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The Effect of Treatment with Citric Acid at Different Levels on Growth Indicators and Leaf Content of Mineral Elements of Date Palm Cuttings (*Phoenix Dactylifera L.)* Al-Sayer Variety.

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Abstract

This study was conducted during the 2020 growing season in one of the private orchards in Basra Governorate / Al-Hartha district with mixed alluvial soil, in order to study knowledge of the effect of treatment with citric acid at different concentrations on the leaf area and the leaf content of the elements of date palm phoenix dactylifera L. Al-Sayer variety, the treatment was completed. With three concentrations of citric acid (5, 10, 15) g / liter sprayed on the shoots, and three concentrations (100, 150, 200) g / liter in addition to the soil in addition to the comparison treatment without addition, as the treatment was done at the beginning of March. The experiment was carried out in the field according to the design of the complete random sectors as a simple experiment with three sectors and each sector included all the above transactions, the results showed. All the transactions were significantly superior in the average paper area and paper content of nitrogen, phosphorus and potassium compared to the comparison treatment that gave the lowest rate for the mentioned traits, while The comparison treatment gave the highest average sodium content of leaves, as it reached (7.03 mg / g), which differs significantly with the rest of the treatments. As for the ratio between sodium to potassium, the comparison treatment exceeded by giving it the highest percentage (1.57 mg / g), while the treatments gave T4, T5, T6. T7, the lowest percentage was (0.73,0.91,0.93,0.90), respectively.

Keywords: date palm, citric acid,Alsayer,

Introduction

The date palm Phoenix dactylifera L. belongs to the Arecaceae family, which is one of the monocotyledons and one of the evergreen fruit trees which is the first tree in Iraq and has been known for more than four thousand years BC and it is one of the semi-tropical fruit trees that

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occupies a distinct position in terms of The economic value and its fruits are of high nutritional value, and the Arab Gulf region is the most widespread area of palm trees in the world, as it is spread from palm cultivation to all areas with a suitable atmosphere (Al-Jubouri, 2002). There are more than 600 varieties of date palms in Iraq, and Al-Sayer is one of the four commercial varieties in Iraq, with a prevalence rate of about 23%. Al-Sayer is considered good-flavored dates, and the fruits are eaten in the wet phase and dates (Al-Bakr, 1972). Therefore, it is necessary to study the effect of some substances (antioxidants) that may improve tree growth and thus reflect positively on production and its quality, such as the use of citric acid.

Citric acid is a non-enzymatic antioxidant (citric acid), as it acts as a substance to get rid of free radicals resulting from the stresses that plants are exposed to that affect the disturbed nutritional changes and the effect on the hydrolytic chain reaction and the effect on the hydrolytic chain reaction. In addition to the fact that it may exhibit a behavior similar to the action of auxins in increasing the division and size of cells, and it is a safe substance from a health point as well. ”Ibrahim and others (2007) reported on their study of spraying mango trees that HindyBisinara described with some antioxidants, including Citric acid and Ascorbic acid And Tannic acid at a concentration of 500 mg. L-1 for each of the mentioned acids, that the best results they obtained were when spraying trees with citric acid, which led to a significant increase in the area of one leaf and the dry weight of the leaves and a significant increase in the weight of fruits and the yield of one tree compared to the rest of the treatments. As a comparison treatment, Kamel and Sakr (2009) indicated that the addition of citric acid at a concentration of 20 mM to SameOccidentalism of soils contaminated with copper and lead led to the improvement of green growth. Irrigation represented by plant height, stem diameter, number of branches, fresh and dry weights of plant parts, leaf content of total chlorophyll and carbohydrates and increased absorption of copper, lead, nitrogen, phosphorous and peptide elements. Fayed (2010) studied the effect of foliar spraying with citric acid as an antioxidant at a concentration of 1000 mg. L-1 on pomegranate trees with a variety of flavonoids for the seasons 2006 and 2007, and observed a significant increase in leaf area and a significant increase in the weight of fruits and yield per tree in both seasons.

Et. al Eisa (2012) that spraying Anna apple trees with citric acid had a clear effect on improving yield and fruit quality compared to control. El-Badway (2013) reported that spraying citric acid and ascorbic acid at a concentration of 1000 and 2000 ppm, respectively, improved the

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vegetative growth characteristics represented by stem length and number of leaves, an increase in leaf area, and increased leaf content of nutrients potassium, phosphorus and nitrogen, in addition to improving fruit quality. And Alkhawaga (2013) on his study to assess the effect of salinity and anti-salinity materials in mitigating the negative effects of salinity on the growth and fruiting of some palm varieties (Zaghloul, Siwi, Hayani), as the results showed that the use of anti-salinity substances such as citric acid was effective in mitigating the negative effect. For salinity on leaf area, yield, and fruit quality compared to the test treatment.

Abdullah (2013) found that spraying with citric acid at a concentration of 225 mg per liter on legumes led to a significant increase in plant height, number of lateral branches, number of facets, total leaf area, acorns and leaf area, number of pods and acorns of acorns. Total soluble in seeds compared to plants sprayed with distilled water (comparison method). Jassim and Taima (2016) found in their study on the effect of adding sulfur, calcium, and citric acid in improving the salt tolerance, leaf area and the content of some elements of date palm. The results of using citric acid at a level of 50 g / palm and 100 g / palm resulted in an increase in the average leaf area and leaf content. Of potassium and lower sodium and the ratio between sodium to potassium compared to the comparison treatment, Al-Araji and Beirut (2017) found that spraying with citric acid at a concentration of 500 and 1000 mg / liter led to a significant increase in the leaf area and the dry weight of apricot trees, so this study aims to know the effect of several treatments from Citric acid, in different concentrations, has an effect on improving growth by increasing the leaf area and leaf content of the mineral elements of Al-Sayer date palm offspring.

Materials and methods of work

This study was conducted in one of the private orchards in Al-Hartha district / Basra Governorate with soils affected by salinity during the 2020 growing season, in mixed alluvial soils, some of their physical and chemical properties are shown in Table (1). For the orchard in a similar manner, the experiment was carried out according to the design of complete random sectors RCBD (Al-Rawi and Khalaf Allah, 1980) with seven transactions by three replicates for one treatment. The trees were treated at the beginning of March with the following transactions:

Comparison (without spraying).

Spraying at a rate of 5 g / l on the shoots.

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Spray at a rate of 10 g / l on the vegetative growth.

Spraying at a concentration of 15 g / L on the shoots.

Add citric acid at a rate of 100 g / liter to the soil.

Add citric acid at a rate of 150 g / liter to the soil.

Add citric acid at a concentration of 200 g / l to the soil.

Table (1). Some physical and chemical characteristics of the soil of the study field before the beginning of the experiment in Al-Hartha district.

The valuable	Adjective
14,58 dSM- 8,16 262mg / kg 31.85mg / kg 131.93mg / kg 12.50g / kg	EC electrical conduction PH Ready nitrogen Ready phosphorous Ready Potassium Organic matter
an alluvial mixture	**Soil tissue**

Study traits:

The leaf area (m2)

The leaf area was calculated by taking four fronds from four fronds taken from the second row and calculating the average of the maximum length and width of one inch, then extracting the average of one frond according to the following equation based on (Ahmed and Morsy, 1999).

$$\text{leave area\%} = \frac{0.37\ (\text{wicker length} \times \text{width}) + 10.29 \times \text{number of wicker}}{1000}$$

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Leaves content of mineral elements (nitrogen, phosphorous, potassium)

At the beginning of August, samples were taken from wicker leaves from the third row after the heart (Al-Ain, 1998). They were washed and dried in an electric oven at a temperature of 70 degrees. When the weight was fixed, the samples were ground in an electric mixer.

The digestion process was carried out with concentrated sulfuric acid and concentrated perchloric acid. Where 0.2 grams of the plant sample were taken and 4 ml of sulfuric acid and 1 ml of perchloric were added to it.According to the method (Cresser and Parsons, 1979), where each of the nitrogen element was estimated in the digestion solution according to the method mentioned in (Raghupathi, Bhargava1999) using the Keldal apparatus, as for potassium by means of a flam photometer. The phosphorous element was estimated by Spectrophotometer at a wavelength of 700 nanometers according to the method given in (Raghupathi, Bhargava1999). As for measuring the ratio of potassium to sodium by dividing the result of the potassium analysis by the result of the sodium analysis.

The data were analyzed statistically using SPSS program and the averages were compared using the least significant difference L.S.D under 5% probability level.

Results and discussion

The leafarea (m2)

The results shown in Table (2) indicate the presence of significant differences between the factors in the effect of treatment with citric acid at different concentrations in the leaf area of date palms of the Sayer variety, where the treatment gave T4, which gave an area average of (1.69 square meters), followed by the treatment T7, which gave an average area of (1.73 square meters), then the treatment T5, which gave (1.74 square meters), then finally the treatment T6, which gave a rate of (1.80 square meters) consecutively, which differed significantly from the comparison treatment and the treatment of T1, T2, which gave the lowest average for the mentioned characteristics at a rate of (1.51, 1.51 and 1 52) m 2 and in a row. The reason for the effect of citric acid on the leafy space may be attributed to the positive role it plays in improving the vegetative growth of trees by stimulating the photosynthesis process, increasing the synthesis and accumulation of carbohydrates and thus improving plant growth (Abd el-al, 2009) in addition to that it is an antioxidant that It acts as an oxin that stimulates the increase in cell division and expansion, which is positively reflected in the increase in the leaf area (Ahmed et

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al., 1998 and Amer, 1999). This result was consistent with Jassem and Taaima (2016) Khalifa (2013) and Fayyad (2010) and El-Khawaga (2013), Badawy (2013), El-Araji and Beirut (2017).

Table (2) The effect of adding treatment with citric acid at different concentrations on leaf area of date palm of Al-Sayer variety

Treatment	leaf Area (m2)
T1(control)	1.51
T2	1.51
T3	1.52
T4	1.69
T5	1.74
T6	1.80
T7	1.73
LSD= 0.03	

Leaves content of nitrogen (mg / g)

The results shown in Table (3) indicate the presence of significant differences in the effect of treatment with citric acid at different concentrations in the content of the leaves of the nitrogen component of the date palm of the Al-Sayer variety, where all the treatments exceeded significantly in the average nitrogen content of the leaves at a rate between (0.34 and 0.35). Mg / g dry substance, compared to "the control treatment that gave the lowest rate of 0.24 mg / g dry substance, and there is no significant difference between the rest of the treatments, and the reason may be due to the role of citric acid in its great effect on the vegetative growth characteristics of trees because it is an antioxidant and its action." Similar to the action of growth-promoting auxins, thus increasing the ability of trees to absorb large quantities of nutrients in the soil and increasing their content in leaves Ahmed et al. (1999) and Omar (1998), in addition to that it works to catch free radicals resulting from stress, including salt stress and

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thus lead To improve the nutritional status of the plant and absorb the elements necessary for growth and increase their content in the leaves (Elad, 1992), including the nitrogen component. This finding is in line with Fayed (2010), El-Badawy (2013) and Jasem and Taaima (2016).

Leaf content of element phosphorous (mg / g)

The results shown in Table (3) indicate the presence of significant differences in the effect of treatment with different concentrations with citric acid in the content of the leaves of the phosphorous component of date palm of the Sayer variety, as the treatment T4 gave the highest rate of phosphorous content in the leaves, which reached 0.53 mg / g, followed by the treatment. T3, which gave a content rate of 0.50 mg / g, then the treatment T2, which gave a rate of 0.42 mg / g, then the rest of the treatments, which differed significantly with the comparison treatment that gave the lowest rate of 0.20 mg / g, and then the treatment T5, which gave a rate of 0.24. It does not differ significantly from the comparison, in addition to the fact that the treatment T3 does not differ significantly with the treatment T4, and the treatment T6 does not differ significantly from T7, and the reason may be attributed to this acid a large role in many physiological processes, as it is one of the antioxidant factors, as it works to protect plant cells from Aging and increasing the amount of nutrients in the various plant organs, and as a result, it improves the nutritional status of the tree through an increase in the efficiency of the photosynthesis process in the leaves and the absorption of nutrients, which led to an increase in the processing of nutrients D. Carbohydrates and mineral elements in the leaves Shaddad et al. (1990), in addition to that it works to catch the free radicals resulting from the stresses of them (salt stress) and thus lead to improving the nutritional status of the plant and absorbing the elements necessary for growth and reducing the elements that cause salinity (Elad, 1992). This finding is in agreement with Jassim and Taima (2016), El-Khawaga (2013), and El-Badawy (2013).

Leaf content of potassium element (mg / g)

The results shown in Table (3) indicate that there is a significant difference in the effect of adding citric acid at different concentrations in the content of date palm leaves of the Al-Sayer variety of potassium, as the treatment T4 gave the highest rate of potassium content in the leaves, which was (5.64) mg / And then the rest of the treatments, which differ significantly from all the treatments, and the comparison treatment that gave the lowest rate in the leaf content of

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potassium as it reached (2.33) mg / g, and as there is a significant difference between the treatments except for treatment T2 with T3 and treatment T6 with T7, the increase may return The occurrence in the leaf content of the potassium component by the effect of treatment with citric acid to the role of citric acid, which is a non-enzymatic antioxidant that works to catch free radicals and protect the cell from the effects resulting from them and selectively increase the absorption of beneficial ions such as potassium and prevent the accumulation of toxic ions thus improving the condition Nutritional plant (Saqr, 2012), in addition to its great effect on improving the vegetative growth characteristics of trees because it is one of the antioxidants, and its action is similar to the action of auxins that encourage growth. The effect of trees' ability to absorb large amounts of nutrients present in the soil and increase their content in leaves Ahmed et al. (1999) and Omar (1998), and thus it is reflected positively.

Leaf sodium content (mg / g)

The results shown in Table (3) indicate that there is a significant difference in the effect of adding citric acid at different concentrations in the content of date palm leaves of the Al-Sayer variety of the element sodium, as the results indicated that all the treatments gave the lowest average in the leaves content of the sodium element, at a rate of (6.58 and 6 35, 6.70, 6.76, 6.75 and 6.75 (mg / gm) respectively compared to the control treatment which gave the highest rate of 7.03 mg / g. This may be due to the increase in soil salinity leads to an increase in its absorption from the medium, and that the absorption process is carried out through Diffusion while its excretion is carried out by active pumping (Al-Sahaf, 2004), or it may be due to its competition with calcium and potassium on the cell walls of the plant and in its plasma membranes, making it easier to move to the root of the plant (Al-Rabie, 2002) and thus accumulates in the leaves, and these came Result is in agreement with Hussain et al., (2011)

As for the reason for the effect of adding citric acid in reducing the accumulation of sodium ion in the leaves, it may be due to its role in protecting the plant cell from free radicals resulting from the stresses of it (salt stress), which can improve the nutritional status of the plant and thus improve the growth characteristics, through increasing activity The process of photosynthesis and the manufacture of carbohydrates; Zhan and Klessing, 1997; Rao et al., 2000)) in addition to its great influence on the characteristics of the vegetative growth of trees because it is an antioxidant, and its action is similar to the action of oxins that encourage growth and thus

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increase the ability of trees to absorb large amounts of elements The nutrients present in the soil and increase their content in the leaves Ahmed and others (1999) and Omar (1998), in addition to that it works to catch free radicals resulting from stress, including salt stress, and thus leads to improving the nutritional status of the plant and absorbing the elements necessary for growth and increasing their content in the leaves (Elad, 1992). This finding is in line with El-Badawy (2013), El-Khawaga (2013) and Jassem and Taaima (2016).

Table (3). The effect of treatment with different concentrations of citric acid on the leaf content of the elements of date palm, Al-Sayer variety

Treatments	Nitrogen mg / g	phosphorus mg / g	potassium mg / g	sodium mg / g	Na + \ K +
T1 (control))	0.24	0.20	2.33	7.03	1.57
T2	0.34	0.42	3.35	6.75	1.53
T3	0.35	0.50	3.51	6.58	1.03
T4	0.35	0.53	5.64	6.35	0.73
T5	0.34	0.24	4.53	6.76	0.91
T6	0.35	0.31	4.13	6.75	0.93
T7	0.35	0.33	4.11	6.75	0.90
LSD (0.05)	**0.04**	**0.05**	**0.25**	**1.29**	**0.04**

The ratio of potassium to sodium

The results shown in Table (3) indicate the presence of significant differences in the effect of adding citric acid at different concentrations in the ratio of sodium to potassium for date palm leaves of the Sayer variety, as the treatment T4, T7, T5 and T6 gave the lowest rate (0.73, 0.90 and 0). 91 and 0.93 (mg / gm) respectively, then the rest of the treatments compared to the comparison treatment that gave the highest content rate in the aforementioned ratio, as it reached 1.57 mg / g, then treatment T2, which gave a rate of 1.53 mg / g, and there is no significant

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difference between them. The content of the leaves in the ratio of sodium to potassium may be due to the role of citric acid in its great effect on the vegetative growth characteristics of trees because it is an antioxidant, and its action is similar to the action of auxins that encourage growth, thus increasing the ability of trees to absorb large quantities of nutrients in the soil and increase their content in The papers Ahmed and others (1999) and Omar (1998), in addition to that it works to catch free radicals resulting from stress, including salt stress, thus improving the nutritional status of the plant and absorbing the elements necessary for growth and increasing their content at first Sublime (Elad, 1992). This finding is broadly consistent with Jassim and Taima (2016), El-Badawy (2013), and El-Khawaga (2013).

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