators of young date palm trees (Phoenix L dactylifera, Barhi cultivar). Kufa Journal of Agricultural Sciences 7:(1) 47-56.
6. Al-Tamimi, Zainab Aliwi Muhammad, Alaa Abbas Ali, Mona Hussein Sharif and Abeer Qassem Kazem (2017). A physiological study of the effect of spraying with humic acid and NPK compound fertilizer on some chemical properties of palm shoots, cultivar Maktoum in the city of Karbala.:. Journal of Kerbala for Agricultural Sciences, 2017, 4.1: 1-13.
7. Al-Hamdani, Mona Hussein Sharif (2012). Effect of some organic compounds on vegetative growth and quantitative and qualitative yield characteristics of olive cultivar Olea europaea L. PhD thesis, College of Agriculture and Forestry. University of Mosul / Iraq
8. Darwish, Mona Ahmed (2008). The effect of biological fertilization and integrated fertilizer (nitrogen, phosphorous, potassium) and humic acid on the growth and chemical composition of casuarina seedlings growing in sandy soil. Journal of Productivity and Development: (3) 13177-169, Zagazig University, Arab Republic of Egypt.
9. Al-Dulaimi, Ahmed Fatkhan and Farouk Farag Juma (2012). Response of the grape variety Hamburg Black (L grossa Schiava) to irrigation with yeast suspension, licorice extract and Amino Quelant-K, Anbar Journal of Agricultural Sciences 10 (1): 48-65.
10. Dahesh, Aqila Mahdi Saleh (2019). Study of the effect of Zen and some treatments on the biochemical and anatomical characteristics of date palm seeds and seedlings Phoenix dactylifera L.. Master's Thesis - College of Agriculture - University of Basra - Iraq. 168 p.

11. Tawajen, Ahmad Musa (1987). Ornamental plants, Basra University Press, Iraq
12. Askar, Hamdi Mahmoud (2011), Nakheel Washingtonia ia -Scientific Bulletin. http://www.uaepigeon./vb/show
13. Alealaf ,Eyad Hani Ismail (2012) The effect of adding urea and humic acid on the growth of seedlings of Alinky Dunya seedlings - Al-Rafidain Agriculture Journal 31-22:(4)40
14. Alwan, Jassim Muhammad and Raeda Ismail Abd al-Hamdani (2012). Organic farming and the environment. Al Al office for printing and publishing. conductor. Iraq
15. Ghaleb, Hossam Hassan Ali (2003). Date palm trees from the reality of the United Arab Emirates. Abu Dhabi - Department of Abu Dhabi Municipality and Town Planning - Department of Agricultural Guidance and Marketing, Livestock. Abu Dhabi Printing and Publishing 467.
16. Moslat Mowaffaq Mizban and Omar Hashem Mosleh (2015) Fundamentals of Organic Agriculture Department of Horticulture and Landscaping - College of Agriculture - University of Anbar, page 149.
17. Al-Najjar, Muhammad Abd al-Amir Hasan and al-Ibrahimi, Mahmoud Shaker Abd al-Wahed al-Abrisem, and Sun Fawzi Fadel (2021). Manual in the laboratory, a guide to laboratory analyzes for postgraduate and primary students. Dar Enheduana for printing, publishing and distribution. Iraq. 223 p.
18. Al-Naimi, Saadallah Najm Abdullah. 2000. Fertilizers and Soil Fertility, Ministry of Higher Education and Scientific Research. University of Al Mosul .
19. The High Commission for the Development of Riyadh (2013). Plants Directory in Riyadh. p 311
20. **Anonymous, (2005). Humic Acid .** Plant Meds (American Lawn Care Company). Washingtonia ia . 17/02/2007.//G://humic acid.htm.
21. **Arancon, N.Q.; Edwards, C.A.; Lee, S.; Byrne, R., (2006).** Effects of humic acids from vermicomposts on plant growth, Eur. J. Soil Biol., (42): 65-69 (5 pages).
22. **Cimrin KM; Onder T; Metin T; and BurcuT. (2010**). Phosphorus and humic acid application alleviate salinity stress of pepper seedling. African J. biotechnol. 9 (36):58451.
23. **Cresser , M. S. and Parsons , J. W. (1979).** Sulphuric perchloric and digestion of plant material for the determination of nitrogen phosphorus potassium calcium and magnesium.
Anal. Chem. Acta., 109 : 431-463.
24. **Havlin,J. L., J. B. Beaton ,S. L. Tisdale and W.L. Nelson.2005**.Soil fertility and fertilizers .7th ed..Uppper Saddle River, New Jersy 07458.Italia . Spanish J. Agric .Res.; 8(3) :817- 822
25. **Keller, M., & Koblet, W. (1995)**. Dry matter and leaf area partitioning, bud fertility and second season growth of Vitis vinifera L.: Responses to nitrogen supply and limiting irradiance. Vitis, 34(2), 77-83.

26. **khalesro, S. sallhi , M . and B . Mahdavi (2015) .** effect of humic acid and salinity stress on germination characteristic of savory (satureja hortensis L.) and dragonhead (dracocephalum moldavica L.) . biological forum- AN International jornal 7 (2) : 554-561

27. **Murphy , T. and Riley , J. R. (1962).** A modified single solution method for the determination of phosphate in natural waters Anal. Chem. Acta . 27: 31-36.

28. **Page, A. L.; Miller, R. H. and Kenney , D. R. (1982).** Methods of soil analysis. Part 2, 2nd. Ed. Agronomy.

29. **Phelps, B. (2000)**. Humic Acid Structure and Properties. Phelps Teknowledge. 29/12/1427. http://www.pheplsteck.com

30. **Tatini M; Bertoni P; Landi A; and Traverisi ML. (1991)**. Effect of humic acids on growth and biomass portioning of container -grown olive plants. Acta . Hort. 294 :75 – 80.